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:

- I ntroduction 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.

References:

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

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Agriculture Engineering, III-Semester

AN302 Principles of Soil Science

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.

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 Engineering, III-Semester

AN303 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-Constantan 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 Outcomes: By the end of the semester, the students will understand the different mechanisms of heat transfer and refrigeration systems.

References:

1. Dhanpat Arora, S.C and Domkundwar, S. (1984). A Course in Heat & Mass Transfer (3 ed.). 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
5. India, New Delhi.
6. Holman,J.P. (1989). Heat Transfer S.I. Metric Edition. McGraw Hill Book Company Ltd., New Delhi.
7. Khurmi R. S. and Guptha J. K. (2004). A text book of Refrigeration & Air conditioning. Eurasia Publishing house (P) Ltd. New Delhi.
8. Treybal, R.E. (1981). Mass transfer Operation. McGraw Hill Book.

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New Scheme Based On AICTE Flexible Curricula

Agriculture Engineering, III-Semester

AN304 Watershed Hydrology

Course objectives: To familiarize the students with the important aspects of watershed hydrology and to impart the knowledge about the various hydrologic phenomena and their relevance in the field of soil and water conservation.

Unit I

Hydrologic cycle, precipitation and its forms, rainfall measurement and estimation of mean rainfall, frequency analysis of point rainfall. Mass curve, hyetograph, depth-area-duration curves and intensity-duration-frequency relationship. Hydrologic processes-interception, infiltration - factors influencing, measurement and indices.

Unit II

Evaporation - estimation and measurement. Runoff - factors affecting, measurement, stage - discharge rating curve, estimation of peak runoff rate and volume, Rational method, Cook's method and SCS curve number method. Geomorphology of watersheds – Linear, aerial and relief aspects of watersheds- stream order, drainage density and stream frequency. Hydrograph - components, base flow separation, unit hydrograph theory, S-curve, synthetic hydrograph, applications and limitations.

Unit III

Floods – terms and definitions head water flood control- method. Stream gauging - discharge rating curves, flood peak, design flood and computation of probable flood.

Unit IV

Flood routing – channel and reservoir routing. Drought – classification causes and impacts, drought management strategy.

Practicals:

1. Visit to meteorological observatory and study of different instruments
2. Design of rain gauge network
3. Exercise on intensity - frequency - duration curves
4. Exercise on depth - area - duration and double mass curves
5. Analysis of rainfall data and estimation of mean rainfall by different methods
6. Exercise on frequency analysis of hydrologic data and estimation of missing data, test for consistency of rainfall records.
7. Exercise on computation of infiltration indices
8. Computation of peak runoff and runoff volume by Cook's method and rational formula
9. Computation of runoff volume by SCS curve number method
10. Study of stream gauging instruments - current meter and stage level recorder
11. Exercise on geomorphic parameters of watersheds
12. Exercise on runoff hydrograph
13. Exercise on synthetic hydrograph
14. Exercise on flood routing

Course Outcomes: Students understand important aspects of watershed hydrology and the relevance of different hydrologic phenomena in the field of soil engineering.

References:

1. Chow, V.T., D.R. Maidment and L.W. Mays. 2010. Applied Hydrology, McGraw Hill Publishing Co., New York.
2. Jaya Rami Reddy, P. 2011.A Text Book of Hydrology. University Science Press, New Delhi. Linsley, R.K., M.A. Kohler, and J.L.H. Paulhus. 1984. Hydrology for Engineers. McGraw-Hill Publishing Co., Japan.
3. Mutreja, K.N. 1990. Applied Hydrology. Tata McGraw-Hill Publishing Co., New Delhi. Raghunath, H.M. 2006. Hydrology: Principles Analysis and Design. Revised 2nd Edition, New Age International (P) Limited Publishers, New Delhi.
4. Subramanya, K. 2008. Engineering Hydrology.3rd Edition, Tata McGraw-Hill Publishing Co., New Delhi.
5. Suresh, R. 2005. Watershed Hydrology. Standard Publishers Distributors, Delhi. Varshney, R.S. 1986. Engineering Hydrology. Nem Chand and Brothers, Roorkee, U.P.

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Agriculture Engineering, III-Semester

AN305 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

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 Engineering, III-Semester

AN306 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 Polymorphism.
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.