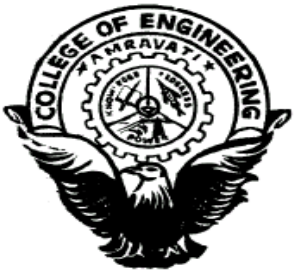
Govt. College of Engineering Amravati

(An Autonomous Institute of Govt. of Maharashtra)



Curriculum

for

III and IV Semesters

of

B. Tech. (Mechanical Engineering)

Department of Mechanical Engineering

2011-12

GOVERNMENT COLLEGE OF ENGINEERING, AMRAVATI

MECHANICAL ENGINEERING DEPARTMENT

SCHEME FOR B. Tech. (Mechanical Engineering) from academic year 2011-2012

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 – III													
SHU301	Engineering Mathematics-III	3	-	-	3	10	15	15	60	-	-	100	3
CEU303	Strength of Materials	4	-	-	4	10	15	15	60	-	-	100	4
EEU311	Electrical Drives and Control	4	-	-	4	10	15	15	60	-	-	100	4
MEU301	Material Science and Engineering	3	-	-	3	10	15	15	60	-	-	100	3
MEU302	Engineering Thermodynamics	4	-	-	4	10	15	15	60	-	-	100	4
CEU307	Strength of Materials Lab.	-	-	2	2	-	-	-	-	25	25	50	1
EEU312	Electrical Drives & Control Lab.	-	-	2	2	-	-	-	-	25	25	50	1
MEU303	Material Science and Engineering Lab	-	-	2	2	-	-	-	-	25	25	50	1
SHU301	General Proficiency-II	1	-	2	3	-	-	-	-	25	25	50	2
		19	**0**	**8**	**27**	**50**	**75**	**75**	**300**	**100**	**100**	**700**	**23**
Semester – IV													
MEU401	Fluid Mechanics	4	-	-	4	10	15	15	60	-	-	100	4
MEU402	Kinematics of Machines	3	1	-	4	10	15	15	60	-	-	100	4
MEU403	Thermal Engineering & Energy Conversion	4	-	-	4	10	15	15	60	-	-	100	4
MEU404	Manufacturing Processes	4	-	-	4	10	15	15	60	-	-	100	4
MEU405	Machine Drawing	2	-	-	2	4	8	8	30	-	-	50	2
MEU406	Fluid Mechanics Lab.	-	-	2	2	-	-	-	-	25	25	50	1
MEU407	Kinematics of Machines Lab.	-	-	2	2	-	-	-	-	25	25	50	1
MEU408	Manufacturing Processes Lab.	-	-	2	2	-	-	-	-	25	25	50	1
MEU409	Computer Aided Drafting Lab.	-	-	4	4	-	-	-	-	50	50	100	2
		17	**1**	**10**	**28**	**44**	**68**	**68**	**270**	**125**	**125**	**700**	**23**

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 – 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	Operation Research Management	3	-	-	3	10	15	15	60	-	-	100	3
MEU506	Machine Design-1 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 Systems Lab.	-	-	2	2	-	-	-	-	25	25	50	1
MEU510	Computational lab.	-	-	2	2	-	-	-	-	25	25	50	1
MEU511	Self study -I	-	-	-	-	-	-	-	-	25	-	25	2
		16	**0**	**10**	**26**	**50**	**75**	**75**	**300**	**150**	**100**	**750**	**23**
Semester – VI													
MEU601	Hydraulic Machines	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	Hydraulic Machines 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**	**50**	**75**	**75**	**300**	**150**	**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		Total	
		L	T	P	Total	TA	CT1	CT2	ESE	ICA	ESE		
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	Lean Manufacturing	

SHU301 ENGINEERING MATHEMATICS-III

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

Marking scheme: 15CT1 + 15CT2 + 10TA + 60 ESE Total Marks: 100

Duration of ESE: 2Hrs.30min

Course objectives:

I. To solve linear, partial differential equations with constant coefficient.
II. To analyze methods of separation of variables & apply it to solve thermal equations for different states.
III. To enhance thinking power with statistics methods.
IV. To develop numerical methods aided by technology to solve algebraic, transcendental, and differential equations, and to calculate derivatives and integrals

Linear Differential Equations with constant coefficients:

General solution to L.D.E. of nth order with constant coefficients, rules for finding C.F., General method for finding P.I., P.I. of some standard functions, Method of Variation of Parameters, Cauchy's and Legendre's L.D.E., applications of L. D. E. to deflection of beam, bending moments.

Partial Differential Equations:

Complete solution of PDE, Linear and non-linear PDE of types (i) f(p, q)= 0, (ii)f(p, q, z)= 0, (iii)f(p, q, x, y)= 0,(iv)f(p, q, x, y, z)= 0 i.e. Lagrange's form Pp+Qq=R and Clairaut's form z = px + qy + f(p, q), (v) Equations reducible to above forms. Complete solution of PDE of first and second order by method of separation of variables.

Laplace Transform:

Definition, standard formulae and properties of LT., Inverse Laplace Transform, Convolution Property.

Numerical Methods:

Solution of system of linear equations by Crout's method, Gauss Siedal method.

Numerical solution of ordinary differential equations: Taylor's series method, Modified Euler's method, Runge Kutta method.

Statistics:

Correlation: coefficient of Correlation, lines of regression, Curve fitting by least square method. Probability distribution: Binomial, Poisson and Normal.

Text Books:

1. Text Book of Applied Mathematics, P. N. Wartikar and J.N.Wartikar, Pune Vidyarthi Griha, Pune, 2001.

2. Higher Engineering Mathematics, B. S. Grewal, Khanna Publication, 40th edition, New Delhi, 2007.

Reference Books:

1. Advanced Engineering Mathematics, Kreyzig, John Wiley & Sons, 9th edition, 1995.
2. Advanced Engineering Mathematics, John Bird, 5th edition, Elsevier Publication 2007.
3. Higher Engineering Mathematics, C. R. Wiley, 8th edition, John Wiley and Sons, 1999

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

SHU301.1 Solve linear PDEs by analyzing the behaviour of solutions.

SHU301.2 Apply the knowledge of linear PDE in heat flow equations and Laplace equations.

SHU301..3 Analyze various relations through correlation & regression methods.

SHU301.4 Apply numerical methods in modern scientific computing.

CEU303 STRENGTH OF MATERIALS

Teaching Scheme : 03 L + 01 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 establish the fundamental concepts of stresses, strains and deformation response of elastic solids under external loading conditions.
II. To understand shear force and bending moment diagrams for various loading conditions.
III. To understand principal stresses and strains analytical and graphically.
IV. To build the necessary theoretical background for structural analysis involving torsion and strain energy.
V. To develop the analytical skill for use of the theories of failure and enable to apply the same systematically.
VI. To make students relate the knowledge for design of different machine elements.

