

## **BEA-401 Energy, Ecology, Environment and Society**

### **UNIT -1**

Sources of Energy : Renewable & Non Renewable, Fossil fuel, Biomass Geothermal, Hydrogen, Solar, Wind, hydro, nuclear sources.

### **UNIT-2**

Segments of Environment: Atmosphere, hydrosphere, Lithosphere, biosphere. Cycles in Ecosystem – Water, Carbon, Nitrogen. Biodiversity: Threats and conservation

### **UNIT-3**

Air Pollution: Air pollutants, classification, (Primary & secondary Pollutants) Adverse effects of pollutants. Causes of Air pollution chemical, photochemical, Green house effect, ozone layer depletion, acid Rain. Sound Pollution: Causes, controlling measures, measurement of sound pollution (deciblage), Industrial and non – industrial.

### **UNIT-4**

Water Pollution– Water Pollution: Pollutants in water, adverse effects. Treatment of Domestic & Industrial water effluent. Soil Pollution – Soil Profile, Pollutants in soil, their adverse effects, controlling measures.

### **UNIT-5**

Society, Ethics & Human values– Impact of waste on society. Solid waste management Nuclear, Thermal, Plastic, medical, Agriculture, domestic and e-waste). Ethics and moral values, ethical situations, objectives of ethics and its study . Preliminary studies regarding Environmental Protection Acts, introduction to value education, self exploration, sanyam & swasthya.

### **REFERENCES:**

1. Harris, CE, Prichard MS, Rabin's MJ, "Engineering Ethics"; Cengage Pub.
2. Rana SVS ; "Essentials of Ecology and Environment"; PHI Pub.
3. Raynold, GW "Ethics in information Technology"; Cengage.
4. Svakumar; Energy Environment & Ethics in society; TMH
5. AK De "Environmental Chemistry"; New Age Int. Publ.
6. BK Sharma, "Environmental Chemistry" ; Goel Publ. House.
7. Bala Krishnamoorthy; "Environmental management"; PHI
8. Gerard Kiely, "Environmental Engineering" ; TMH
9. Miller GT JR; living in the Environment Thomson/cengage
10. Cunningham WP and MA; principles of Environment Sc; TMH
11. Gandhiji M.K.- My experiments with truth

## **MEA- 402 Instrumentation & Control**

### **Unit-1**

**Introduction to instrumentation systems**, classifications, functional elements of a measurement system, standards and calibration, static performance characteristics, measurement errors and uncertainties, analysis, sequential and random test, specifications of instrument static characteristics, data acquisition, reduction, data outlier detection,

### **Unit-2**

**Dynamic characteristics of the instruments**, formulation of system equations, dynamic response, compensation, periodic input, harmonic signal non harmonic signal, Fourier transform, response to the transient input, response to random signal input, first and second order system compensation,

### **Unit-3**

**Introduction to instrument systems-** (a) Temperature measurements, thermometry based on thermal expansion, liquid in glass, bimetallic, electric resistance- thermometry, thermocouples, thermistors, detectors, (b) pressure and velocity measurements, barometer, manometer, dead weight tester, pressure gauges and transducers, dynamic measurements,(c) flow measurements, pressure differential meters, orifice meter, venturi meter, rota-meter,

### **Unit-4**

strain gauges, strain and stress measurements, electrical circuits, compensations, motion force and torque measurements, displacement measurements, potentiometers, linear and rotary variable differential transformers, velocity measurements, electromagnetic technique, stroboscope, load cell, measurement of torque on rotating shaft, power estimation from rotating shaft.

### **Unit-5**

**Control systems**, open loop and close loop control, mathematical modeling of dynamic systems – mechanical systems, electrical systems, fluid systems, thermal systems, transfer function, impulse response function, block diagrams of close loop systems, system modeling using software.

### **Reference:**

- 1.Nakra B.C.Chaudhary K.K, Instrumentation measurement and analysis Tata McGraw Hill,
- 2.Richard S, Figiola & Donal E. Beasley, John Wiley, Theory and design of mechanical measurements.

### **List of Experiments**

- 1.To determine the functional elements of a measurement system.
2. To Study of Dynamic characteristics of the instruments
3. To Study of Temperature measurements instruments
4. To Study of strain gauges, strain and stress measurements.
5. To Study of Control systems.
6. To Study of open loop and close loop control systems.

