Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal

Branch- Common to All Discipline

ES301	**Energy & Environmental Engineering**	**3L-1T-0P**	**4 Credits**

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-sports 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, Gaiam

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New Scheme Based On AICTE Flexible Curricula

Agriculture Technology, III-Semester

AT302 Soil Technology -I

Course objectives: The course introduces students to basic knowledge of soil science for better understanding of agro-technologies and production related issues.

Unit I

Pedological and edaphological concepts; Earth's crust, Composition of Rocks and minerals; Weathering, soil formation factors and processes; Components of soils; Soil profile; Classification of soils and soils of India

Unit II

Soil physical properties and their significance; Soil texture and textural classes; particle size analysis; Soil structure and classification; soil aggregates and its significance; Soil consistency; soil crusting; Bulk density and particle density of soils & porosity, their significance and manipulation ; Soil colour – its significance, causes and measurement.

Unit III

Soil water, Soil water retention, potentials, Soil moisture constants; Methods of determination of soil moisture; Thermal properties of soil, soil temperature, Soil air, Gaseous exchange; Influence of soil temperature and air on plant growth; Soil Colloids: Inorganic and organic colloids, their nature and physico-chemical properties.

Unit IV

Ion exchange phenomena; Layer silicate clays, their genesis and sources of charges; Adsorption of ions, ion exchange, CEC and AEC, factors influencing ion exchange and its significance; Soil reaction, Buffering capacity and EC; Soil organic matter, composition, decomposition, Humus, Fractionation of organic matter; Carbon cycle, C:N ratio,; Soil biology, Biomass, Soil Organisms & their beneficial & harmful roles.

Practicals:

1. Identification of common rocks and minerals
2. Soil sample collection and processing for analysis
3. Visit to soils of different terrains and study of soil profile
4. Determination of particle size distribution
5. Determination of bulk density, particle density and porosity
6. Soil aggregate analysis;
7. Measurement of soil water content by different methods
8. Determination of soil water potential – Tensiometer
9. Soil moisture constants – Field capacity Infiltration rate, water holding capacity ;
10. Determination of soil pH and EC
11. Analytical chemistry – Basic concepts, techniques and calculations;
12. Estimation of soil organic carbon

Course outcomes: After successful completion of course, students are expected to possess basic understanding and knowledge about soil science and impart competence to acquire advance knowledge related to soil technologies.

References:

1. The Nature and properties of soils- N.C.Brady and Ray R.Weil
2. A text book of Soil Science – T.D. Biswas & S.K. Mukherjee
3. Soil Science- An Introduction – Indian Society of Soil Science
4. Dilip Kumar Das. 2004. Introductory Soil Science, Kalyani Publishers, New Delhi
5. Conception, Application of Pedology – J.L. Sehgal
6. Introduction to Soil Physics –D. Hillel
7. Vogel's Quantitative Chemical Analysis – Vogel

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Agriculture Technology, III-Semester

AT303 Heat and Mass Transfer

Course objectives: The course introduces heat transfer mechanisms and their governing principles along with thermodynamics applied to refrigeration so that the students would understand how the heat and mass transfer from one body to other.

UNIT I

Heat transfer mechanism and types. Conduction; Fourier's law, heat transfer trough various geometries, steady state uni directional flow, insulation. Convection; natural and forced convection. Dimensional analysis of free and forced convection. Useful non dimensional numbers and empirical relationships for free and forced convection. Radiation; Stefan Boltzmann's law, Krichoff's law and Plank's law. Concepts of black body and grey body. Emissivity; shape factor.

UNIT II

Heat exchangers; parallel, counter and cross flow. Logarithmic mean temperature difference. Condensation heat transfer. Introduction to mass transfer, Fick's law of diffusion, steady state diffusion of gases and liquid through solids, Equimolal diffusion. Convective mass transfer, Analogy between heat, mass and momentum transfer, Application of mass transfer phenomena in food processing.