Mechanical properties: Concept of direct, bearing and shear stresses and strains, stress strain relations, Biaxial and triaxial loading, elastic constants and their relationship, stress-strain diagrams and their characteristics for mild steel, TOR steel and concrete, Generalized Hook's law, factor of safety.

Uniaxial stresses and strains: Stresses and strains in compound bars in uniaxial tension and compression, temperature stresses in simple restrained bars and compound bars of two metals only.

Shear force & bending moment diagrams: Beams, loading and support conditions, bending moment, shear force and axial load diagrams for all types of loadings for simply supported beams, cantilevers and beams with overhangs, relation between shear forces, bending moment and loading intensity.

Stresses in beams (Bending, Shear):

i) Bending: Theory of simple bending, section modulus, moment of resistance, bending stresses in solid, hollow and built up section.

ii) Shear: Distribution of shear stresses on beam cross sections,

iii) Strain energy under uniaxial tension and compression, impact loads and instantaneous stresses.

Torsion: Theory of torsion & assumptions, derivation of torsion equation, polar modulus, stresses in solid & hollow circular shaft

Principal stresses: Biaxial stress system, principal stresses, principal planes, Mohr's circle of stresses, principal strains.

Thin and Thick cylinders and thin spherical shells subjected to internal pressures.

Combined direct & bending stresses: Combined direct and bending stresses, applications to short columns with eccentric loads.

Slope & deflection of beams: Slope & deflection in statically determinate beams subjected to point loads, uniformly distributed loads, moments by Macaulay's method, Moment Area method and Conjugate Beam method.

Columns: Theory of long columns, Euler, Rankin formula

Introduction to fatigue

Text Books:

1. Engineering Mechanics of Solids, E.P. Popov, 2nd Edition, Prentice Hall of India, 1998
2. Mechanics of Materials, by Beer, Johnston and DeWolf, 3rd Edition, Tata McGraw Hill Publication, New Delhi, 2002.

Reference Books :

1. Mechanics of Materials, Gere and Timoshenko, 2nd Edition, CBS publishers, 2002.
2. Mechanical of Solids in Introduction, Laudner T. J. and Archer R. R., McGrawHill International Edition, 1994.
3. Theory and Problems of Strength of Materials, William A. Nash, 3rd Edition, Schaum's Outline Series, McGraw Hill International Editions, 1994.

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

CEU303.1 Analyze and design structural members subjected to composite loading using fundamental concepts of stress, strain, elastic behavior

CEU303.2 Identify, formulate and solve the cases related to static design in engineering applications

CEU303.3 solve the problems of simple, combined bending and torsion in shafts

CEU303.4 Draw the principal stress and strain problems graphically

CEU303.5 Apply the appropriate theory of failure to analyze machine components

EEU311 ELECTRICAL DRIVES AND CONTROL

Teaching Scheme : 04 L Total : 04 Credit : 04

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

Duration of ESE: 2 hrs. 30 min

Course objectives:

I. To understand the working principle of power transistors, power MOSFET, SCR.

II. To understand basic construction, its principle, characteristics, power flow diagram, starters speed control methodology.

III. To understand basic types of single phase and 3-phase motors, their working principles and its applications

IV. To understand the construction, characteristics of a semi conducting devices

Concept of General Electric Drives: Classification and comparison of electric drive system, cooling and heating of electric motors, Theory and working principle of power transistors, power MOSFET, SCR.

Basic Characteristics of DC Motors: Torque equation, modified speed–torque characteristics, starting and braking of electric DC motors, comparison of mechanical and electric braking methods, conventional speed control methods.

Classification of AC Motors: Construction, types, characteristics of 3-phase IM, torque equation, applications, staring and braking of 3-phase IM, conventional speed control methods.

Thyristorised stator voltage control of 3-phase IM, (V/F) control, slip–power recovery scheme, thyristorised armature voltage control of DC motors using phase control and thyristorised chopper.

Introduction, principle, construction and working of DC servomotors, stepper motors, brushless DC motors, classification of 1-phase IM, construction, principle, working and applications, principle and working of Universal motor, linear IM

Industrial Applications: Classes of duty, selection of an electric drive for particular applications such as steel mill, paper mill, cement, textile mill, electric traction, coal mining, etc.

Text Books:

1. Electric machines, I. J. Nagrath and D. P. Kothari, 2nd Edition, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 2008.
2. Electrical Technology (AC and DC drives) Vol-II and Vol-III B. L. Thereja, 4th Edition, Dhanpat Rai and Sons, 2002.

Reference Books:

1. Electric Motor Drives-modeling, analysis and control, R. Krishnan, 1st Edition, Pearson Edu, 2006.
2. Utilization of Electrical Power, R.K. Rajput, 5th Edition, Laxmi publications, 2007

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

EEU311.1 Select electrical drive for industries

EEU311.2 Identify types of DC motor and 3 phase induction motor

EEU311.3 Evaluate the performance characteristics of DC motor and 3 phase induction motor

EEU311.4 Select special motors

EEU311.5 Apply starting braking and speed control methods

MEU301 MATERIAL SCIENCE AND ENGINEERING

Teaching Scheme : 03L **Total : 03** **Credit : 03**

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

Duration of ESE: 2 hrs. 30 min

Course objectives:

I. Understand the basic structure of metals and alloys

II. Understand the relationship between structure and property of metals and alloys

III. Learn about structure, property and applications of industrially useful metals and alloys

IV. Develop the ability to suitably alter the properties of metals and alloys by application of heat treatments and other processes

Solid Crystalline Structure: Metal structure and crystallization, Nucleation and growth in metals and alloys, single and polycrystalline materials, classification of crystals, FCC, BCC, HCP lattice, lattice structure, unit cell, packing density and co-ordination number, Crystallographic directions and planes.

Theory of Alloys and Alloy Diagrams: Alloys, solid solutions, intermetallic compounds, binary diagrams, its construction, eutectic, peritectic, eutectoid reactions, Lever rule.

Construction and study of Iron-Carbon equilibrium diagram,

Plain carbon steels: Microstructure and properties, effect of impurities and grain size on the properties of p.c. steels.

Alloy Steels: Effect of alloying elements on the structure and properties of steels, classification of alloying elements, effect on constitution of steels, effect on transformation of steels, low and high alloy engineering steels.

High Speed Steels: Their heat treatment and applications, ferritic, austenitic, martensitic.

Stainless Steels: Properties and applications, weld decay in stainless steels.

Cast Irons: Constitution and properties of white, grey, nodular and malleable cast irons, their applications, alloy cast irons.

Non-Ferrous Materials: Brasses and bronzes, types, properties, applications, alloys of aluminum, lead, tin, zinc their applications. Bearing metal, season cracking, and precipitation hardening.

