

Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal

Branch- Common to All Discipline

ES401	Energy & Environmental Engineering	3L-1T-0P	4 Credits
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The objective of this Course is to provide *an introduction to energy systems and renewable energy resources, with a scientific examination of the energy field and an emphasis on alternative energy sources and their technology and application.*

Module 1: Introduction to Energy Science:

Introduction to energy systems and resources; Introduction to Energy, sustainability & the environment; Overview of energy systems, sources, transformations, efficiency, and storage; Fossil fuels (coal, oil, oil-bearing shale and sands, coal gasification) - past, present & future, Remedies & alternatives for fossil fuels - biomass, wind, solar, nuclear, wave, tidal and hydrogen; Sustainability and environmental trade-offs of different energy systems; possibilities for energy storage or regeneration (Ex. Pumped storage hydro power projects, superconductor-based energy storages, high efficiency batteries)

Module2: Ecosystems

- Concept of an ecosystem; Structure and function of an ecosystem; Producers, consumers and decomposers; Energy flow in the ecosystem; Ecological succession; Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of the following ecosystem (a.)Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Module 3: Biodiversity and its conservation

- Introduction – Definition: genetic, species and ecosystem diversity; Bio-geographical classification of India; Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values; Biodiversity at global, National and local levels; India as a mega-diversity nation; Hot-spots of biodiversity; Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; Endangered and endemic species of India; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Module 4: Environmental Pollution

- Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards; Solid waste Management: Causes, effects and control measures of urban and industrial wastes; Role of an individual in prevention of pollution; Pollution case studies; Disaster management: floods, earthquake, cyclone and landslides.

Module 5: Social Issues and the Environment

- From Unsustainable to Sustainable development; Urban problems related to energy; Water conservation, rain water harvesting, watershed management; Resettlement and rehabilitation of people; its problems and concerns. Case Studies

Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies Wasteland reclamation; Consumerism and waste products; Environment Protection Act; Air (Prevention and Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act; Issues involved in enforcement of environmental legislation; Public awareness.

Module 6: Field work

- Visit to a local area to document environmental assets- river/forest/grassland/hill/mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc.

REFERENCE

1. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc.
2. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB).
3. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai,
4. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
5. Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Standards', Vol I and II, Enviro Media (R)
6. Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.) (2004), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press.
7. Schaeffer, John (2007), Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living, Gaia

New Scheme Based On AICTE Flexible Curricula

Industrial Production Engineering, IV-Semester

IP402- Machine Design and Drawing

Unit-I: Drawing conventions; drawing and dimensioning IS codes, sectional views and sectioning, surface finish and tolerances, representation of machine parts such as external and internal threads, slotted heads, square ends, and flat radial ribs, slotted shaft, splined shafts, bearings, springs, gears, Rivet heads and Riveted joints, Welded joints, Drawing of Threaded fasteners .

Unit-II : Assembly Machine Drawing: Basic concept of assembly drawing ,bill of materials, Assembly drawing of Cotter and Knuckle joints, pedestal and footstep bearings, Engine parts- crosshead and stuffing box, IC engines parts - piston and connecting rods; lathe machine parts-Tool post and Tail stock.

Unit-III : Basic design concepts, design process, stages/phases in design, flowchart, problem formulation, design considerations for strength-Types of loads ,Design stress and Factor of safety for steady and variable loads, impact and fatigue considerations, Theories of failure, Design consideration for manufacturing standardization, Limits, surface roughness, Design for reliability ,Ergonomics factor in design, design consideration for casting, welding, forging and machining. Design for recycle and reuse. Introduction to Design optimization

Unit- IV: Design of components subject to static loads: riveted joints, welded joints ,threaded joints, pin , knuckle and cotter joints

References:

1. Bhat, ND; Machine Drawing; Charotar publication
 2. Singh A; Machine Drawing; TMH publication
 3. Narayana and Reddy; Machine Drawing; New age, Delhi.
 4. Shigley JE et al; Mechanical Engineering Design, TMH
 5. Sharma C.S. & Purohit kamlesh; Design of machine elements ;PHI
 6. Kulkarni SG; Machine Design; TMH
 8. PSG Design data book
 8. Mahadevan and Reddy's Mechanical design data book
- List of Experiments: Assembly Drawing and design problem as per given syllabu

IP403 -THEORY OF MACHINES

- [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,
- [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
- [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
- [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,
- [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.