UNIT III

Principles of refrigeration, second law of thermodynamics applied to refrigeration, carnot cycle, reversed carnot cycle, coefficient of performance, unit of refrigeration. Refrigeration in food industry, types of refrigeration system, mechanical vapour compression, vapour absorption system, components of mechanical refrigeration, refrigerant, desirable properties of ideal refrigerant.

UNIT IV

Centrifugal and steam jet refrigeration systems, thermoelectric refrigeration systems, vortex tube and other refrigeration systems, ultra low temperature refrigeration, cold storages, insulation material, design of cold storages, defrosting. Thermodynamic properties of moist air, perfect gas relationship for approximate calculation, adiabatic saturation process, wet bulb temperature and its measurement, psychometric chart and its use, elementary psychometric process.

UNIT V

Air conditioning – principles- Type and functions of air conditioning, physiological principles in air conditioning, air distribution and duct design methods, fundamentals of

design of complete air conditioning systems – humidifiers and dehumidifiers – cooling load calculations, types of air conditioners –applications.

Practicals

1. Calibrate Copper-Constantannstantan Thermocouple
2. Heat transfer through Metal rod and Composite wall
3. Thermal Conductivity of Insulation Powder
4. Heat transfer in Natural Convection
5. Emissivity Measurement
6. To determine the Stefan Boltzmann Constant for the given material
7. To determine the following for (i) Parallel flow heat exchanger and (ii) Counter flow heat exchanger

- Log mean temperature difference (LMTD)
- Overall heat transfer co – efficient (Experimental)
- Overall heat transfer coefficient (Theoretical)

8. Air Conditioning Test Rig

- To demonstrate working of air conditioning system.
- To demonstrate cooling, heating and humidification processes.
- To find the coefficient of performance.

Course Outcome: Bu the end of the semester, the students will understand the different mechanisms of heat transfer and refrigeration systems.

References:

1. Arora, S.C and Domkundwar, S. (1984). A Course in Heat & Mass Transfer (3 ed.). Dhanpat Rai & Sons, Delhi.
2. Ballaney, P.L. (1980). Refrigeration and Air Conditioning. Khanna Publishers, Delhi-6.
3. Arora, C.P. (1981). Refrigeration and Air Conditioning . Tata- McGraw Hill Publishing Co., New Delhi.
4. Geankoplis, C.J. (1997). Transport Processes and Unit Operations. Prentice Hall of India, New Delhi.
5. Holman,J.P. (1989). Heat Transfer S.I. Metric Edition. McGraw Hill Book Company Ltd., New Delhi.
6. Khurmi R. S. and Guptha J. K. (2004). A text book of Refrigeration & Air conditioning. Eurasia Publishing house (P) Ltd. New Delhi.
7. Treybal, R.E. (1981). Mass transfer Operation. McGraw Hill Book.

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New Scheme Based On AICTE Flexible Curricula

Agriculture Technology, III-Semester

AT304 Strength of Materials

Course objectives: The course introduces students to basic knowledge of strength of different materials along with the stress-strain analysis for designing beams and structural members.

UNIT I

Elasticity–Stresses and strains-Elastic limit–Elastic constants-Lateral strain- Composite sections-Temperature stresses-Volumetric strain in a body- Resilience and strain energy.

UNIT II

Analysis of statically determinate beams- Shear force and bending moment diagrams, Bending and shearing stresses in beams – slope and deflection of beams using double integration method, Macaulay's method, Moment area theorems and conjugate beam method.

UNIT III

Combined bending and direct stresses - Columns and struts - Euler's theory -Empirical formulae for loads on columns; Stresses in thin cylindrical shells – Torsion of shafts and springs; Analysis of statically indeterminate beams, Propped beams, fixed and continuous beams – Analysis using superposition, Three moment equation and moment distribution methods.