Principles of Heat Treatment: Annealing, normalizing, tempering, Iso-thermal transformation diagrams (S-curves), superimposition of S-curve on continuous cooling diagram, characteristics of pearlite, bainite, martensite transformation on continuous cooling. hardenability, quenching media, severity of quench, austempering, martempering, patenting, retained austenite, sub-zero treatment.

Methods of surface hardening: Carburizing, nitriding, cyaniding, flame hardening, induction hardening.

Mechanical working of metals: Deformation of metals, slip, twinning, critical resolved shear stress, deformation in single and polycrystalline materials, stress-stain curve, Luder bands, recovery, re-crystallization, grain growth, hot and cold working-

advantages, disadvantages. fracture, creep, fatigue failures. Strengthening mechanisms e.g. strain hardening, age hardening, precipitation hardening.

Welding Metallurgy: Weldabilty, metallurgical effects of welding, residual stresses, heat affected zone, microstructure changes during welding, grain size, cracking, and corrosion characteristics of welds.

Powder Metallurgy: Manufacture of metal powders, single die, double die compaction, sintering, manufacture of porous bearings and cemented carbide tip tools, advantages, limitations, application of powder metallurgy.

Text Books

1. Introduction to Material Science and Engineering, W.F. Smith, 4th Edition, Mc-Graw Hill International London, 2006.
2. Material Science and Engineering, V. Raghavan, 5th Edition, PHI. 2005
3. Introduction to Physical Metallurgy, S. Avner, 5th Edition ,Tata Mc-Graw Hill, New Delhi, 2006

Reference books

1. Mechanical Metallurgy, G.E. Dieter, 3rd Edition, Mc-Graw Hill International, London, 1999.
2. Physical Metallurgy for Engineers, 4th Edition, Clarke and Varney,. 2004.
3. Powder Metallurgy, A.K. Sinha 1st Edition., 1991.
4. Engineering Physical Metallurgy, Y. Lakhtin, 2nd Edition, Mir Publications, 1999.

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

MEU 301.1 Understand the basic structure of metals and alloys

MEU 301.2 Understand the relationship between structure and property in metals and alloys

MEU 301.3 Understand structure, property and applications of industrially useful metals and alloys

MEU 301.4 Develop the ability to suitably alter the properties of metals and alloys by application of heat treatments and other processes

MEU302 ENGINEERING THERMODYNAMICS

Teaching Scheme : 04L **Total : 04** **Credit: 04**

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

Duration of ESE: 2 hrs. 30 min

Course Objectives:

I. To train the students on the basics and applications of energy in Mechanical Engineering and energy conservation

II. To be able to use the first law of thermodynamics to estimate the potential of thermo-mechanical energy conversion in engineering devices

III. To be able to chart thermodynamic processes on appropriate thermodynamic diagrams, such as a temperature-entropy or pressure-volume diagram
IV. To explain the influence of temperature limits on performance of cycles
V. To understand the nature and role of the following thermodynamic properties of matter: internal energy, enthalpy, entropy, temperature, pressure and specific volume
VI. To understand implications of the second law of thermodynamics and limitations placed by the second law on the performance of thermodynamic systems
VII. To be able to differentiate forms of energy on the basis of quality
VIII. To be able to quantify the entropy generation and exergy of a system
IX. To analyze gas power and vapor power cycles on the basis of first law of thermodynamics

Basic concepts and properties: introduction, thermodynamic system, control volume, macroscopic and microscopic approaches, properties of a system, continuum, state and equilibrium, processes and cycles, quasi-static process, point and path functions, steady flow process, temperature and the zeroth law of thermodynamics, properties such as specific volume pressure, temperature, ideal gas & ideal gas temperature, temperature scales.

Energy, Energy Transfer & Analysis: forms of energy, energy transfer by heat, energy transfer by work, electrical & mechanical forms of work, pdV work, work-a path function, heat transfer- a path function, comparison of heat and work.

Properties of Pure Substances: Phase change process of a pure substance: specific heats, sensible heat and latent heat, triple point, critical point, superheat and total heat of steam, p-v & p-T diagram of a pure substance, p-v-t Surface, T-s and H-s diagram of a pure substance, quality or dryness fraction, steam tables.

Properties of Ideal Gas: Difference between gases and vapors, ideal gases, gas laws, gas constant, universal gas constant, Specific heats, internal energy and enthalpy of an ideal gas, entropy change of an ideal gas, reversible adiabatic and isothermal process, poly-tropic process, Equations of state.

First law of thermodynamics: law of conservation of energy, first law applied to closed system undergoing a cycle, joule experiment, energy-a property of system, energy balance, energy transfer of a system and mechanisms of energy transfer, internal energy: a function of temperature, energy and environment,.

First law applied to flow processes: steady-state steady flow process, mass balance and energy balance in steady flow process, steady flow energy equation and its application to nozzles and diffusers, throttling valve, turbines and compressors, pumps, heat exchangers etc. Work done and heat transfer during steady flow processes.

Second law of thermodynamics: limitations of first law, qualitative difference between Heat and Work, cyclic heat engines, reservoirs, Kelvin-Plank and Clausius statements of second law, refrigerators and heat pumps, equivalence of Kelvin – Planck and Clausius statements, reversibility and irreversibility, causes of irreversibility, conditions for reversibility, Carnot Cycle, reversed heat engine, Carnot's Theorem, absolute temperature scale, efficiency of the reversible heat

engine, types of irreversibility.

Entropy: Clausius Theorem, the property of entropy, inequality of Clausius, entropy: a property of system, entropy change for ideal gases, entropy change of a system during irreversible process, entropy principle and its applications, entropy transfer with heat flow, entropy generation, first and second laws combined, reversible adiabatic work in a steady flow system. Availability and irreversibility: available energy, available energy referred to cycle, quality of energy, maximum work in a reversible process, reversible work in an open system exchanging heat only with the surroundings, useful work, dead state, availability (exergy), availability in a steady flow system, irreversibility and effectiveness, decrease in available energy with heat transfer through a finite temperature differences, exergy balance, second law efficiency, T-ds equations,

Power cycles: gas power cycles: Otto cycle, Diesel cycle, Semi-Diesel, Sterling cycles, their efficiency and mean effective pressure calculations.

Vapor power cycles: properties of steam, specific volume and entropy of steam, dryness fraction of steam, throttling of steam, determination of dryness fraction, steam tables and their use, t-s and h-s diagram, Rankine and Modified Rankine cycle, work done and efficiency, specific steam consumption, comparison of Rankine and C arnot cycle, representation on p-v, t-s and h-s diagram.

