Govt. College of Engineering Amravati

(An Autonomous Institute of Govt. of Maharashtra)

Curriculum
for

V and VI Semesters.

of

B. Tech. (Mechanical Engineering)

Department of Mechanical Engineering

2012-2013

GOVERNMENT COLLEGE OF ENGINEERING, AMRAVATI

MECHANICAL ENGINEERING DEPARTMENT

SCHEME FOR B. Tech. (Mechanical Engineering) from academic year 2012-2013

Course Code	Name of the Course	Teaching Scheme (Hrs./week)				Evaluation scheme							Credits
		L	T	P	Total	Theory				Practical		Total	
						TA	CT1	CT2	ESE	ICA	ESE		
Semester – V													
MEU501	Machine Design – I	3	-	-	3	10	15	15	60	-	-	100	3
MEU502	Dynamics of Machines	3	-	-	3	10	15	15	60	-	-	100	3
MEU503	Machining Processes	3	-	-	3	10	15	15	60	-	-	100	3
MEU504	Metrology and Measurement system	4	-	-	4	10	15	15	60	-	-	100	4
MEU505	Hydraulic Machines	3	-	-	3	10	15	15	60	-	-	100	3
MEU506	Machine Design-I Lab.	-	-	2	2	-	-	-	-	25	-	25	1
MEU507	Dynamics of Machines Lab.	-	-	2	2	-	-	-	-	25	25	50	1
MEU508	Machining Processes Lab.	-	-	2	2	-	-	-	-	25	25	50	1
MEU509	Metrology & Measurement System Lab.	-	-	2	2	-	-	-	-	25	25	50	1
MEU510	Hydraulic Machine Lab	-	-	2	2	-	-	-	-	25	25	50	1
MEU511	Self study -I	-	-	-	-	25	-	-	-	-	-	25	2
		16	**0**	**10**	**26**	**75**	**75**	**75**	**300**	**125**	**100**	**750**	**23**
Semester – VI													
MEU601	Operation Research Management	3	-	-	3	10	15	15	60	-	-	100	3
MEU602	Machine Design-II	3	-	-	3	10	15	15	60	-	-	100	3
MEU603	Heat Transfer	3	-	-	3	10	15	15	60	-	-	100	3
MEU604	Control Systems Engineering	3	-	-	3	10	15	15	60	-	-	100	3
MEU605	Industrial Management and Quality Control	3	-	-	3	10	15	15	60	-	-	100	3
MEU606	Computational Lab.	-	-	2	2	-	-	-	-	25	25	50	1
MEU607	Machine Design – II Lab.	-	-	2	2	-	-	-	-	25	-	25	1
MEU608	Heat Transfer Lab.	-	-	2	2	-	-	-	-	25	25	50	1
MEU609	Control Systems Engineering Lab.	-	-	2	2	-	-	-	-	25	25	50	1
MEU610	Minor Project	-	-	2	2	-	-	-	-	25	25	50	2
MEU611	Self Study-II	-	-	-	-	25	-	-	-	-	-	25	2
MEU612	Industrial Lecture - I	1	-	-	1	-	-	-	-	-	-	-	-
		16	**0**	**10**	**26**	**75**	**75**	**75**	**300**	**125**	**100**	**750**	**23**

The ESE (Theory) duration for all courses shall be 2hrs 30 min except courses MEU101, MEU501 and MEU602 for which the ESE duration will be 3hrs.

ICA - Internal Continuous Assessment; ESE - End Semester Examination

Assessment of course MEU612 Industrial Lecture -I is scheduled in VII semester with course MEU711 Industrial Lecture – II

The course MEU511 Self Study-I is based on the basis of 20% curriculum of the courses MEU502, MEU503, MEU504 and MEU505 declared by the respective course

coordinator at the beginning of the semester

The course MEU611 Self Study-II is based on the basis of 20% curriculum of the courses MEU601, MEU603, MEU604 and MEU605 declared by the respective course coordinator at the beginning of semester

One Faculty member shall be appointed as Course Coordinator for the course Self Study and his/ her teaching workload shall be considered as 01 hr per week

Course Code	Name of the Course	Teaching Scheme (Hrs./week)				Evaluation scheme							Credits
						Theory				Practical			
		L	T	P	Total	TA	CT1	CT2	ESE	ICA	ESE	Total	
Semester – VII													
MEU701	Refrigeration & Air Conditioning	3	-	-	3	10	15	15	60	-	-	100	3
MEU702	Mechatronics	3	-	-	3	10	15	15	60	-	-	100	3
MEU703	Elective-I	3	-	-	3	10	15	15	60	-	-	100	3
MEU704	Institute Level Elective	3	-	-	3	10	15	15	60	-	-	100	3
MEU705	Refrigeration and Air Conditioning Lab	-	-	2	2	-	-	-	-	25	25	50	1
MEU706	Mechatronics Lab.	-	-	2	2	-	-	-	-	25	25	50	1
MEU707	Elective-I Lab.	-	-	2	2	-	-	-	-	25	25	50	1
MEU708	Project Stage-I	-	-	4	4	-	-	-	-	50	-	50	2
MEU709	Seminar	-	-	2	2	-	-	-	-	50	-	50	1
MEU710	Industrial Training / Visit	-	-	-	-	-	-	-	-	50	-	50	2
MEU711	Industrial Lecture - II	1	-	-	1	-	-	-	-	25	-	25	1
MEU712	Self Study-III	-	-	-	-	-	-	-	-	25	-	25	2
		13	**0**	**12**	**25**	**40**	**60**	**60**	**240**	**275**	**75**	**750**	**23**
Semester – VIII													
MEU801	IC Engines	3	-	-	3	10	15		60	-	-	100	3
MEU802	CAD / CAM	3	-	-	3	10	15		60	-	-	100	3
MEU803	Elective-II	3	-	-	3	10	15		60	-	-	100	3
MEU804	Elective-III	3	-	-	3	10	15		60	-	-	100	3
MEU805	IC Engines Lab.	-	-	2	2	-	-		-	25	25	50	1
MEU806	CAD/CAM Lab.	-	-	2	2	-	-		-	25	25	50	1
MEU807	Elective-III Lab.	-	-	2	2	-	-		-	25	25	50	1
MEU808	Project	-	-	6	6	-	-		-	75	100	175	6
MEU809	Self Study-IV	-	-	-	-	-	-		-	25	-	25	2
		12	**0**	**12**	**24**	**40**	**60**		**240**	**175**	**175**	**750**	**23**

The ESE (Theory) duration for all courses shall be 2hrs 30 min except courses MEU101, MEU501 and MEU602 for which the ESE duration will be 3hrs.

ICA – Internal Continuous Assessment; ESE – End Semester Examination

Assessment of course MEU612 Industrial Lecture -I is scheduled in VII semester with course MEU711 Industrial Lecture - II

The course MEU712 Self Study-III is based on the basis of 20% curriculum of the courses MEU701, MEU702 and MEU703 declared by the respective course coordinator at the beginning of the semester

The course MEU809 Self Study-IV is based on the basis of 20% curriculum of the courses MEU801, MEU802, MEU803 and MEU804 declared by the respective course coordinator at the beginning of semester

One Faculty member shall be appointed as Course Coordinator for the course Self Study and his/ her teaching workload shall be considered as 01 hr per week

Students of this department will select any one Interdisciplinary Elective offered by other other departments. Interdisciplinary Elective shown below will be offered to the students of other departments

Sr. No.	MEU703 ELECTIVE-I	MEU704 INTERDISCIPLINARY ELECTIVE	MEU803 ELECTIVE-II	MEU804 ELECTIVE-III
1	New and Renewable Energy Sources	Quality System Engineering	Power Plant Engineering	Automobile Engineering
2	Tool Engineering	Human Resource Management	Production Management	Mechanical Vibrations
3	Experimental Stress Analysis	Entrepreneurship Development	Machine Tool Design	Finite Element Methods
4		Thermal Engineering		
5		Introduction to System Engineering		

MEU501 MACHINE DESIGN- I

Teaching Scheme: 03 L + 00 T Total: 03 Credits: 03
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 03.00 Hrs.