BOOKS:

- [1] R.L.Norton, kinematics & dynamics of machinery, Tata McGraw Hill, ISBN 13 978 0 07 014480 4
- [2] A.Ghosh & A.Malik, Theory of Mechanisms and Machines, EWP Pvt Ltd, ISB 81 85095 72 8

Tutorials:

- 1. Displacement diagrams of slider crank and other linkages, analytical and graphical
- 2 Velocity diagrams and acceleration diagrams
- 3 Diagrams of cam and followers for different applications
- 4 Gears and gear trains transmission diagrams, analytical and graphical applications
- 5 Solutions to problems of industrial application using software

IP404- FLUID MECHANICS

- [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.
- [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.
- [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.
- [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 (Darcy's equation), friction factor, minor losses, hydraulic and energy gradient, pipe networks
- [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 Rayleigh lines, flow through nozzles,

BOOKS:

- 1. Massy B.S., Mechanics of fluid, Routledge Publication
- 2. Shames, Fluid Mechanics, Tata McGraw Hills

IP405- MANUFACTURING PROCESS-II

UNIT 1 Principle of generation of surface, classification of machining processes and machine tools, cutting tool materials, their properties & types of single point cutting tools. Type of lathe and operation such as turning, taper turning, thread cutting, grooving, parting off. Use of multiple tool for manufacturing of simple components, Concepts of feed, speed and depth of cut. Machining time estimation: Evaluation of machining time for turning, facing, drilling, milling and shaping operations.

UNIT 2 Shaping, Planning and slotting operation and machines, Quick return mechanism, Hydraulic system for shaper. Drilling and drilling machines, Types of drills, tapes and reamers, Geometry of drills, reamers and taps, Tapping and Spot facing operations. Milling machines, Types and operations. Types of milling cutters, Up and Down milling, gang cradle milling. Broaching operation, types of broaching machines and broaches design of broaching tools.

UNIT 3 Grinding process and grinding machines, Grinding wheel, Types nomenclature and their selection. Centreless grinding and job feeding arrangement, Dressing and trueing of grinding wheels. Super finishing processes: Honning, lapping, super-finishing, polishing and buffing.

UNIT 4 Press working: Types of presses, Classification and specifications, press working operations as Blanking, piercing, shearing, bending, forming, embossing, coining drawing and deep drawing, operations. Elements of dies and punches, Clearance, Compound, combination, progressive and inverted dies and their operations, Blank layout, Metal spinning.

UNIT 5 Gear and their types, elements of gears, different method of producing gears, gear cutting on milling m/c and by generating methods viz, hobbing, shaping, and rack cutting, gear finishing by shaving and grinding.

PRACTICALS

LIST OF PRACTICALS

1. Study various measuring instruments
2. Study of various types of Lathe Machines
3. Manufacturing job on the lathe as per drawing
4. Study of Milling machine and Indexing machine
5. Manufacturing of gear on milling machine as per drawing
6. To study Shaper machine and various mechanisms of Shaper.
7. Prepare a job on shaper machine as per the drawing
8. Study of Grinding machine and tool cutter
9. Do study of Super finishing process
10. Study various press working operations.

TEXT BOOKS RECOMMENDED:

1. Campbell J. S., Principles of Manufacturing Materials & Processes.
2. Lindberg, Manufacturing Processes.
3. Chapman W. A. J., Workshop Technology part II and III.
4. P N Rao , Manufacturing Process
5. HMT, Production Technology

REFERENCES RECOMMENDED:

1. ASME, Fundamentals of Tool Design