Text Books:

1. Thermodynamics: An Engineering Approach, Yunus Cengel and Michael Boles, 4th Edition, McGraw Hill, 2002
2. Engineering Thermodynamics, P. K. Nag, 4th Edition, McGraw Hill, 2008

Reference books:

1. Fundamentals of Thermodynamics, Richard Sonntag, Claus Borgnakk, 7th Edition, John Wiley and Sons, 2009
2. Fundamentals of Engineering Thermodynamics, Michael J. Moran, Howard Shapiro, 6th Edition John Wiley & Sons, 2008

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

MEU302.1 Understand the fundamentals of first and second laws of thermodynamics and their application to a wide range of systems

MEU302.2 Analyze the work and heat interactions associated with a prescribed process path, and to perform a first law analysis of a flow system

MEU302.3 Demonstrate limitations of the first law, study second law and its applications to energy conversion devices

MEU302.4 Evaluate entropy changes in a wide range of processes and determine the reversibility or irreversibility of a process from such calculations

MEU302.5 Calculate the efficiencies of heat engines and other engineering

CEU307 STRENGTH OF MATERIALS-LAB

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

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

Duration of ESE: 3 hrs.

Course objectives:

I. Learn to perform the tension, compression and bend test on different specimens and observe the nature of failure
II. Learn to perform the shear test on metals using Izod impact test apparatus
III. Learn to perform the hardness test and torsion test on metals
IV. Understand buckling of columns and factors affecting strength of columns.

It is a representative list of practical. The instructor may choose experiments as per his/her requirements (so as to cover entire contents of the course CEU303) from the list or otherwise. Minimum eight experiments should be performed from part A, while part B is compulsory.

List of Experiments:

Part A:

1. To perform tension test on mild steel and compare the results obtained with standard IS values and comment
2. To perform tension test on TOR steel also perform bend test. Compare the results obtained with standard IS values and comment. Refer I.S. 1608.
3. To perform compression test on metals. Observe the nature of failure and determine the compressive stress. Refer I.S.1708 for test procedure.
4. To perform compression test on Wood (parallel and perpendicular to grains). Observe the nature of failure and determine the compressive stress. Refer I.S.1708 for test procedure. Comment on results.
5. To perform shear test on metals. Study single & double shear action. Interpret failure pattern and calculate shear strength in single & double shear. Refer I.S 5242-9779.
6. To perform impact test on metals. Determine the shock absorbing capacity of the material using Izod impact test apparatus. Compare the impact resisting qualities of different metals. Refer IS: 1598 and IS: 1757 – 1973.
7. To perform hardness test on different metals and compare hardness number for different metals. Refer IS 1500.
8. To perform torsion test on metals. Interpret the graph of torque and angle of twist and determine shear strength and modulus of rigidity of the specimen. Refer I.S. 1717.
9. To find deflection of beams, bending stresses and their relation for simply supported beam. Also find Young's modulus.
10. Determine modulus of rupture of wooden beam. Observe the parameters that affect modulus of rupture.
11. Observe types of columns, their deflection behaviors. Understand buckling of columns and factors affecting strength of columns. Find buckling load of given set of columns with different end conditions.

12. Observe deflection and working of different types of springs. Determine modulus of rigidity of spring material and stiffness of spring.

Part B:

At least four problems from four different topics to be solved using either programming or spreadsheet or solvers or any software.

Note :

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

ESE – The End Semester Exam for Practical shall be based on performance in one of the experiment and may be followed by sample questions.

Course outcomes: After completion of the laboratory course, students will be able to:

CEU307.1 Perform tension test tension, compression and bend test on different specimens and observe the nature of failure

CEU307.2 Compare the results obtained with standard IS values and comment

CEU307.3 Observe the nature of failure and determine the compressive stress

CEU307.4 Interpret failure pattern and calculate shear strength in single & double shear

CEU307.5 Compare the impact resisting qualities of different metals

CEU307.6 Interpret the graph of torque and angle of twist and determine shear strength and modulus of rigidity of the specimen

CEU307.7 Analyze the deflections of beam, column & evaluate the modulus of rupture, buckling load, etc.

EEU312 ELECTRICAL DRIVES AND CONTROL 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. Understand the various controls of D.C. motor & 3-phase induction motor
II. Aquire skill to use the braking methods for D.C motor
III. Understand the methodology of single-phase induction motor & 3-phase induction motor
IV. Learn the different sources of heating in the motors

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 EEU311) from the list given below

List of the Experiments:

1. To perform speed control of d. c. shunt motor.
2. Speed control of 3-phase induction motor by changing rotor resistance.
3. To perform load test on D.C. series motor.
4. Rheostatic speed braking of D.C. shunt motor.
5. To study single-phase induction motor.
6. To identify different parts and understand working of starters used for 3-phase I.M.
7. Study of D.C. motor starters.
8. To study different types of heating.
9. To study power MOSFET

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 the laboratory course, students will be able to:

EEU 312.1 Perform braking methods

EEU 312.2 Demonstrate speed control methods

EEU 312.3 Draw various characteristics of dc motor and induction motor

EEU 312.4 Identify the starter operation

MEU303 MATERIAL SCIENCE AND ENGINEERING LAB

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

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

Duration of ESE: 3 hrs.

Course objectives:

I. Reinforce the concepts learnt in the theory classes of Material Science and Engineering (MEU 301)
II. Learn the specimen preparation for optical microscopy and by using optical microscope, study microstructures of various metals and alloys which are used in industries for various applications
III. Be conversant with the various equipments/ instruments/machines which are used to study structures and properties of metals and alloys
IV. Relate the structure and properties of various metals and alloys

Note: It is representative list of experiments. The instructor may choose minimum eight experiments as per his/her requirement (so as to cover entire content of course MEU301) from the list given below.

List of Experiments:

1. Study of metallurgical microscope.
2. Preparation of specimen for micro-examination.

3. Molding of specimen for micro-examination.
4. Study of microstructure of annealed and normalized steels.
5. To carry out hardening and tempering of steel.
6. To study Jominy end quench test for harden ability.
7. Hardness Testing using Rockwell Hardness Tester.
8. To study microstructures of various cast irons.
9. To study microstructures of various non –ferrous metals and alloys.
10. To study and perform impact test.
11. Hardness Testing using Brinell Hardness Tester
12. Study of Image analyzer
13. Study of scanning electron microscopy
14. Study of Transmission electron microscopy

Note:

ICA: The Internal Continuous Assessment shall be based on practical record and knowledge/skills acquired.

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 the laboratory course, students will be able to-

303.1 Prepare the specimen for optical microscopy and by using optical microscope,
303.2 study microstructures of various metals and alloys
303.3 use various equipments/ instruments/machines which are used to study structures and properties of metals and alloys
303.4 Relate the structure and properties of various metals and alloys

SHU301 GENERAL PROFICENCY – II

Teaching Scheme: 01L+02 P Total : 03 Credit : 02
Evaluation Scheme: 25 ICA + 25 ESE =Total 50 Total Marks: 50
Duration of ESE: 3 hrs.