Course Objectives:

I. To develop an ability to apply knowledge of mathematics, science, and engineering
II. To develop an ability to design a system, component to meet desired needs within
III. realistic constraints.
IV. To develop an ability to identify, formulate, and solve engineering problems.
V. To develop an ability to use the techniques, skills, & engineering tools

Introduction: Steps of design, Design Principle, Design consideration for dynamic and static load, selection of materials, designation of material as per ISI, Various codes and standards.

Simple Stresses : Simple stresses, factor of safety, Hertz constant stress, thermal stresses, impact stress,torsional stress, bending in straight and curved beams and application to hooks, c-clamps, Biaxial stress, theories of failure.

Variable Stresses: Fatigue and Endurance limit, factors influencing fatigue, surface finish, stress concentration, Stress Intensity Factor, notch sensitivity, combined steady and variable stresses, Gerber Line, Sordbergs line.

Design of screw and bolted Joints: Forms and Threads, types of Fastening, standard dimensions stresses due to screwing up and external forces, stresses due to combination of screwing up and external force, bolts of uniform strength, bolted joints for eccentric loads.

Design of Riveted Joints: Method of riveting, types of rivets and fixed joints, caulking, fullering, failures, strength and efficiency of riveted joints, joints of boiler shell, eccentric loaded joint.

Welded Joints: Types of welding and joints, strength of transverse and parallel fillet welded section, axially loaded unsymmetrical welded section, eccentrically loaded joint.

Design of springs: Types of spring, stresses in helical springs, Wahl's stress factor, bulking and surge, design of compression, tension, spiral helical and flat spiral springs, Introduction of leaf spring, material and construction, nipping, design of spring.

Design of Power Screw: Types of threads, torque required to raise loads, efficiency and helix angle, overhauling and self locking of screw, acme threads, stresses in power screw.

Design of Leaver: Types and Design Procedure.

Note: - Use of Design Data Book will be permitted during the examination.

Text Book:

1) Mechanical Engineering Design, Joseph E.Shigley and Charles R.Mischke, Tata McGraw Hill Publication, 6th Edition,2005
2) Design of Machine Element, V.B.Bhandari, Tata McGraw Hill Publications, 4th Edition, 1997

Reference Books:

1) Design of Machine Element, C.S.Sharma& Kamlesh Purohit, Prentice Hall of India Publications New Delhi, 4th Edition,2003
2) Machine Design- AbasicApproach , Dr S.S.Wadhwa&S.S.Jolly, Dhanpatrai and Company, 1st Edition ,2007
3) http://nptel.iitm.ac.in

Design Data Book:

1) Design Data Book for Mechanical Engineers, K.Mahadevanan&K.Balaveera Reddy, CBS Publishers & Distributor Delhi, 4th Edition 2008
2)Design Data Book – B.D.Shiwalkar, Central Techno Publication Nagpur, 2nd Edition 2007

Course Outcomes: After completion of course, students will be able to:

MEU501.1 Analyze the stress and strain on mechanical components; and understand, identify andquantify failure modes for mechanical parts

MEU501.2 Demonstrate knowledge on basic machine elements used in machine design

MEU501.3 Design machine elements to withstand the loads and deformations for a given application, while considering additional specifications.

MEU501.4 Solve a design problem successfully

MEU501.5 Proficient in the use of software for analysis and design

MEU502 DYNAMICS OF MACHINES

Teaching Scheme: 03 L + 00 T Total: 03 **Credits: 03**

Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**

Duration of ESE: 2hrs.30 min.

Course Objective:

I. To understand the force-motion relationship in components subjected to external forces and analysis of standard mechanisms.
II. To understand the effects of unbalances resulting from prescribed motions in mechanisms.
III. To understand the fundamentals of vibrations.
IV. To understand the principles in mechanisms used for governing of machines.
V. To understand static and dynamic balancing of highspeed rotary and reciprocating machines.

Static force analysis : Applied to plane motion mechanism (4 bar mechanism, single slider crank mechanism) virtual work method, static force analysis considering friction.

Inertia Force Analysis :D-Alembert's Principle, dynamic analysis of slider-crank mechanism, velocity & acc. of piston, piston effort, crank effort, inertia of connecting rod. Dynamic analysis of slider crank mechanism.

Turning Moment: turning moment diagram for reciprocating engines, speed fluctuation, Power smoothening by flywheels

Governors:-Speed Control by Governors.

Gyroscopic Couple : Gyroscopic couples and its effect on a plane disc a naval ship ,aeroplane Gyroscopic stabilization, stability of automobile during turn (Four wheeler)

Vehicle Dynamics : Coefficient of adhesion, resistance to vehicle motion, relative drive effectiveness, braking of vehicles.

Vibration : Free vibrations:- Equilibrium method, energy method, and Rayleighs method, transverse vibration of uniformly loaded shaft & several loads attached to shaft. Damped vibrations and forced vibration, Dynamic magnifier, elastic suspension. Transmissibility, vibration isolation, Introduction to Vibration systems with more than one degree of freedom. Torsional vibration, single rotor systems, Two Rotor system, three rotor system, geared systems, Graphical method for multi rotor system, Whirling of shaft & critical speeds.

Balancing of Rotating Masses : Balancing of single revolving mass by single mass rotating in same plane, Balancing of single revolving mass by two masses rotating in 8 different planes, Balancing of several masses revolving in same plane, Balancing of several masses revolving in different planes, reference plane method.

Balancing of Reciprocating Masses: Primary and secondary unbalanced forces of reciprocating masses, Partial balancing of unbalanced primary force in an reciprocating engine, partial balancing of locomotives, effect of partial balancing of reciprocating parts of two cylinder locomotive – variation of tractive force, swaying couple and hammer blow, balancing of coupled locomotives, balancing of primary and secondary forces of multicylinder inline engine, balancing of radial engine, static and dynamic balancing machines

Text Books:

1. Theory of Machines, S.S.Rattan, Tata McGraw Hill Publishing Co Ltd., New Delhi, 2nd Edition, 2005.
2. Theory of Machines & Mechanism, P.L.Ballaney , Khanna Publishers, New Delhi, 21st Edition, 2005.

Reference Books:

1. The Theory of Machines, Thomas Bevan, CBS Publishers and Distributors, New Delhi,1st Edition, Reprint 2005.
2. Theory of Machines & Mechanism, J.E.Shigley, J. J.Uicker, McGraw Hill Publication–New Delhi, 2nd Edition.
3)http://nptel.iitm.ac.in

Course Outcomes: After Completion of Course, the students will able to

MEU502.1 Perform static and dynamics force analysis for machine components.
MEU502.2 Apply the knowledge of flywheel, governor and gyroscope for the field applications
MEU502.3 Analyze free and forced vibrations of machines, engines and structures.
MEU502.4 Perform static and dynamic balancing of high speed rotary and reciprocating machines.

MEU 503 MACHINING PROCESSES

Teaching Scheme: 03 L + 00 T Total: 03 Credits: 03
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 2hrs.30 min.

Course Objectives:

I. To identify the necessity and importance of machining processes.
II. To learn the fundamentals of metal cutting and cutting force analysis.
III. To understand the working principles and classifications of lathe, drilling, boring, broaching, reaming, milling, grinding, shaper, planer and slotter machine.
IV. To differentiate between these processes in terms of application, function, advantages, disadvantages, quality and productivity
V. To understand necessity, principle, advantages, disadvantage, limitations, applications of unconventional Machining Process

Theory of Metal cutting: Mechanics of Metal cutting, Cutting parameters, chip formation & types, Tool materials, Tool Geometry, Tool life, Tool wear types, Cutting forces and power consumption, Cutting fluid classification, Machining forces and merchants force circle diagram.