## **MEA- 403 Theory of Machines**

### **Unit-1**

Introduction, kinematics and kinetics, mechanisms and machines, degree of freedom, types of motions, kinematic concept of links, basic terminology and definitions, joints and kinematic chains, inversions, absolute and relative motions, displacement, velocity and acceleration diagrams, different mechanisms and applications,

### **Unit-2**

kinematic synthesis of linkages, dynamic motion analysis of mechanisms and machines, D'Alembert's principle, number synthesis, free body diagrams, kinematic and dynamic quantities and their relationships, analytical method and graphical method

### **Unit-3**

Cams, introduction, classifications of cams and followers, nomenclature, analysis of cam and follower motion, analytical cam design with specific contours, pressure angle, radius and undercutting, motion constraints and program, critical path motion, torque on cam shaft

### **Unit-4**

Power transmission, kinematics of belt- pulley, flat and v –belt, rope, condition of maximum power transmission, efficiency, friction, friction devices, pivot and collars, power screw, plate and cone clutch, brakes, classifications, block, band, internal and external, friction circle, friction axis,

### **Unit-5**

Gears, laws of gearing, classification and basic terminology, tooth profiles, kinematic considerations, types of gears, spur, bevel, worm, helical, hypoid etc, gear trains, epicyclic, compound,, balancing- static and dynamic, in same/ different planes, Introduction to vibration, single degree of freedom.

### **Reference:**

- 1.R.L.Norton,kinematics& dynamics of machinery,Tata McGraw Hill, ISBN13
- 2.A.Ghosh & A.Malik, Theory of Mechanisms and Machines,EWP Pvt Ltd,ISB
3. Rao JS and Dukkupati; Mechanism and Machine Theory; NewAge Delhi.
4. Dr.Jagdish Lal; Theory of Machines; Metropolitan Book Co; Delhi –
- 5.Ghosh,A,.Mallik,AK; Theory of Mechanisms & Machines, 2e,

### **List of Experiments**

- 1.Study of cam and follower and finding velocity and acceleration of follower
- 2.Study of slider crank mechanism
- 3.Study of different kinematic pairs
- 4.Generation of involute teeth profile for different gears
- 5.Performance of interference and undercutting of tooth (by plotting)
- 6.Study of gyroscopic effect using gyroscope
- 7.To study working of differential gear mechanism.
- 8.To study working of sun and planet epicycle gear train mechanism using

## **MEA- 404 Fluid Mechanics**

### **Unit-1**

Introduction, fluid and the continuum, fluid properties, surface tension, bulk modulus and thermodynamic properties, Newton's laws of viscosity and its coefficients, Newtonian and non Newtonian fluids, hydrostatics and buoyancy, meta center and metacentric height, stability of floating bodies.

### **Unit-2**

Fluid kinematics, Lagrangian and Eulerian method, description of fluid flow, stream line, path line and streak line, types of flow and types of motion, local and convective acceleration, continuity equation, potential flow, circulation, velocity potential, stream function, Laplace equation, flow nets.

### **Unit-3**

Fluid dynamics, system and control volume, Reynold transport theorem, Euler's equation, Bernoulli's equation, momentum and moment of momentum equation, their applications, forces on immersed bodies, lift and drag, streamlined and bluff bodies, flow around circular cylinder and aerofoils.

### **Unit-4**

Flow through pipes, Reynold number, laminar and turbulent flow, viscous flow through parallel plates and pipes, Navier Stoke's equation, pressure gradient, head loss in turbulent flow (Darcey's equation), friction factor, minor losses, hydraulic and energy gradient, pipe networks

### **Unit-5**

Introduction to boundary layer theory, description of boundary layer, boundary layer parameters, Von Karman momentum equation, laminar and turbulent boundary conditions, boundary layer separation, compressible flow, Mach number, isentropic flow, stagnation properties, normal and oblique shocks, Fanno and Reyleigh lines, flow through nozzles,

### **Reference:**

1. Massy B.S., Mechanics of fluid, Routledge Publication
2. Shames, Fluid Mechanics, Tata McGraw Hills
3. Fluid Mechanics- Yunush A. Cengel, John M. Cimbala- TMH, Delhi
4. Fluid Mechanics and Fluid Power Engineering – D.S. Kumar– Kataria & Sons –
5. A text of Fluid Mechanics – R. K. Rajput – S. Chand & Company Ltd., Delhi