Course objectives:

I. To Build the Basics of Presentation and Managerial Skills
II. To Provide Understanding of General and Specific Communication Skills for Presentation
III. To Sensitize about Various Models of Presentation
IV. To Develop Effective Time Management Skills
V. To be able to Learn Stress Management Techniques
VI. To Develop Team Work Capabilities

Presentation Skill:

Communication Boosters – Aura Words, Pronunciation, Body Language – Voice, Posture and Gesture, Eye Contact, Dress Codes

Function of Culture Code in Presentation – Planning, Preparing and Delivering a Presentation, Etiquettes, Clarity and Aliveness of Delivery

General Communication Skill for Presentation – Content Matching and Language Matching for Specific Audience, Tone, Hummer Poise- Listener/Speaker Sensitivity

Specific Communication Skill for Presentation – Ice Breaker, Small Talk Dialogue, Debate, Turn Taking, Effective and Defensive Handling of Question.

Models of Presentation – Public Speaking, Academic and Professional Presentation, Group Discussion, Personal Interview, Technical Report Writing (IEEE Standards)

Managerial Skill:

Time Management - Advantages, Time Wasters – Procrastination, Time Management Tips and Strategies

Stress Management- Stress and its Disadvantages, Stress Coping Ability and Stress Inoculation Training, Management of Various Types of Fear, Depression and Anger

Conflict Management -Types of Conflict, Conflict Stimulation and Conflict Resolution Technique for Conflict for Effective Conflict Management, Effective Ways of Dealing with People, Significance of Body Language in Communication and Assertiveness Training

Interpersonal Skills - Concept of Team, Advantages of Team Work, Promotion of Team Spirit, Team Building Techniques, Nurturing Leadership Qualities, Negotiation Skills

Topics for Assignments/Practical:

Minimum Eight Assignments / Practical Based on above Topics. The Representative List is Given Below

1. Collection of New Words Concerning Various Technical And Professional Subjects
2. Listening to Audio Cassette or Lecture or Watching Video Cassette (Based on the Topics of Managerial Skill) followed by Speech/Seminar by Students
3. Listening to Audio Cassette or Lecture or Watching Video Cassette (Based on the Topics of Managerial Skill) Followed by Group Discussion of Students
4. Collecting the Information Related to the Topics of Managerial Skill Using Internet, Books, Magazines etc. and its Power Point Presentation or Seminar/Lecture
5. Power Point Presentation on Topic Related to any Subject of Programme
6. Preparing a Technical Paper in IEEE Format
7. Management Games
8. Personal Interview
9. Extempore Elocution, Debate

Text Books:

1. Professional Communication Skills, Alok Jain, Pravin S.R. Bhatia, A.M. Sheikh, 3rd Edition, S. Chand And Company, New Delhi,2005
2. Personality Development, E.B. Hurlock, 5th Edition, Tata McGraw Hill, New Delhi 2006

Reference Books:

1. Power Of Positive Thinking, D. J. Mile, 2nd Edition, Rohan Book Company, Delhi, 2004
2. All About Self Motivation, Pravesh Kumar, 3rd Edition, Goodwill Publishing House, New Delhi,2005
3. Body Language: How to Read Others Thoughts by their Gestures, Pease, Allan, 3rd Edition, Sudha Publications. New Delhi, 1998
4. Multiple Intelligences: The Theory in Practice: A Reader, Howard Gardner, 1st Edition, Basic Books, New York, 1993
5. Six Thinking Hats, De Bono Edward, 2nd Edition, Penguin Books, New York, 2000

Course Outcomes: After Completion of the Course, the Students Should be Able to:

MEU303.1 Display Competence in Oral, Written and Visual Communication
MEU303.2 Develop Effective Communication Strategies for Diverse Audiences
MEU303.3 Develop Excellent Public Speaking Skills
MEU303.4 Use Effective Time Management Skills for Career Planning
MEU303.5 Develop Strong Interpersonal Skills for Team Building
MEU303.6 Bring Assertiveness in Leadership Qualities

MEU 401 FLUID MECHANICS

Teaching Scheme : 04 L Total : 04 **Credit : 04**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
Duration of ESE: 2 hrs. 30min

Course Objectives:

I. To understand the basic fundamental of fluid mechanics and its properties.
II. To analyze the various types of fluid flow problems in the dynamic situation.
III. To demonstrate the fluid properties, fundamentals of fluid statics and fluid flow.
IV. To interpret the concepts of flow measurements and flow through pipes.
V. To develop the relative equation from the available parameter for research work.

General Properties of fluids and Fluid Statics: Viscous fluids, Newtonian and non-Newtonian, their stress strain relationship (general description only), pressure at a point in fluid, variation of pressure with depth, fluid application to manometer,

transmission of pressure in a fluid, thrust on plane surface, centre of pressure horizontal and vertical plane surfaces, forces on immersed bodies, vapour pressure, cavitation.

Fluid kinematics: Types of flow-steady & unsteady, uniform & non-uniform, laminar & turbulent, one, two & three dimensional, rotational & irrotational, compressible and incompressible, Reynold's experiment and Reynolds number, Euler's approach of describing fluid motion- Velocity and acceleration, Stream line, Streak line, Path line, Stream tube, Stream function, Velocity potential, Flow net- uses, limitations & methods of drawing, Discharge, Continuity equation of fluid flow

Fluid Dynamics: Euler's equation of motion, Bernoulli's equation, assumption and limitations, kinetic energy correction factor, different forms of energy heads, loss of head, Modified form of Bernoulli's theorem, Flow measurement, velocity measurement, Energy gradient line and Hydraulic gradient line, Impulse momentum equation, momentum correction factor, Vortex flow.

Dimensional Analysis: Dimensional homogeneity and dimensionless ratios. Reduction of parameters in a physical problem Dimensionless parameters, Similitude and model studies.

Motion of Viscous Fluids: Introduction to laminar and turbulent flows, boundary layer concept, separation, drag lift on immersed body, Reynolds number and its significance.

Darcy's Weisbach equation: Equation of pipe flow, friction charts and its use, minor losses in pipes and fittings, losses due to sudden enlargement and contraction, hydraulic and energy gradient lines, pipes in series and parallel, elementary concept of water hammer.

Text Books

1. Introduction to Fluid Mechanics and Fluid Machines, S.K. Som and G. Biswas, 2nd Ed ,Tata McGraw Hill Education Publishing Company Limited, 2007.
2. Fluid Mechanics, F.M. White, 4th International Editions ,McGraw-Hill, 2005.