Lathe: Mechanical Construction, classification of lathe machine,specifications, Operations and accessories of centre lathe, introduction of capstan &turret lathe, introduction to Automatic screw machines.

Drilling: Introduction, Working principle, Classification general purpose, Mass production and special purpose drilling machines, drill tool geometry.

Boring: Gear producing machines, Introduction, classification & mechanical construction og gear producing machines. Horizontal, Vertical and jig Boring machine.

Broaching and Reaming: Introduction, Working principle, classification, mechanical construction.

Milling: Introduction, Working principle, Classification, Types of Milling Cutters, Dividing head, Compound and differential indexing, Climb & conventional milling, applications

Grinding: Introduction, Working principle, Classification, types of bonds & Abrasive, grinding wheel specification, selection of wheel, super finishing processes.

Shaper, Planer, Slotter: Introduction, Working principle, mechanical construction, classification

Unconventional Machining Processes

Mechanical Processes: - Ultrasonic Machining - principle and applications, process parameters, Abrasive and water abrasive jet machining.Thermal processes: - Election Beam Machining - Generation of beam, principle and applications, Laser Beam machining: Plasma-arc machining- Concept and generation of plasma, principle of PAM, applications. Electro Chemical Machining- Classification, fundamentals, Electro mechanical milling. Electric discharge Machining –EDM, wire EDM, Mechanism of material removal, process parameters, advantages and applications.

Text Books

1. Workshop Technology Vol II, H S Bawa, 2nd Edition, Tata Mc Graw Hill, 2008
2. Workshop TechnologyVol II, B S Raghuwanshi, 10th EditionDhanpat Rai & Sons, Delhi, 2009

References Books:

1. Processes and Materials of Manufacture, R A LindBerg, 5th Edition PHI Publication, 2001.
2. Manufacturing Science, A.Ghosh and Bhattacharya. 2nd Edition East West Publication, 2001
3. Production Technology, HMT, Tata McGraw Hill Education Private Limited, New Delhi. 2010
4. Workshop Technology Vol. – I, II & III, Chapman, 4th Edition, Standard Publishers Distributors, New Delhi, 2010
5. Elements of Workshop Technology, Vol II, S.K.Hajra Choudhary and S.K.Bose, 2nd Edition Asia Publishing House, Bombay, 2010
6. http://nptel.iitm.ac.in

Course Outcomes: After Completion of Course, the students will able to

MEU503.1 Able to understand working principles and classifications of lathe, drilling, boring, broaching, reaming, milling, grinding, shaper, planer and slotter machine.

MEU503.2 Able to understand advantages and limitations different machining processes.

MEU503.3 Able to differentiate between these processes in terms of application, function, advantages, disadvantages, quality and productivity

MEU503.4 Able to understand necessity, principle, advantages, disadvantage, limitations, applications of unconventional Machining Processes

MEU 504 METROLOGY AND MEASUREMENT SYSTEM

Teaching Scheme: 04 L + 00 T Total: 04 **Credits: 04**

Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**

Duration of ESE: 2hrs.30 min.

Course Objectives

I. To learn basic principles of linear and angular measurement using precision non precision measuring instruments.
II. To understand the concept of tolerance and design of different limits gauges.
III. To understand the measurement of gear & screw thread elements.
IV. To learn different methods of force, torque, power, pressure and flow measurement

Elementary Metrology: - Definition of Metrology, Objectives of Metrology, Standardization and Standardizing organizations, International system of units, Methods of measurement.

Linear Measurement: - Introduction, Surface Plate, Angle Plate, V block, feeler gauges,Angle Gauges, , Principle of Vernier, Micrometers, Types of Micrometer, Slip Gauges, Introduction to CMM.

Angular Measurement:-Introduction, Bevel types Protractor, Sine Principle and Sine Bars,

Measurement of Spur Gears: Measurement ofRun out,Pitch, Profile, Backlash, Tooth Thickness.

Comparators- Characteristics, advantages, disadvantages, working of Mechanical, optical, electrical and Pneumatics Comparators.

Surface finish measurement- Introduction, RMS and CLA method, testing of surface finish.

Measurement of External Threads: Different errors in Screw Threads, Measurement of forms of Thread with Profile Projector, Pitch Measurement, Measurement of Thread diameter with Standard wire, Screw Thread Micrometer.

Instruments and gauges for testing straightness, flatness, squareness,parallelism.

Limits, Fits and Gauges:-Introduction, Concept of Tolerances, Interchangeability, Methods of Limit Systems - Hole Basis and Shaft Basis.

Generalized Measurement system:-Significance of measurement, generalized systems, Types of measuring instruments. General configuration and functional elements of measuring instruments, types of inputs, various methods of correction for interfering and modifying inputs.

General performance Characteristics and strain measurement : - Static characteristics, different types of errors, Types of strain gauges, strain gauge circuits

Pressure Measurements : Basic methods of pressure Measurement, High pressure measurement low pressure Measurement.

Force, Torque and power measurement- Various mechanical, hydraulic, pneumatic and electrical methods.

Flow measurement Construction- Venturi, orifice, Rota meter, Pressure probes- types and its working.

Temperature Measurements: - Standards, Various temperature measuring devices, Bimetallic strip, liquid in glass thermometer, pressure thermometers, thermo-couples, electrical resistance thermometers, Thermistors, radiation Thermometers

Liquid Level Measurements: - Various methods such as- single float, displacement or force transducers, capacitance variation type (for both conducting and non conducting type liquids).

Speed Measurements: - Various mechanical types of tachometers, electrical tachometers, stroboscope etc

Text Books:

1. Engineering Metrology, R.K. Jain, 4th Edition ,Khanna Publishers, New Delhi, , 2005
2. .Measurement Systems, ErenestO.Doebeling ,5th Edition, Tata Mc Graw Hill, New Delhi.

Reference Books:

1. Total Quality Management, L.Suganthi, A.A.Samuel, 2nd Edition,,Prentice Hall of India, New Delhi, 2005.
2. Inspection and Quality Control, National Productivity Council.
3. Quality Engineering Handbook, Thomas Pyzdek, Roger W. Berger, Tata McGraw Hill Publication, New Delhi, 1996.
4. Quality Handbook, J.M Juran, McGraw Hill Publication, New Delhi, 4th Edition, 2005.
5. Quality Control and TQM, P.L.Jain, Tata McGraw Hill Publishing Ltd, New Delhi, 6th Edition, 2001.
6. Practical Engg. Metrology- Sharp K.W.B. Pitman,London.
7. Engineering Metrology, I.C. Gupta , Khanna Publishers, New Delhi, 4th Edition, 2005.
8. . Instrumental Measurement & Analysis, NakraChoudhari Tata Mc Graw Hill.
9. . Experimental Methods for Engineers, J.P.Holman, Mc Graw Hill,New Delhi.
10. Mechanical Measurements, T. G. Bechwith, R.D.Marangoni, J.H.Lienhard –Pearson Education, Asia, Fifth Edition
11. Quality Control, Tata McGraw Hill Publishing Ltd, TTTI, Madras, 11th Edition, 2005.
12. Mechanical Measurements, T.G.Beckwith&N.L.Bulk - Addison Wesly Publishing Company, New Delhi, Sixth Edition
13. http://nptel.iitm.ac.in

Course Outcomes: After Completion of Course, the students will able to

MEU504.1 Apply the principles in measurements of various parameters using precisionmeasuring instrument.

