

# Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal

## Branch- Common to All Discipline

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| ES301 | 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

**MM 302 MINING ENVIRONMENT – I**

Introduction Ventilation requirements in mines, natural ventilation and mechanical ventilation. Mine Gases Composition of atmospheric air. Mine gases - occurrences, properties, physiological effects, detection; sampling, analysis, monitoring. Methane layering, methane drainage. Radon and its daughter products - effects and control. Heat and Humidity Sources, effects and control of heat and humidity in mines. Cooling power of mine air – psychrometry, Kata thermometer, effective temperature. Air conditioning. Spot coolers. Airflow in Mine Workings Reynold's number, laminar and turbulent flow. Square law of mine ventilation. Frictional and shock losses. Equivalent orifice. Resistance in series and parallel. Ventilation control devices. Splitting of air current. Ventilation network analysis – conventional method and scope for computer application. Airborne Respirable Dust Definition – generation, physiological effects, sampling, measurement and control measures. Mine Illumination Flame safety lamp – construction, maintenance, gas testing. Cap lamps. Lamp room layout and organization. Underground lighting from mains. Illumination standards. Photometry. Illumination survey. Miners' Diseases

**EVALUATION**

Evaluation will be continuous an integral part of the class as well through external assessment.

**References :**

1. Mishra, G.B. Mine Environment and Ventilation, Oxford University Press, 1992.
2. Hartman, H.L. Mine Ventilation and Air Conditioning, Wiley Interscience publication, 1993.
3. Hall, C.J., Mine Ventilation Engineering, Society of Mining Engineers, New Engineers, New York, Second Edition, 1992.
4. Vutukuri, V.S., Mine Environment Engineering, Trans Tech Publishers, 1986.
5. McPherson, M.J., Subsurface Ventilation and Environmental Engineering, Chapman and Hall Publication, London, 1993.

**New Scheme Based On AICTE Flexible Curricula**

**Mining and Mineral Processing, III-Semester**

**MM303 MINING SURVEYING – I**

Distance Measurement Chains, tapes, electronic distance measurement, total station. Levelling Levels, reduced level, corrections for curvature and refraction, reciprocal levelling, contouring, tachymetry. Traversing Triangulation and Trilateration Theodolites, control point framework, baseline, satellite station, extension and double extension of base. Trilateration. Plane Table Surveying Methods, two and three point problems, errors. Curve Ranging Minor Instruments Planimeter, sextant, abney level, optical square. Computations Area and volume calculations. Theory of Errors Definitions, indices of precision and weights, correction and adjustment of measurements.

**EVALUATION**

Evaluation will be continuous an integral part of the class as well through external assessment.

**References :**

1. Bannister, A. and Raymond. S., Surveying, ELBS, 6th Edition 1992.
2. Kennetkar, T.P. Surveying and Levelling, Vols. 1 and 2, United Book Corporation, Pune, 2010.
3. Punmia, B.C. Surveying, Vols. 1, 2 and 3, Laxmi Publications, 2010.

**MM304 ROCK MECHANICS**

Status of Rock Mechanics Role and status of rock mechanics in mining and civil engineering. Stress and Strains Stresses in two and three dimensions. Stress tensors. Principal stresses. Stress invariants. Displacements and strains. Mohr's circle. Stress-strain relationships. Effect of temperature and pressure on stress and strain relationships. Equilibrium and compatibility equations. Rockmass Classification Systems Q-system, RMR, Modified RMR and their applications. Physico-Mechanical Properties of Rocks Specific gravity, hardness, porosity, moisture content, permeability, thermal conductivity. Compressive, tensile and shear strengths. Modulus of elasticity. Poisson's ratio and triaxial strength. Swell index, slake durability, point load index, Protodyakonov index. Determination of in-situ strength. Determination of In-situ Stresses Methods of measurement – hydrofracturing and stress-relief. Rheological Models and Time Dependent Properties of Rocks Theories of Rock Failure Griffith, Mohr-Coulomb, Hoek and Brown. Types of rock fractures. Post-failure Behaviour.

**EVALUATION**

Evaluation will be continuous an integral part of the class as well through external assessment.

**References :**

1. Obert, L. and Duvall, W.I., Rock Mechanics and Design of Structure in Rock John Wiley and Sons Inc., New York, 1967.
2. Vutukuri, V.S., and Lama, R.D., Handbook on Mechanical Properties of Rocks, Vol. I, II, III and IV, Transtech Publication, Berlin, 1974/78.
3. Peng, S.S., Ground Control, Wiley Interscience, New York, 1987.
- 4 Brady, B.H.G. and Brown, S.T., Rock Mechanics, Wiley Interscience, 1985.
- 5 Hoek, E., and Brown, S.T., Underground Excavations in Rocks, Institute of Mining Metallurgy, London, 1980.

**MM305 GEOLOGY – I**

Importance of Geology in Mining Mineralogy Minerals – definition, formation and occurrences. Identification – physical, chemical and optical. Classification of minerals. Crystallography Scope, crystal systems. Polymorphism and isomorphism. Economic Geology Ores and gangue – genesis, classification, distribution in India and geological occurrences. Uses of important metallic and non-metallic minerals. Atomic mineral resources of India – genesis and occurrence. Structural Geology Stratified rocks and their structures. Attitude of strata. Outcrop and incrop. Folds – genesis, classification, identification in field, impact on landscape, mineral deposits, mining and tunnelling. Faults – mechanism of faulting, classification, impact of faulting on topography, significance of faults in mining engineering and tunnelling. Joints – definition and characteristics, classification, occurrence of joints in igneous, sedimentary and metamorphic rocks. Engineering considerations and treatments. Prospecting and Exploration Geological guides for prospecting of mineral deposits. Introduction to different methods of prospecting for mineral deposits – geological, geophysical, geochemical, geobotanical, aerial photography and remote sensing. Exploratory drilling methods. Trenching and pitting. Sampling grids. Drill hole logging. Deviation of drill holes and drill hole surveying. Directional drilling. Reserve Estimation Selection of methods, merits and demerits, applicability.

**EVALUATION**

Evaluation will be continuous an integral part of the class as well through external assessment.

**References :**

- Parbin Singh. Geology for Engineers, IBH Publications, N. Delhi. 1991.
2. Arthur Holemess, Principles of Physical Geology, Thomas Nelson and Sons, USA, 1964.
3. Ford, W.E. Dana's Textbook of Minerology (4th edition), Wiley Eastern Ltd., N. Delhi, 1989
- . 4. Winter, J.D. An Introduction to Igneous and Metamorphic Petrology, Prentice Hall, N. Delhi, 2001.
5. Billings, M.P. Structural Geology, Prentice Hall Inc., N. Jersey, USA, 1972
- . 6. Krishnan M.S. Geology of India and Burma, 3rd Edition, IBH Publishers, N. Delhi, 1984.

**New Scheme Based On AICTE Flexible Curricula**

**Mining and Mineral Processing, III-Semester**

**MM306 Computer Programming (JAVA)**

Basic Java Features - C++ Vs JAVA, JAVA virtual machine, Constant & Variables, Data Types, 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.