Reference Books

1. Fluid mechanics and Hydraulic machines, Dr. R. K. Bansal , 9 th Edition, Laxmi Publication, Delhi, 2005
2. Fluid Mechanics and Machines, Kotharduraon and Rudramoorthy, 2nd Edition, New Age Internationals, 2007
3. Hydraulics And Fluid Mechanics Including Hydraulics Machines**,** Dr. P.N.Modi, Dr. S.M. Seth, 14th Edition, Standard Book House / Rajsons Publications p ltd, Delhi, 2011.
4. Fluid Mechanics, Mohanty A.K., 2nd Edition, Prentice Hall of India, 2005.
5. Fluid Mechanics, Streeter, 7 th Edition, Tata McGraw Hill (SI),2000

Course Outcomes: After completion of this course student will be able to:

MEU401.1 Understand and determine the various physical properties of the fluids.
MEU401.2 Apply and analyze fluid systems using the integral form of the continuity, momentum equations.
MEU401.3 Apply Bernoulli's Equation for various fluid systems and flow measuring devices.

MEU401.4 Apply dimensional analysis method for developing the relative equation from given parameter.
MEU401.5 Apply the boundary layer concept foe analyzed the fluid flow problem.
MEU401.6 Analyze and explain physical significance of flow through the pipes

MEU402 KINEMATICS OF MACHINES

Teaching Scheme : 03 L+ 01T **Total : 04** **Credit: 04**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
Duration of ESE: 2 hrs. 30 min

Course Objectives:

I. To understand the basic components and layout of linkages in the assembly of a system/ machine.
II. To understand the principles in analysing the assembly with respect to the displacement, velocity, and acceleration at any point in a link of a mechanism.
III. To understand the motion resulting from a specified set of linkages, design few linkage mechanisms and cam mechanisms for specified output motions.
IV. To understand the basic concepts of toothed gearing and kinematics of gear trains.
V. To understand the basics of synthesis of simple mechanisms.
VI. To understand different types of Brakes, clutches, bearing for their capacity.

Concepts of kinematics, Classification of links, pair ,chain ,mechanisms mechanisms, Grashof's law, Different four bar mechanisms, Inversions of single slider, double slider kinematics' chain, Grubler's criterion , Kutrbach's theory, straight line mechanisms, steering mechanism.
Kinematics Analysis of Mechanisms: Displacement analysis, Transmission angle, coupler curve and their properties, radius of curvature of coupler curves, Velocity analysis: Relative Velocity method, instantaneous center of rotation method, transmission ratio. Acceleration analysis: Relative acceleration method, Corriolis component of acceleration, analytical method for four bar mechanism, Klein's construction for slider crank mechanism and four bar mechanism.

Synthesis of Mechanism: Introduction to type, Number and dimensional synthesis, graphical method of two positions, three position and four position, synthesis for Input output co-ordination. Overlay's method, Frendentein's equation.

Friction: Friction angle, friction circles and friction axis. Pivot and collar bearings. Brakes, clutches, types, constructional details, operation and calculation of leading dimensions.

Cams: Introduction, types of cam and follower, different motions of followers, graphical layout of cam profiles, pressure angle, cam with specified contours.

Gear: Introduction terminology, gear tooth profiles, interference, spur, helical gears, spiral gears, and its efficiency, bevel and worm gears.

Gear Trains: Types of gear trains, speed ratio, applications.

Text Books:

1. Theory of Machines, S.S. Rattan, 2nd Edition Tata Mc-Graw Hill Company, New Delhi, 2005.
2. Theory of Machines and Mechanisms, P.L. Ballaney, 3rd Edition, Khanna Publishers Delhi, 2000.

Reference Books:

1. The Theory of Machines, Thomas Baven, 3rd Edition, CBS Publishers and Distributors, 2000.
2. Theory of Machines and Mechanisms, Joseph Edward Shigley and Johan Joseph Uicker Jr., 2nd Editions ,McGraw-Hill Inc, 1995

Course Outcomes: After completion of this course student will be able to:

MEU402.1 Identify the mechanisms for various applications

MEU402.2 Analyse mechanisms using graphical methods

MEU402.3 Apply the basic kinematic principles for design of machine elements.

MEU403 THERMAL ENGINEERING & ENERGY CONVERSION

Teaching Scheme: 04 L + 00 T Total : 04 Credit : 04

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

Duration of ESE : 2hrs.30min

Course Objectives:

I. Understand thermal related basic components and their uses
II. Explain the different thermodynamic processes
III. Explain the working principles of IC engines, Boiler, condensers, & jet-propulsion
IV. Understand construction, working and applications of centrifugal and reciprocating compressors
V. Explain working and applications of Gas turbine turbines and air compressor
VI. Understand the need & types of non-conventional energy sources

Steam power plant: Steam power cycle, reheat, regenerative cycles, analysis limited to two stages only, deaerator, typical layout of steam power plant, efficiencies in steam power plant, concept of co-generation, Steam generators: Classification, Early and modern water-tube type steam generator arrangements, Economiser, superheater, reheaters, steam generator control, air preheater, principle of fluidized bed boiler, cylone separator. Electrostatic precipitator.

Steam turbines and condensers : flow through nozzles, critical pressure ratio and choked flow, nozzle efficiency, determination of throat and exit areas, concept of super saturated flow and Wilson line (no numerical), type of steam turbines, Types of steam turbines such as impulse, reaction turbines. Compounding, Velocity diagrams. Graphical and analytical methods for work and power developed, axial thrust and efficiency. Turbine governing and control, throttle governing, need of a condenser and its types, quantity of cooling water required, condenser and vacuum efficiency. Sources of air in condensers and its effect on performance

Air Compressors: Industrial uses of compressed air, Methods of compression and efficiencies of compression. clearance volume and its effect on work done and volumetric efficiency, condition for minimum work in two stage compression, Intercooling and its effects. Comparison between reciprocating and rotary compressors, centrifugal and axial flow compressors, difference between fans, blowers and compressors, general equations for rotary machines. Working and construction of Screw compressor,Vane, Roots blower.

I.C. Engines: Classification of I.C. engines, General description of Petrol and Diesel engine, working, calculations limited to engine brake power, Gas Turbines, Closed cycle and open cycle plant arrangement, advantages, analysis of Brayton cycle, Effect of reheating, Performance of Gas turbine power plant. Components of GT power plant. Introduction to jet propulsion, Ramjet, turbojet.

Refrigeration and Air conditioning: Vapor compression Refrigeration and COP, vapor absorption refrigeration. Air conditioning: classification and applications. Psychometric charts elementary treatment with simple problems.

Non conventional energy sources: Introduction to non conventional energy sources i.e. Solar, Wind, Tidal & Ocean, Geothermal energy and Magneto Hydrodynamics, its advantages, disadvantages.

Text Books

1. Basic and Applied Thermodynamics, P.K. Nag, 2nd Edition, Tata Mc-Graw Hill Pub., 2010.
2. Power Plant Engineering, P.K. Nag, 3rd Edition, Tata Mc-Graw Hill Publishing, 2008.