MEU504.2 Understand the concept of tolerance and design of different limits gauges.

MEU504.3 Understand the measurement of gear & screw thread elements.

MEU504.4 Understand different methods of force, torque, power, pressure and flow measurement

MEU505 HYDRAULIC MACHINES

Teaching Scheme: 03 L + 00T Total: 03 Credits: 03
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 2hrs.30 min.

Course Objectives:

1. To study working principle and parameters of analysis for different hydro-machines.
2. To understand working and construction of reciprocating and centrifugal pumps.
3. To analyze the performance characteristics of different pumps and turbines.
4. To study various types of pumps and pumping system.
5. To know the basic of Computational Fluid Dynamics.

Principles of Fluid Machinery: Dynamic action of fluid force exerted by fluid jet on plane, curved, stationary and moving vanes. Velocity diagrams, work done by impact, pressure due to deviated flow.

General Theory of Hydrodynamic Machines: Euler's equation, degree of reaction, classification of machines according to degree of reaction. Efficiencies, volumetric efficiency, hydraulic efficiency, mechanical efficiency and overall efficiency.

Prime Movers :- Theory of impulse and reaction machines. Pelton, Francis and Kaplan turbines, their construction, analysis, characteristics and governing.Specific Speed, Types of Draft Tubes, Cavitations, and Performance Characteristics.

Centrifugal pumps: - Basic Theory, classification, construction, operation, characteristics, NPSH and cavitations in pumps. Slip Factor, Losses and Characteristics of a Centrifugal Pump.

Axial flow pump:-Basic theory, construction, operation, and characteristics. Other water lifting devices :-(a) Air lift pump (b) Jet Pump (c) Hydaulic Ram

Positive displacement Pumps: -Reciprocating Pumps: - Basic theory, types, construction, installation and characteristics

Computational Fluid Dynamics (CFD) : Basic Definition, Applications of CFD, Importance of Governing Equations and the physical meaning of the involved terms. Equation of continuity,

Hydrostatic systems, their function, components and application such as Hydraulic press, lift, crane and fluid drive for machine tools,Intensifier and accumulator.

Hydrokinetic systems: Fluid couplings and torque converter.

Text Books:

1.Hydraulics And Fluid Mechanics Including Hydraulics Machines**,** Dr. P.N.Modi , Dr. S.M. Seth, 14th Edition ,Standard Book House / Rajsons Publications pvt. ltd, Delhi, 2011.
2.Introduction to Fluid Mechanics and Fluid Machines, S.K. Som and G. Biswas, 2nd Ed ,Tata McGraw Hill Education Publishing Company Limited, 2007.

Reference Books:

1. Fluid mechanics and Hydraulic machines, Dr. R. K. Bansal, 9th Edition, Laxmi Publication, Delhi, 2005.

2. Fluid Mechanics and Hydraulics Machines by Dr. A.K. Arora, Standard Publisher, NewDelhi, Sixth Edition.
3. Fluid Power and Machines, Agrawal Tata Mc-Graw Hill
4. J D Anderson, Computational Fluid Dynamics, Basics and Applications– Mc HillInternational Publications
5. Fluid Mechanics, White, F. M., ,5th edition, McGraw-Hill, New York ,2003
6.http://nptel.iitm.ac.in

Course Outcomes: After completion of course, students will be able to:
MEU505.1 Explain the working of a hydro power plant, different hydro prime movers and pumps.
MEU502.2 Evaluate performance of different power generator and pumping system.
MEU502.3 Analyze and select hydro turbine / pump for a given application.
MEU502.4 Apply the proper pumping system as per requirement.
MEU502.5 Use Computational Fluid Dynamics in real fluid flow system.

MEU506 MACHINE DESIGN –I LAB

Teaching Scheme: 02 P **Total: 02** **Credit: 01**
Evaluation Scheme: 25 ICA **Total Marks: 25**

Course Objectives:

I. To develop an ability to apply knowledge of mathematics, science, and engineering
II. To develop an ability to design a system, component to meet desired needs within
realistic constraints
III. To develop an ability to identify, formulate, and solve engineering problems
IV. To develop an ability to use the techniques, skills, & engineering tools

It is representative list of practical. The instructor may choose minimum **Four** experiments as per his/her requirement (so as to cover entire content of course MEU501 Machine Design I) from the list given below

List of the Experiments:

1. Design of Screw Jack
2. Design of Knuckle Joint
3. Design of Bolted joint
4. Design of Riveted Joint
5. Design of helical spring
6. Design of Welded Joint and computer program based on above exercise.

ICA: The Internal Continuous Assessment shall be based on practical record and knowledge/skills acquired. The performance shall be assessed experiment wise by using continuous assessment formats, A&B

Course Outcomes: After completion of course, students will be able to:
MEU506.1 Analyze the stress and strain on mechanical components; and understandidentify and quantify failure modes for mechanical parts
MEU506.2 Demonstrate knowledge on basic machine elements used in machine design; design machine elements to withstand the loads and deformations for a givenapplication, while considering additional specifications.
MEU506.3 Solve a design problem successfully
MEU506.4 Proficient in the use of software for analysis and design.

MEU507 DYNAMICS OF MACHINES LAB

Teaching Scheme: 02 P Total: 02 Credit: 01
Evaluation Scheme: 25 ICA +25 ESE Total Marks: 50
Duration of ESE: 3 hrs.

Course Objective:

I. Perform static and dynamics force analysis for machine components.
II. To understand fundamentals of machine vibrations
III. To understand gyroscopic effect of two wheelers, four wheelers, and aircrafts.
IV. To Analyze free and forced vibrations of machines, engines and structures.
V. To Perform static and dynamic balancing of high speed rotary and reciprocating machines.

It is representative list of practical. The instructor may choose minimum **Six** experiments as per his/her requirement (so as to cover entire content of course MEU502 Dynamics of Machines) from the list given below

1. Graphical solution of problems On Static Force Analysis on half imperial size sheet.
2. Graphical solution of problems On Dynamic Force Analysis on half imperial size sheet, and compare it by analytical method.
3. To determine of mass moment of inertia of simple pendulum & compound pendulum.
4. To determine mass moment of inertia of rigid body using multifelar suspension method.
5. To determine the balancing mass for unbalanced rotary masses system for given set up.
6. To determine gyroscopic couple for gyroscopic apparatus for its spinning speed, verify the same with theoretical value.
7. To determine whirling speed of shaft of given diameter and length with specified end conditions.

8. To determine natural frequency of spring mass system , single rotor system.
9. To determine frequency of forced damped vibrating systems with one degree of freedom.
10. To determine frequency on free damped torsional vibration.
11. To verify Dunkerly's Formula in laboratory for given set up

ICA: The Internal Continuous Assessment shall be based on practical record and knowledge/skills acquired. The performance shall be assessed experiment wise by using continuous assessment formats, A&B

ESE: The end semester Exam for practical shall be based on performance in one of the experiments and may be followed by sample questions

Course Outcomes: After Completion of Course, the students will able to
MEU507.1Demonstrate ability towards graphically estimating velocity and acceleration.
MEU507.2Exhibit skills towards application of principles of static and dynamics force analysis.
MEU507.3Knowledge attained will comply towards successfully addressing issues relating to gears, governors, cams and followers in real life engineering problems.
MEU507.4Understand free, forced damped vibrations
MEU507.5Measure Radius of Gyrations of simple and compound pendulum,

MEU 508 MACHINING PROCESSES LAB

Teaching Scheme: 02 P Total: 02 Credits: 01
Evaluation Scheme: 25 ICA + 25 ESE Total Marks: 50
Duration of ESE: 3 Hrs

Course Objectives:

I. To learn working of lathe, shaper, milling, drilling, grinding machine
II. To prepare one job on lathe covering taper turning and threading and one composite job on shaper, milling, drilling, grinding machine.