UNIT IV

Analysis and design of singly reinforced and doubly reinforced beams – Shear, bond and torsion – Design of T beams – Slabs – Design of one way and two way slab (IS code method only) – Columns, Foundations, Retaining walls, Silos and Ferro cement tanks.

UNIT V

Loads and use of BIS codes - Design of riveted and welded connections – Design of structural steel members in tension, compression and bending.

Practicals:

1. To perform the tension test on metal specimen (M.S., C.I.), to observe the behaviour of materials under load, to calculate the value of E, ultimate stress, permissible stress, percentage elongation etc. and to study its fracture
2. To perform the compression test on; Concrete cylinders &cubes, CJ., M.S. & Wood specimens and to determine various physical and mechanical properties
3. To perform the bending test on the specimens; M.S. Girder, Wooden beam, Plain concrete beams & R.C.C. beam, and to determine the various physical and mechanical properties

4. To determine Young's modulus of elasticity of beam with the help of deflection produced at centre due to loads placed at centre & quarter points
5. To study the behaviour of materials (G.I. pipes, M.S., C.I.) under torsion and to evaluate various elastic constants
6. To perform the Drop Hammer Test, Izod Test and impact tests on the given specimens
7. To determine compressive & tensile strength of cement after making cubes and briquettes
8. To measure workability of concrete (slump test, compaction factor test);
9. To determine voids ratio & bulk density of cement, fine aggregates and coarse aggregates
10. To determine fatigue strength of a given specimen

Course outcomes: After successful completion of course, the students are expected to possess basic understanding and knowledge of design of beams and how to carryout different tests in a material.

References:

1. Khurmi, R.S. 1998 Strength of Materials and Mechanics of Structures,. Vol. 1& 11 S. Chand and Company, New Delhi
2. Singh Gurubaksh. 1998 Strength of Materials and Structures,. Vol. I & II Khanna Publishers, New Delhi.
3. Timoshenko, S.P. and Young, D.H. 1968.Strength of Materials. Affiliated East-West Press Pvt. Ltd., New Delhi.
4. Bansal, R.K. (1992). Engineering Mechanics and Strength of materials. Laxmi Publications, New Delhi.
5. Kumar, K. L. (2003). Engineering Mechanics. Tata Mc Graw Hill Publishing Company, New Delhi.
6. Punmia, B.C., Ashok Kumar Jain and Arun Kumar Jain. (1994). Reinforced Concrete Structures (Vol. I). Laxmi Publications, New Delhi.

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Agriculture Technology, III-Semester

AT305 Agriculture production Technology –I

Course Objective : The course introduces students to basic Principles of crop production and Natural resources management related to sustainable management of national agro-ecosystems .

UNIT I

Agro-climatic zones of India, agro-ecological sub-regions in India, Pattern of normal annual distribution of rainfall in India and their variability. National agricultural production scenario with respect to acerage, production and productivity of crops, major soils of India and their distribution, land capability classification and land use pattern.

UNIT II

Essential plant nutrients, Liebig' s law of Minima, Nutrient uptake mechanisms in plants, plant nutrients and growth, photosynthesis, difference between C_3 and C_4 plants, factors affecting photosynthesis and net dry matter accumulation in plants.

UNIT III

Commercial Fertilizers in India, indigenous Production and import of commercial fertilizers, contribution of fertilizers in National food production, Different types of organic manures and their nutrient content, extent of availability of manures in India, biological nitrogen fixation and its role in National food production and in fertilizer N saving.

UNIT IV

Agronomic package of practices for cultivation of major cereal crops, namely, Rice, Wheat, Barley, Maize and Oats, highlighting Scientific name, family, origin, climatic requirement, sowing time, land preparation, seed rate, sowing methods, Important varieties, fertilizer requirement, water requirement, inter-culture operations, plant protection measures, harvesting etc.