Reference Books:

1. Gas Turbines, V Ganesan, 3nd Edition, Tata McGraw Hill, 2010.
2. Thermodynamics-An Engineering Apporach, Y. A. Cengel and M. A. Boles, 3rd Edition, Mc-Graw Hill, 1998.
3. Applied Thermodynamics, Onkar Singh, 3rd Edition, New Age International Publishing, 2009.
4. Thermal Engineering by Mahesh M Rathore, 3rd Edition, Tata Mc-Graw Hill, 2010

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

MEU403.1. Describe basic thermal system components their functions

MEU403.2. Apply the concepts of thermodynamics to IC engines, Boiler, condensers, Gas turbine for engineering applications

MEU403.3. Describe the construction and working of thermal systems

MEU403.4. Apply appropriate techniques for the performance enhancement of thermal systems

MEU403.5.Understand the need & types of non-conventional energy sources

MEU404 MANUFACTURING PROCESSES

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

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

Duration of ESE: 2 hrs. 30 min

Course Objectives

I. To identify the necessity and importance of manufacturing.
II. To learn the fundamentals of major classes of manufacturing processes.
III. To understand the working principles of different casting and welding operations
IV. To differentiate between these processes in terms of application, function, advantages, disadvantages, quality and productivity

Pattern Making and Mould Design: Introduction to basic manufacturing processes, Pattern materials, allowances, Types of patterns, Design considerations in pattern making, Color codes for patterns and core boxes. Basic principle and Terminology of sand casting, gating system, types of gate ,Risers design, Risering aids, Directional and Progressive solidification. General properties of moulding sands, Types of sands, testing of moulding sand, Mold hardness. Preparation of sand moulds of different types, Moulding processes, core making.

Technology of melting and special casting methods: Melting furnaces pit, open hearth, gas fired cupola and electric hearth furnaces, cupola operation development in cupola melting, Electric furnaces - Direct Arc, Indirect arc and electric induction furnace, Selection of furnace. Modernization and Mechanization of Foundries, permanent mold casting, slush casting, shell molding, Investment or lost wax casting, vacuum process, centrifugal casting, Continuous casting, Die casting equipments and processes for Gravity, pressure and vacuum casting methods, Comparison between casting methods.

Defects, Inspection and testing of casting: Origin and classification of defects, shaping faults, Inclusions and sand defects, Gas defects, shrinkage defects, contraction defects, dimensional errors. Radiography, ultrasonic, Eddy current testing, fluorescent penetrate test.

Mechanical working of metals: Principle of Hot and cold working processes, Different types of hot and cold working processes, e.g. Rolling, types of rolling forging operations, extrusion, piercing, pipe and tube production, manufacture of seamless pipe and tubing. Spinning, embossing and coining, squeezing and bending operations, rotary swaging

Processing of plastics: Compression, Transfer, Injection, Extrusion. Blow moulding,

Rotational moulding and calendaring.

Joining processes: Introduction to riveting, soldering, brazing and welding. Gas welding, working principle and its application, Arc welding: arc initiation, arc maintenance, and arc control, transfer of metal across the gap, Electrode efficiency, Types and purpose of Electrodes, TIG welding: working principle and its application, MIG- welding: working principle and its application. SAW - welding: working principle and its application,

Resistance welding : Working principle and its applications

Other welding processes: Working principle and applications of Friction Welding, Forge Welding, Plasma arc, and Thermit Welding. Ultrasonic, Electro slag, Electron Beam, laser welding.

Welding defects, Testing and Inspection of welds: Various welding defects, weld testing methods. Weld ability. Welding symbols.

Surface Treatment: Electroplating, electroforming, and iodizing, metal spraying, shot penning, polishing, mechanical cleaning.

Text Books:

1. Manufacturing Process-II H. S.Bawa, 3rd Edition, Tata Mc Graw hill Publishing Co. Ltd.2004
2. Workshop Technology-I, B. S. Raghuwanshi, 2nd Edition, Dhanpat Rai and Sons, 2001

References Books:

1. Manufacturing Science Ghosh and Malik, Affiliated East – West PressLtd, 3rd Edition, 2002
2. Processes and Materials of Manufacture, R A LindBerg, 2nd Edition,PHI Pub 2001
3. Rao P N Manufacturing Technology : Metal Cutting and Machine tools, 3rd Edition, Tata McGraw Hill 2001
4. Workshop Technology, Hajra Chaudhary, 4th Edition,Dhanpat Rai and Sons 2001

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

MEU404.1 Able to understand principles of casting, forming, welding and plastic processing.

MEU404.2 Able to understand advantages and limitations of casting, forming, welding processes.

MEU404.3 Able to understand cause and remedies for different types of defects in cast, formed, welded product.

MEU404.4 Able to select appropriate manufacturing process based on function, material, quality requirement, production volume of a product.

MEU405 MACHINE DRAWING

Teaching Scheme: 02 L **Total: 02** **Credit: 02**

Evaluation Scheme: 08CT1+08CT2+04TA+30 ESE **Total Marks: 50**

Duration of ESE: 02hrs. 30min

Course Objectives:

I. Helping the student in drafting their technical ideas.
II. Creating knowledge about the various practices with regard to the dimensioning, sectioning and development of views.
III. Understanding the importance of the linking functional and visualization aspects in the preparation of the part drawings.
IV. Preparation of the part or assembly drawings as per the conventions.
V. Interpretation of machine drawings that in turn help the students in the preparation of the jobs, components,etc.

Sectional views: conversion of pictorial view into sectional orthographic projections, missing views

Development of surfaces: Development of surface of cubes, prisms, cylinder, pyramids, cones etc.

Intersection of surfaces: Interpenetration of solids, prism and prism, cylinder and cylinder, cylinder and prism, cone and cylinder, cone and prism.

Assembly Drawing: Preparation of detailed and assembly drawing of simple machine assemblies like pedestal bearing, Plummer block, simple eccentric, stuffing box, cross head, connecting rod, tail stock, tool post, c-clamp, screw jack, boiler safety valve etc.

Introduction to Modeling by using Pro/Engineer /CATIA Software.

Text Books:

1. Machine drawing, N.D.Bhatt, 38th Edition ,Charotar Publisher, 2003
2. Machine Drawing, N.Sidheshwar, Shastry, Kanhaiah, 4th Edition, Tata Mcgraw Hill, 2005

Reference Books:

1. Machine Drawing, Narayan, K.L.Reddy, 2nd Edition, New AGE International Publishers, 2004
2. Machine Drawing, P.J.Shah, 3rd Edition, Shah Publishers, 1997
3. Computer Graphics & Design, P.Radhakrishnan, 3rd Edition, Dhanpat Rai & Sons, 2009
4. Using AUTOCAD, James E Fuller, 9th Edition, Denmark Publishing Company, 2004
5. Machine Drawing, R.K.Dhawan, 4th Edition, S.Chand & Co.,2006

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

MEU405.1 Draw the development of surfaces for sheet metal working applications.
MEU405.2 Understand the representation of materials used in machine drawing.
MEU405.3 Draw the machine elements including keys, couplings, cotters, riveted, bolted and welded joints.
MEU405.4 Construct an assembly drawing using part drawings of machine components.
MEU405.5 Represent tolerances and the levels of surface finish of machine elements

MEU406 FLUID MECHANICS LAB

Teaching Scheme : 2 P **Total : 02** **Credit: 01**

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

Duration of ESE: 3 hrs.