It is representative list of practical. The instructor may choose minimum **Three** experiments as per his/her requirement (so as to cover entire content of course MEU503 Machining Processes) from the list given below:

Demonstration of operations related to lathe, shaper, drilling & grinding m/cs.
One job on lathe covering taper turning and threading.

One composite job on shaper, milling, drilling, grinding machine.

ICA: The Internal Continuous Assessment shall be based on practical record and knowledge/skills acquired. The performance shall be assessed experiment wise by using continuous assessment formats, A&B

ESE: The end semester Exam for practical shall be based on performance in one of the experiments and may be followed by sample questions

Course Outcomes: After Completion of Course, the students will able to

MEU508.1 Ability to understand working of lathe, shaper, milling, drilling, grinding machine

MEU508.2 Ability to prepare job on lathe covering taper turning and threading and one composite job on shaper, milling, drilling, grinding machine.

MEU508.3 Able to understand necessity, principle, advantages, disadvantage, limitations, applications of Machining Processes

MEU509 METROLOGY AND MEASUREMENT SYSTEM LAB

Teaching Scheme: 02 P **Total: 02** **Credit: 01**

Evaluation Scheme: 25 ICA + 25ESE **Total Marks: 50**

Duration of ESE: 3 hrs.

Course Objectives:

I. To learn basic principles of linear and angular measurement using precision non-precision measuring instruments.
II. To understand the concept of tolerance and design of different limits gauges.
III. To understand the measurement of gear & screw thread elements.
IV. To learn different methods of force, torque, power, pressure and flow measurement

It is representative list of practical. The instructor may choose minimum **SIX** experiments as per his/her requirement (so as to cover entire content of course MEU504 Metrology and Measurement System) from the list given below:

A) Any Three of Following

1. Determination of Linear/Angular dimensions of a given specimen/part using Precision/Non-Precision measuring instruments
2. Precision Angular Measurement using Sine Bar/Sine Centre, Autocollimator /Angle Dekker.
3. Measurement of circularity/Roundness of a given specimen
4. Measurement of Screw Thread Element by Floating Carriage Micrometer.
5. Testing of Surfaces by using Optical Flat.
6. Measurement of various angles of single point cutting tool by using Profile Projector and Tool Maker's Microscope.
7. Dimensional measurement of a given product using CMM

B) Any Three of Following

1. Measurement of strain using strain gauges.
2. Performance of capacitance transducer as an angular displacement-measuring device.
3. Displacement Measurement by inductive Transducers.
4. Speed measurement by magnetic pick up or photo electric pick up tachometer.
5. Speed measurement by stroboscope
6. Liquid level measurement by capacitance method.
7. Temperature measurement by thermocouple, thermistor and RTD.
8. Pressure Measurement by strain gauge type transducer

ICA: The Internal Continuous Assessment shall be based on practical record and knowledge/skills acquired. The performance shall be assessed experiment wise by using continuous assessment formats, A&B

ESE: The end semester Exam for practical shall be based on performance in one of the experiments and may be followed by sample questions

Course Outcomes: After Completion of Course, the students will able to
MEU509.1Apply the principles in measurements of various parameters using precision measuring instrument.
MEU509.2 Understand the concept of tolerance and design of different limits gauges.
MEU509.3Understand the measurement of gear & screw thread elements using Floating Carriage Micrometer
MEU509.4 Understand different methods of Angular displacement, Pressure, Speed, Liquid level, Temperature measurement

MEU510 HYDRAULIC MACHINES LAB

Teaching Scheme: 02 P **Total: 02** **Credit: 01**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**
Duration of ESE: 3 hrs.

Course Objectives:

I. To demonstrate working of hydraulic turbines.
II. To demonstrate working of hydraulic pumps.
III. To study performance and operating characteristics of turbines.
IV. To study performance characteristics of pumps.

It is representative list of practical. The instructor may choose minimum **Six** experiments as per his/her requirement (so as to cover entire content of course MEU505 Hydraulic Machines) from the list given below

1 Trial of Pelton turbine.
2 Trial of Francis turbine.
3 Trial of Kaplan Turbine.
4 Trial of centrifugal pump.
5 Trial of reciprocating pump.
6 Trial of Axial flow pump
7 Study of multistage pump.
8 Trial of Hydraulic Ram.
9 Study of Hydrostatic components systems.
10 Study of Hydrostatic systems.

ICA: The Internal Continuous Assessment shall be based on practical record and knowledge/skills acquired. The performance shall be assessed experiment wise by using continuous assessment formats, A&B

ESE: The end semester Exam for practical shall be based on performance in one of the experiments and may be followed by sample questions

Course Outcomes: After Completion of Course, the students will able to
MEU510.1 Develop procedure for standardization of experiments.
MEU510.2 Calibrate measuring device used in hydraulic system.
MEU510.3 Identify the different types of hydraulic turbines and pumps.
MEU510.4 Obtain performance characteristics of turbines and pumps.
MEU510.5 Demonstrate the hydraulic system.
MEU510.6 Test the performance of pumps and turbines.

MEU511 SELF STUDY-I

Teaching Scheme: 00 P **Total: 00** **Credit: 02**
Evaluation Scheme: 25 TA **Total Marks: 25**

Self Study-I is based on one class test each on the basis of 20% curriculum of the courses MEU502 Dynamics of Machines, MEU503 Machining Processes, MEU504 Metrology and Measurement system and MEU505 Hydraulic Machines declared by the respective course coordinator at the beginning of the semester

MEU601 OPERATION RESEARCH MANAGEMENT

Teaching Scheme: 03 L + 00 T Total: 03 Credits: 03
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 2hrs.30 min.

Course Objectives:

I. To illustrate the need of operational research models from the real world system
II. To learn the mathematical tools that are needed to solve optimization problem
III. To gain ability to apply the techniques of OR to solve real life problems in industry

Introduction: Characteristics, phases, limitations, and classification of O.R. Models.
Linear programming: formulation, Graphical method ,simplex methods: Minimization, Initialization and Iteration problems, introduction to duality.

Transportation Models: introduction, methods, formulation of transportation problems, methods for finding initial solution, Modi method.

Assignment Models: introduction, mathematical statement and solution methods of assignment problems, variations of assignment problems.

Network Models: - Network construction, PERT analysis, CPM analysis, cost analysis.

Waiting line models: introduction, classification, analysis of M/M/1and M/M/S models. Introduction to simulation, applications, generation of random numbers.

Sequencing Models: Processing of n jobs through 2 machines, n jobs through 3 machines,

Replacement Models: individual replacement policies.

Dynamic Programming: Introduction, characteristics, Examples involving discrete variables, continuous variables.

Inventory model: Deterministic models, Discount models.

Text Books:

1. Operation Research, H. A. Taha, PHI, 7th Edition.
2. Operations Research, Panneerselvan , PHI, 3nd Edition.

Reference Books:

1. Introduction to Operations Research, Billy E. Gillett, Tata McGraw Hill, 2nd Edition
2. Operation Research , Natarajan, Balasubramani, and Tamilarasi, Pearson Education, 3rd Edition,2008
3. System Simulation with Digital Computer, Narsingh Deo, PHI.

4.http://nptel.iitm.ac.in

Course Outcomes: After completion of course, students will be able to:

MEU604.1 Identify and develop operational research models from the real world system
MEU604.2 Understand the mathematical tools that are needed to solve optimizationproblem
MEU604.3 Able to apply the techniques of OR to solve real life problems in industry

MEU602 MACHINE DESIGN- II

Teaching Scheme: 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
Duration of ESE: 03.00Hrs

Course Objectives:

I. To develop an ability to apply knowledge of mathematics, science, and engineering
II. To develop an ability to design a system, component to meet desired needs withinrealistic constraints.
III. To develop an ability to identify, formulate, and solve engineering problems.
IV. To develop an ability to use the techniques, skills, & engineering tools

Design of Shaft: Material, Design on the basis of strength considering shaft subjected to twisting moment only, bending moment, combined twisting and bending moment, axial load in addition to twisting and bending, Design on the basis rigidity.