Practicals:

1. Seed bed preparation,
2. identification of major fertilizers,
3. Analysis of nutrient content as per fertilizer control order,
4. Identification of major cereal crops and their phenotypic differences,
5. Identification of major weeds,

Course outcomes: After successful completion of course, students are expected to possess basic understanding and knowledge about the status of Indian agriculture and impart competence for advanced studies.

References:

1. Annonymus: Latest edition of Handbook of Agriculture published by Directorate of Knowledge Management in Agriculture, ICAR New Delhi.
2. Principles of Plant Nutrition by Konrad Mengel and Ernest A. Kirkby.
3. Textbook of Field Crop Production by Rajendra Prasad.
4. Introduction to Agronomy & Principles of Crop Production by S.R.Reddy.
5. Principles of Agronomy by T.Y.Reddy and G.H.S.Reddy

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Agriculture Technology, III-Semester

AT306 Computer Programming (JAVA)

Basic Java Features - C++ Vs JAVA, JAVA virtual machine, Constant & Variables, Data ypes, Class, Methods, Objects, Strings and Arrays, Type Casting, Operators, Precedence relations, Control Statements, Exception Handling, File and Streams, Visibility, Constructors, Operator and Methods Overloading, Static Members, Inheritance: Polymorphism, Abstract methods and Classes

Java Collective Frame Work - Data Structures: Introduction, Type-Wrapper Classes for Primitive Types, Dynamic Memory Allocation, Linked List, Stack, Queues, Trees, Generics: Introduction, Overloading Generic Methods, Generic Classes, Collections: Interface Collection and Class Collections, Lists, Array List and Iterator, Linked List, Vector. Collections Algorithms: Algorithm sorts, Algorithm shuffle, Algorithms reverse, fill, copy, max and min Algorithm binary Search, Algorithms add All, Stack Class of Package java. Util, Class Priority Queue and Interface Queue, Maps, Properties Class, Un-modifiable Collections.

Advance Java Features - Multithreading: Thread States, Priorities and Thread Scheduling, Life Cycle of a Thread, Thread Synchronization, Creating and Executing Threads, Multithreading with GUI, Monitors and Monitor Locks. Networking: Manipulating URLs, Reading a file on a Web Server, Socket programming, Security and the Network, RMI, Networking, Accessing Databases with JDBC: Relational Database, SQL, MySQL, Oracle

Advance Java Technologies - Servlets: Overview and Architecture, Setting Up the Apache Tomcat Server, Handling HTTP get Requests, Deploying a web Application, Multitier Applications, Using JDBC from a Servlet, Java Server Pages (JSP): Overview, First JSP Example, Implicit Objects, Scripting, Standard Actions, Directives, Multimedia: Applets and Application: Loading, Displaying and Scaling Images, Animating a Series of Images, Loading and playing Audio clips

Advance Web/Internet Programming (Overview): J2ME, J2EE, EJB, XML.

References:

1. Deitel & Deitel, ”JAVA, How to Program”; PHI, Pearson.
2. E. Balaguruswamy, “Programming In Java”; TMH Publications
3. The Complete Reference: Herbert Schildt, TMH
4. Peter Norton, “Peter Norton Guide To Java Programming”, Techmedia.
5. Merlin Hughes, et al; Java Network Programming , Manning Publications/Prentice Hall

List of Program to be made (Expandable)

1. Installation of J2SDK
2. Write a program to show Concept of CLASS in JAVA
3. Write a program to show Type Casting in JAVA
4. Write a program to show How Exception Handling is in JAVA
5. Write Programs to show Inheritance and Polimorphism.
6. Write a program to show Interfacing between two classes
7. Write a program to Add a Class to a Package
8. Write a program to demonstrate AWT.
9. Write a Program to show Data Base Connectivity Using JAVA
10. Write a Program to show "HELLO JAVA " in Explorer using Applet
11. Write a Program to show Connectivity using JDBC
12. Write a program to demonstrate multithreading using Java.
13. Write a program to demonstrate applet life cycle.