Course Objectives:

I. To validate the various theory concept practically by demonstrating the experiments.
II. To acquire hand on experience to use the various measuring instrument for the fluid flow.
III. To analyze the various frictional losses in fluid flow.

IV. To develop the practically evaluating ability in the different situation of fluid flow.
V. To utilize this practical knowledge for upcoming related subject and research work.

It is representative list of practical. The instructor may choose minimum Eight experiments as per his/her requirement (so as to cover entire content of course MEU401) from the list given below

1. Measurement of fluid pressure by manometer.
2. Determination of metacentric height.
3. Verification of Bernoulli's equation.
4. Flow measurement by venturimeter
5. Flow measurement by orifice meter.
6. Determination of Reynolds number.
7. Study of velocity distribution in Boundary layer and its thickness.
8. Determination of co-efficient of friction for pipes.
9. Determination of head loss due to sudden enlargement and contraction.
10. Determination of losses in bends and elbows.
11. Study of flow through pipes in series and parallel.

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 the course, the student will be able to:
MEU406.1 Prove theory concept practically by developing the experiments.
MEU406.2 Use the various measuring instrument for the fluid flow in different situation.
MEU406.3 Analyze the various frictional losses in fluid flow.
MEU406.4 Identify the types of flow by using flow demonstrator.
MEU406.5 Develop the own experimental set-up and analyze for research work.

MEU407 KINEMATICS OF MACHINES LAB

Teaching Scheme : 2 P Total : 02 Credit: 01
Evaluation Scheme: ICA 25 + ESE 25 Total Marks :50
Duration of ESE: 3 hrs.

Course Objective:

I. To make the student conversant with commonly used mechanism for industrial application.
II. To develop competency in drawing velocity and acceleration diagram for simple and complex mechanism.
III. To develop analytical competency in solving kinematic problems using complex algebra method.
IV. To develop competency in graphical and analytical method for solving problems in static and dynamic force analysis.
V. To develop a model applying all knowledge of kinematics of machine

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 MEU402) from the list given below

List of Experiments:

1. To draw inversions of four bar kinematics chain locating end points and explain working of mechanisms.
2. To draw inversions of single slider crank chain, locating points and explain working of mechanisms.
3. To draw inversions of double slider cranks Kinematic chain locating end points and explains working of mechanisms.
4. To determine relative velocity of given links in mechanisms by relative velocity method or instantaneous center of rotation.
5. To determine relative acceleration of links in mechanisms by relative acceleration method.
6. To draw profile of cam graphically for given follower with its specified motion.
7. Mini Project on Clutch, Brake, and Dynamometers- It is required to select these contrivances from working system..
8. Gear trains – Gear box of any four wheelers should be selected and studied with respect to types of gear, velocity ratio, type of train, arrangement of gears.
9. To determine pressure distribution pattern at different load and speed along the periphery of journal with the help of Journal Bearing Apparatus.

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, student will be able to:

MEU407.1. Demonstrate knowledge of various mechanisms in order to design and analyze mechanisms essential in mechanical engineering.

MEU407.2. Demonstrate ability towards graphically estimating velocity and acceleration.

MEU407.3. Exhibit skills towards application of principles of static and dynamics force analysis.
MEU407.4. Knowledge attained will comply towards successfully addressing issues relating to gears, cams and followers in real life engineering problems

MEU408 MANUFACTURING PROCESSES LAB

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

Course Objectives:

I. To understand making of pattern using pattern making tools for sand casting
II. To learn the preparation of two box green sand mould and to understand the construction /working principle of metal melting furnace CUPOLA
III. To understand the preparation of a composite job with the help of Electric Arc Welding and Gas welding.
IV. To learn the principles of sheet metal working and learn how to prepare a job on bending machine

It is representative list of practical. The instructor may choose minimum four job as per his/her requirement (so as to cover entire content of course MEU404) from the list given below

List of Experiments:

1. **Pattern Making Shop:** Study of different types of patterns and pattern making tools, One job on preparation of a pattern.
2. **Foundry Shop:** Study of any two furnaces, Study of foundry tools, Demonstration of casting Sand preparation and testing. One job on preparation of green sand mould.
3. **Welding Shop:** Preparation of a composite job with the help of Electric Arc Welding and Gas welding.
4. **Sheet Metal Working** Demonstration of Mechanical and Hydraulic presses. Preparation of a job on bending Machine.

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, student will be able to:
MEU408.1 Ability to make a pattern using pattern making tools for sand casting
MEU408.2 Able to prepare two box green sand mould and able to understand the working of Cupola

MEU408.3 Ability to make a composite job with the help of Electric Arc Welding and Gas welding.
MEU408.4 Ability to make a job on bending machine

MEU409 COMPUTER AIDED DRAFTING LAB

Teaching Scheme: 04 P **Total : 04** **Credit: 02**
Evaluation Scheme : 50 ICA + 50 ESE **Total Marks: 100**
Duration of ESE: 3 hrs.

Course Objectives:

I. To impart students with the necessary skills for drafting and modeling machine components using CAD tools.
II. To impart the fundamental knowledge in designing and drafting.
III. To develop the Practical knowledge in the field components designing.

It is representative list of practical. The instructor may choose minimum eight Sheet as per his/her requirement (so as to cover entire content of course MEU405) from the list given below

List of Drawing

PART A : Sheets (one each) by using Pro Engineer /CATIA and Sketchbook

1. Sectional Views of objects
2. Developments of surfaces
3. Intersection of solids

PART B : Drawing of following machine elements using Pro/Engineer/CATIA Software (four Sheets)

1. Cotter Joints
2. Knuckle Joints
3. Flange Coupling
4. Wall Bracket
5. Plummer Block
6. Stuffing Box
7. Machine tool Components
8. Rivet and Rivet Joints

PART C : One sheet on: ISI Conventions for various components like bearing, gears, springs, keys and keyways, threads, tap holes and materials

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, student will be able to:

MEU409.1. Demonstrate the complete methodology of design &drafting.

MEU409.2 Develop skills in designing the automobile engine components using software like AutoCAD.

MEU409.3. Model and assemble machine parts and Know about the industrial models and their usages in practical design and manufacturing fields.