Design of Key: Types, strength of keys.

Design of Coupling: Types, requirement of good couplings, design of sleeve coupling, clamp or compression coupling, rigid flange coupling, and flexible flange coupling.

Antifriction Bearing: Types of bearing, construction, designations, standard load rating by AFBMA for static and dynamic loads, life of bearings, selection of bearing, lubrication, mounting and enclosure.

Journal Bearing: Types of Lubrication, stale lubrication, Thick film lubrication, pressure distribution, minimum film thickness, relations of variable-viscosity, coefficient of friction,speed,pressure,length and diameter, bearing modulus, viscosity-Temperature chart,Sommerfield number, selection of lubricant, design procedure and numerical.

Design of flexible machine element: Flat belt types, material and construction of belt, types of drives, slip, creep, Design **of V Belts and Rope drive- Construction** and types,

design of V and Rope drive. **Chain Drive** Classification, power, no of teeth on pockets, principal dimensions, election and design of chain. **Wire Rope** Design Procedure.

Design of Gears: Classification, law of gearing, forms and system of teeth, interference, beam strength of teeth, dynamic tooth load, wear tooth load, tooth failure a) Spur gear b) Helical gear : Classification face width, formative teeth number, strength of gear Design of gear c) Bevel gear : Classification, pitch angles, strength of gear, Design of gear d)Worm gear : Types, efficiency of gear, Design of gear.

Design of Clutch- Design of single plate, multiplate clutch

Design of Brake: Design of band brake and shoe brake.

Introduction to design of IC Engine Component.

Note: 1. Use of design data book will be permitted during the examination.

Text Book:

1) Mechanical Engineering Design, Joseph E. Shigley and Charles R. Mischke , Tata McGraw Hill Publications, 6th edition Reprint ,2005
2) Design of Machine Elements, V .B Bhandari, Tata McGraw Hill Publications, 2nd Edition 2007.

Reference Book:

1) Design Of Machine Elements, C.S Sharma & Kamlesh Purohit, Prentice Hall of Indiapublications, New-Delhi, Eastern Economy 3rd Edition, 2003.
2) Machine Design- A Basic Approach, Dr. S.S. Wadhwa and S.S. Jolly, Dhanpat Rai and Company, Delhi , 1stt Edition 2007
3) http://nptel.iitm.ac.in

Design Data Book:

1)Design data hand book for mechanical Engineers, K. Mahadevanan K. Balaveera Reddy, CBS Publishers, Delhi,4th Edition,2009
2) Design Data for Machine Element, B.D.Shiwalkar, Central Techno Publication,2nd Edition,2006

Course Outcomes: After completion of course, students will be able to:

MEU602.1 Analyze the stress and strain on mechanical components; and understand, identify andquantify failure modes for mechanical parts

MEU602.2 Demonstrate knowledge on basic machine elements used in machine design; design machine elements to withstand the loads and deformations for a given application, while considering additional specifications.

MEU602.3 Solve a design problem successfully

MEU602.4 Proficient in the use of software for analysis and design.

MEU603 HEAT TRANSFER

Teaching Scheme: 03 L + 00 T Total : 03 Credits: 03

Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE Total Marks: 100

Duration of ESE: 2hrs.30 min.

Course Objectives:

I. To learn basic modes and laws of heat transfer.
II. To learn network analogy for solving composite structure heat transfer problems.
III. To learn problem solving techniques for natural convection, forced convection, two phase systems and radiation.
IV. To solve problems on combined modes in heat transfer.
V. To study and analyze heat exchanger performance

Introduction: heat transfer in engineering, modes of heat transfer, basic laws of heat transfer and their basic equations. Conduction- thermal conductivity and thermal diffusivity effect of phase & temperature on thermal conductivity, one dimensional steady state heat conduction through slab, cylinder & sphere-simple and composite. Combined conduction convection, overall heat transfer coefficient. General heat conduction differential equation. One dimensional steady state conduction with internal heat generation for infinite slab, wire & cylinder. Introduction Two dimensional heat transfer

Insulations, critical radius of insulation, Economic thickness of insulation, Conduction through extended surfaces, analysis of a uniform C.S. fin, efficiency, fin effectiveness, Biot number. Introduction to unsteady state heat conduction, Newton's law of cooling, lumped heat capacity analysis, Heisler chart

Radiation- general concepts and definitions, black body & grey body concept. Laws of addition- Plank's, Stefan-Boltzman's radiation. Concept of shape factor, emissivity factor and radiation heat transfer equation. Radiation errors in temperature, measurement, radiation shield

Forced convection- heat convection, forced and natural convection, boundary layer theory, hydrodynamic & thermal boundary layers, boundary layer thickness. Laminar & turbulent flow over flat plate and through pipes & tubes Dimensionless number and their physical significance Reynold, Prandtl, Nusselt, Grashoff number, empirical correlations for forced convection for flow over flat plate, flow over cylinder and sphere through pipes & tubes & their applications in problem solving.

Free convection- velocity and thermal boundary layers for vertical plate, free convection over vertical cylinder and horizontal plate/cylinder. Boiling and condensation.

Heat exchanger - applications, classifications, overall heat transfer coefficient, fouling. L.M.T.D. & E.N.T.U. methods, temperature profiles, selection of heat exchangers. Introduction to working of heat pipe with and without wick

TextBooks:

1) Heat Transfer by J.P. Holman, Tata McGraw Hill Publication, 9th ed. 2002.
2) Heat Transfer by S.P. Sukhatme, Tata McGraw Hill Publication, 1994.

Reference Book:

1) Heat Transfer data book Convective heat & mass transfer by Kays and Crawford, Tata McGraw Hill Publication.1998
2) Computer aided heat transfer analysis by Adams J.A. & Roger D.E Tata McGraw Hill Publication, 1997.
3) Heat pipe theory application Springer link Publication, by S. W. Chi, 1998.
4)Heat Transfer by P.K. Nag, Tata McGraw Hill Publication, 2005.
5) Heat and Mass Transfer Data Book Book by C P Kothandaraman, S Subramanyam, New Age International, 1994
6) http://nptel.iitm.ac.in

Course Outcomes: After completion of course, students will be able to:

MEU603.1Identify the basic modes of heat transfer.
MEU603.2Compute temperature distribution in steady-state and unsteady-state heat conduction.
MEU603.3Identify and analyse heat transfer through extended surfaces.
MEU603.4Interpret and analyze forced and free convection heat transfer.
MEU603.5Identify the concept and analyze radiation heat transfer.
MEU603.6Design heat exchangers using LMTD and NTU methods

MEU 604 CONTROL SYSTEMS ENGINEERING

Teaching Scheme: 03 L +00T Total = 03 **Credit : 03**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks : 100**
Duration of ESE: 2hrs.30 min.

Course Objectives:

I. To teach the fundamental concepts of control systems & mathematical modeling of system
II. To study the concept of time response and frequency response of the system
III. To teach the basics of stability analysis of the system

Introduction:

System concept, open and closed loop systems, Mathematical models of physical systems, transfer functions. Block diagrams reduction and signal flow graphs.

Basic control actions and Industrial controllers: Classification of industrial automatic controllers, control actions, proportional controllers, obtaining derivative and integral control action, effects of integral and derivative control action on systems performance. Industrial Control examples: electro hydraulic valves, hydraulic servomotors, electro-pneumatic valves, pneumatic actuators.