### **List of Experiments:**

1. To determine the meta-centric height of a ship model.
2. To verify Impulse Momentum Principle.
3. To calibrate a Venturimeter and study the variation of coefficient of discharge.
4. To calibrate an orifice-meter.
5. To Flow measurement using Pitot tube.
6. To determine the hydraulic coefficients ( $C_c$ ,  $C_d$  and  $C_v$ ) of an orifice.
7. To determine the coefficient of discharge of a mouth piece.
8. To study the variation of friction factor for pipe flow.

## **MEA- 405 Manufacturing Technology**

### **Unit-1**

Analysis of Machining processes, introduction, tool geometry, tool materials, wear characteristics, cutting forces, , cutting fluids, failure of cutting tools, broaching operation, types of broaching machines, design of broaching tools, centre less grinding, thread chaser, thread grinding boring, super finishing processes like honing, lapping, electro polishing and buffing

### **Unit-2**

Gear machining, types of gears, elements of gears, different methods of gear production, gear cutting on milling machine, gear machining by generation method, principles of generation of surfaces – hobbing, shaping and basic rack cutting, gear finishing by shaving and gear grinding, tooth profile grinding, suitable gear treatments

### **Unit-3**

Plastics, composition of plastic materials, moulding method- injection moulding, compression moulding, transfer moulding, extrusion moulding, calendaring, blow moulding, laminating and reinforcing, welding of plastics.

### **Unit-4**

Unconventional machining processes, introduction, abrasive jet machining, ultrasonic machining, electrochemical machining, electro discharge machining, electron beam machining, laser beam machining, plasma arc machining, non destructive testing of machined surfaces and tools,

### **Unit-5**

Extrusion, principles, hot and cold extrusion processes, tube extrusion, sawing, power hacksaw, band saw, circular saw, Introduction to numerical control machining, NC Machine tools, NC tooling ,part programming, functions, coordinate systems

### **Reference:**

1. Ghosh A., Mallik A.K., Manufacturing science, EWP Pvt Ltd, ISBN 81 85095 85 X
2. R.K.Jain, Production Technology, Khanna Publishes, ISBN 81 7409 099 1
3. Campbell J.S., Principles of Manufacturing Materials and Processes.
4. CMTI Handbook
5. Rao P.N., Manufacturing Technology, Tata McGraw Hill

### **List of Experiments:-**

1. To Study of different methods of gear production .
2. To Study of different grinding machines.
3. To Study of Processing Plastics-Injection Molding.
4. To Study the manufacturing of different methods of gear.
5. To Study of hot and cold extrusion processes

## **MEA- 406 Software Lab**

Role of computers in design and manufacture. Drawing soft ware, configuration, function and facilities, parametric representation, examples of drawings and systems

Surface modeling, curves and surface representation – composite surfaces, case studies in CAD, parametric representation analytic and synthetic curves, surface manipulation, design and engineering applications,

Current developments in CAD, feature based modeling,, design by feature,

Solid modeling, boundary representation, analytic solid modeling, constructive solid geometry, sweep representation, design and engineering applications,

Strategic plan of CAD system design and development, graphic exchange, features recovery, etc.

### **Reference:**

Donald H, Paulin M, Computer graphics, Prentice Hall,

Ibrahim z., CAD/CAM, Theory and Practice, McGraw Hill,

Mc mohan C, Browne , CAD/ CAM Principles- practice and manufacturing management, Pearson Education AsiaLtd,

### **List of Experiments**

1. 2D sketching on CAD software
2. 3D modeling on CAD software
3. Modeling of IC Engine components
4. Modeling of hand tools
5. Modeling of modern Furniture using CAD software
6. Modeling and Assembling components for a project on CAD software
7. A case study on Product Design using CAD software

## **MEA- 407 Industrial Training –I**

Duration:- 2 weeks after the IVsemester in the summer break, Assessment in V semester.

Students must observe following to enrich their learning during industrial training:

- Industrial environment and work culture.
- Organizational structure and inter personal communication.
- Machines/ equipment/ instruments - their working and specifications.
- Product development procedures and phases.
- Project planning, monitoring and control.