Transient Response Analysis: Standard test signals, steady state response of first and second order systems for step, ramp and impulse input, transient response specifications, steady state error and error constants.

Concept of stability Necessary condition for stability, Routh's stability criterion, Root locus concept, construction of Root loci, systems with transportation lag.

Compensation: Introduction to lead and lag compensation

Frequency Response methods: Introduction, Relationship between time & frequency response, concept of polar plot and Bode diagrams.

Study of important automatic speed control systems in machine tools, Prime movers etc. Analysis of performance characteristics. Modeling of Mechanical system elements, such as motion, friction, gear trains etc.

Text Books

1. Modern Control Systems,- by Richard C. Dorf, Robert H Bishop, 11th Edition, Pearson, 2007.
2. Modern Control Engineering, - by Katsuhiko Ogata, PHI, 5th Edition, 2010.

Reference Books

1. Automatic Control Systems, - by Benjamin C. Kuo and Farid Golnaraghi, 9th Edition, John Wiley & Sons, 2009
2. Control Systems Engineering, - by I. J. Nagrath and M. Gopal, 5th Edition, Anshan Pub., 2009.
3. http://nptel.iitm.ac.in

Course Outcomes: After completion of course, students will be able to:

MEU604.1 Ability to apply knowledge of mathematics, science, and engineering

MEU604.2 Ability to design and conduct experiments, as well as to analyze and interpret data

MEU604.3 Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

MEU604.4 Gaining knowledge of mathematics through differential and integral calculus, and basic science, computer science, and engineering sciences,

MEU604.5 Analysis and designing of complex electrical and electronic devices, software, and systems containing hardware and software components, as appropriate to electrical engineering

MEU605 INDUSTRIAL MANAGEMENT & QUALITY CONTROL

Teaching Scheme: 03 L + 00 T Total: 03 **Credits: 03**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
Duration of ESE: 2hrs.30 min.

Course Objectives:

I. To impart fundamental knowledge and skill sets required in the IndustrialManagement and Engineering profession, which include the ability to apply basic knowledge of mathematics, probability and statistics, and the domain knowledge of Industrial Management and Engineering.
II. To produce graduates with the ability to adopt a system approach to design, develop,implement and innovate integrated systems that include people, materials, information, equipment and energy.
III. To enable students to understand the interactions between engineering, business, technological and environmental spheres in the modern society.
IV. To enable students to understand their role as engineers and their impact to society at large

Introduction:
Concept, principles and techniques of management, evolution of management thoughts, scientific management, modern management, principles of management, management and administration, functions of management, various areas of management. Organization structure and relationship.

Marketing Management:
Different types of market research, various marketing strategies, new product development, product life cycle,and advertising media.

Financial Management:
Need for finance, elements of cost, waste and scrap, financial ratios, profit and loss statements, balance sheet.

Personnel Management:
Functions of Personnel Management, human resources planning, recruitment and training, workers participation in management, industrial safety.

Materials Management , Estimating & Costing:

Classes of materials, purchasing methods and procedure, inventory control, stores, EOQ, ABC analysis. Objectives of estimating and costing, elements of cost,

Quality function in Industry: - Introduction, dimensions of product quality, Three aspect of quality, Evolution of Quality:, Quality costs, Customer-Orientation: Internal & External Customer Concept , seven basic quality control tools.

Statistical Quality Control: - Process Capability, Measuring process capability, Control Charts, types of control charts, Variables charts : (X bar and R- charts), Attribute charts : (p, c, u charts) , Construction and analysis of above mentioned charts.

Sampling Inspection: - Introduction to Sampling Inspection, Types of sampling plan,: (Single sampling, Double sampling and Sequential Sampling Plan).

Operating Characteristics (OC) Curve: - Introduction,Parameters of OC Curves - (Producer'sRisk, Consumer's Risk, Acceptance Quality Level (AQL) etc, Zone of Acceptance,Rejection and Indecision

Text Books:

1.Essentials of Management,, Koontz, Harold, McGraw Hill Education India Ltd. New Delhi , 2009 Edition.
2.Purchasing and Materials Management ,Gopalkrishnan, McGraw Hill Education India Ltd. New Delhi , 2010 Edition.
3.Statistical Quality Control, E.L.Grant, R.S.Leavenworth, Tata McGraw HillPublishing Ltd, New Delhi, 6th Edition, 2005.

Reference Books:

1. Total Quality Management, L.Suganthi, A.A.Samuel, Prentice Hall of India, New Delhi, 2nd Edition, 2005.
2. Quality Engineering Handbook, Thomas Pyzdek, Roger W. Berger, Tata McGraw Hill Publication, New Delhi, 1996.
3. Quality Handbook, J.M Juran, McGraw Hill Publication, New Delhi, 4th Edition, 2005.
4. Quality Control and TQM, P.L.Jain, Tata McGraw Hill Publishing Ltd, New Delhi, 6th Edition, 2001.
5.Quality Control, Tata McGraw Hill Publishing Ltd, TTTI, Madras, 11th Edition, 2005

6.http://nptel.iitm.ac.in

Course outcomes: After the course, the students are expected to be able to:

MUE605.1 Design and conduct experiments, analyze, interpret data and synthesize valid conclusions.

MEU605.2 Design a system, component, or process, and synthesize solutions to achieve desired needs

MEU605.3 Use the techniques, skills, and modern engineering tools necessary for engineering practice with appropriate considerations for public health and safety, cultural, societal, and environmental constraints

MEU605.4 Function effectively within multi-disciplinary teams and understand the fundamentalprecepts of effective project management.

MEU605.5 Design and perform experiments to determine critical areas of product development and analyze the results and form conclusions for quality improvement.

MEU605.6 Use statistical process control techniques (SPC) recognized throughout industries to ensure the quality level of products

MEU606 COMPUTATIONAL LAB

Teaching Scheme: 02 P **Total: 02** **Credit: 01**

Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**

Duration of ESE: 3 hrs.

Course Objectives:

I. This course aims to develop a practical approach to mathematical problem solving.

II. The course will introduce to many commonly used tools and techniques in numerical work. Due emphasis will be placed on converting algorithms and techniques to working computer codes. Carefully designed examples will help in understanding the nuances of the numerical techniques and computer applications of the same.

III. Solving through programming. It aims to train the student to the basic concepts of the programming language.

IV. This course involves a lab component which is designed to give the student hands on experience with the concepts

At least Six tasks from any of the following, using MATLAB/SciLab/ SimulationX or any equivalent software package or programming language.

1) Solution of linear simultaneous equations
2) Solution of non-liner equations
3) Solution of differential equations
4) Curve fitting problems
5) Plots of potential flow
6) Integration of velocity profile to determine displacement and momentum thickness
7) Determination of adiabatic flame temperature
8) Determination of nature of nozzle flow
9) Design of spring

10) Design of power screw
11) Simulation of waiting line models
12) Simulation of Inventory models

ICA: The Internal Continuous Assessment shall be based on practical record and knowledge/skills acquired. The performance shall be assessed experiment wise by using continuous assessment formats, A&B

ESE: The end semester Exam for practical shall be based on performance in one of the experiments and may be followed by sample questions

Course outcomes: After the course, the students are expected to be able to
MEU606.1 Identify situations where computational methods and computers would be useful.
MEU606.2 Given a computational problem, identify and abstractthe programming task involved.
MEU606.3 Approach the programming tasks using techniques learned
MEU606.4 Choose the right data representation formats based on the requirements of theproblem.
MEU606.5 Use the comparisons and limitations of the various programming constructs and choose theright one for the task in hand.
MEU606.6 Write the program on a computer, edit, compile, debug, correct, recompile and run it.
MEU606.7Identify tasks in which the numerical techniques learned are applicable and apply them to write programs, and hence use computers effectively to solve the task.

MEU607 MACHINE DESIGN –II LAB

Teaching Scheme: 02 P **Total: 02** **Credit: 01**

Evaluation Scheme: 25 ICA **Total Marks: 25**

Course Objectives:

I. To develop an ability to apply knowledge of mathematics, science, and engineering
II. To develop an ability to design a system, component to meet desired needs withinrealistic constraints.
III. To develop an ability to identify, formulate, and solve engineering problems.
IV. To develop an ability to use the techniques, skills, & engineering tools

It is representative list of practical. The instructor may choose minimum **Six** experiments as per his/her requirement (so as to cover entire content of course MEU602 Machine Design II) from the list given below

List of the Experiments:

1) Design of shaft

2) Design of bushed pin type flexible coupling.
3) Design of I.C. Engine parts.
4) Design of Steel wire rope of lift
5) Design of Chain Drive.
6) Design of Belt Drive
7) Design of Antifriction Bearing
8) Design of Journal Bearing

Note: Team Work shall consist of drawing sheet based on above exercise and design report.

ICA: The Internal Continuous Assessment shall be based on practical record and knowledge/skills acquired. The performance shall be assessed experiment wise by using continuous assessment formats, A&B

Course Outcomes: After completion of course, students will be able to:

MEU607.1 Analyze the stress and strain on mechanical components; and understand, identify andquantify failure modes for mechanical parts
MEU607.2 Demonstrate knowledge on basic machine elements used in machine design; design machine elements to withstand the loads and deformations for a given application, while considering additional specifications.
MEU607.3 Solve a design problem successfully
MEU607.4 Proficient in the use of software for analysis and design.

MEU608 HEAT TRANSFER LAB

Teaching Scheme: 02 P **Total: 02** **Credit: 01**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 25**
Duration of ESE: 3 hrs.

Course Objectives:

I. To learn basic modes and laws of heat transfer.
II. To learn network analogy for solving composite structure heat transfer problems.
III. To learn problem solving techniques for natural convection, forced convection, two phase systems and radiation.
IV. To solve problems on combined modes in heat transfer.
V. To study and analyze heat exchanger performance

It is representative list of practical. The instructor may choose minimum **Six** experiments as per his/her requirement (so as to cover entire content of course MEU603 Heat Transfer) from the list given below

LIST OF PRACTICALS

1. Determination of thermal conductivity of a metal bar.
2. Determination of thermal conductivity of insulating powder.
3. Determination of heat transfer through composite wall.
4. Determination of fin efficiency.
5. Verification of Stefan-Boltzman's law.
6 Determination of emissivity of grey body.
7. Determination of heat transfer coefficient for forced convection.
8. Determination of heat transfer coefficient for natural convection.
9. Trial on double pipe heat exchanger.
10. Determination of efficiency of cross flow heat exchanger.
11. To determine temperature distribution and efficiency of heat pipe

Note:

ICA: The Internal Continuous Assessment shall be based on practical record and knowledge/skills acquired. The performance shall be assessed experiment wise by using continuous assessment formats, A&B

ESE: The end semester Exam for practical shall be based on performance in one of the experiments and may be followed by sample questions

Course Outcomes: After completion of course, students will be able to:

MEU608.1 Estimate the thermal conductivity of insulating powder and metal bar
MEU608. 2 Estimate the effective thermal resistance in composite slabs.
MEU608.3 Estimate heat transfer coefficient in forced convection and in natural convection and correlate with theoretical values.
MEU608.4 Determine surface emissivity of a test plate

MEU 609 CONTROL SYSTEMS ENGINEERING LAB

Teaching Scheme: 02 P **Total: 02** **Credit: 01**

Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**

Duration of ESE: 3 hrs.

Course Objectives

I. To teach the fundamental concepts of control systems & mathematical modeling of system
II. To study the concept of time response and frequency response of the system
III. To teach the basics of stability analysis of the system

It is representative list of practical. The instructor may choose minimum Six experiments from any of the following list using MATLAB/SciLab or any equivalent software package as per his/her requirement (so as to cover entire content of course MEU604 Control System Engineering) from the list given below

1) Partial fraction expansion
2) Transformation of Mathematical models
3) Transient response Analysis (Two cases)
4) Root-Locus plots
5) Bode diagram
6) An Industrial visit covering control systems applications
7) Analysis of performance characteristics of speed control system
8) Electro hydraulic and electro-pneumatic valves.

Note:

ICA: The Internal Continuous Assessment shall be based on practical record and knowledge/skills acquired. The performance shall be assessed experiment wise by using continuous assessment formats, A&B

ESE: The end semester Exam for practical shall be based on performance in one of the experiments and may be followed by sample questions

Course Outcomes: After completion of course, students will be able to:

MEU609.1 Ability to apply knowledge of mathematics, science, and engineering

MEU609.2 Ability to design and conduct experiments, as well as to analyze and interpret data

MEU609.3 Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

MEU609.4 Knowledge of mathematics through differential and integral calculus, and basic science, computer science, and engineering sciences, necessary to analyze and design complex electrical and electronic devices, software, and systems containing hardware and software components, as appropriate to electrical engineering

MEU610 MINOR PROJECT

Teaching Scheme: 02 P **Total: 02** **Credit: 02**

Evaluation Scheme: 25 ICA +25 ESE **Total Marks: 50**

Duration of ESE: 3 hrs.

Course Objectives:

I. To prepare the students to examine any design or process or phenomenon.
II. To encourage the process of independent thinking and working.
III. To develop for solving the conceive problem by designing and analyzing.
IV. To build the ability of working in a team for the betterment of the society.

Minor project includes topics such as,
1) Design,
2) Fabrication,
3) Analysis,
4) Simulations,
5) Field study
6) Market survey and
7) Case study etc.

The guide would be allotted by the department to the batch of 15 students. However the topic may be given to the individual student or a group of not more than three students. Students shall prepare and submit the report in consultation with the guide in three copies based on the work done. Committee of two faculties be set up to review the report and attend the presentation of the students. Marks would be given by the committee based on the quality of the work, report and presentation.

Note:

ICA: The Internal Continuous Assessment shall be based on practical record and knowledge/skills acquired. The performance shall be assessed experiment wise by using continuous assessment formats, A&B

ESE: The end semester Exam for practical shall be based on performance in one of the experiments and may be followed by sample questions

Course Outcomes: After completion of course, students will be able to:

MEU610.1 Integrate the fundamentals knowledge of subjects to search the related literature and devise solution.

MEU610.2 Conceive a problem statement either from rigorous literature survey or from the requirements raised from need analysis.

MEU610.3 Generate and implement innovative ideas for social benefit.

MEU610.4 Design, implement and test the prototype/algorithm in order to solve the conceived problem.

MEU610.5 Write comprehensive report on mini project work.

MEU610.6 Work in a group to develop the leadership/interpersonal skills for finishing task within timeframe.

MEU611 SELF STUDY-II

Teaching Scheme: 00 P **Total: 00** **Credit: 02**

Evaluation Scheme: 25 TA **Total Marks: 25**

Self Study-I is based on one class test each on the basis of 20% curriculum of the courses MEU601 Operation Research Management, MEU603 Heat Transfer, MEU604 Control

System Engineering, MEU605 Industrial Management and Quality Control declared by the respective course coordinator at the beginning of the semester

MEU612 INDUSTRIAL LECTURE I

Teaching Scheme:01T Total: 01 Credit: 00

The industrial Lectures of the experts from nearby industries will be organized on the topics such as Design, Production Engineering, Manufacturing Process, Quality Management, Thermal Engineering, Maintenance, Heat Transfer etc.

Note: Assessment of course MEU612 Industrial Lecture –I is scheduled in VII semester with course MEU711 Industrial Lecture – II