Shri Vaishnav Vidyapeeth Vishwavidyalaya

Master of Science (Environmental Science)

SEMESTER III

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MSCENV301	**PG**	Analytical Methods in Environmental Science	3	1	0	4	60	20	20	00	00

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:-

To give basic knowledge of concept of Physical Method of analysis.

To develop the understanding of Separation techniques in Environmental Science.

Course Outcomes:-

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes. The student will demonstrate capability of
CO1. Theoretical understanding of concept of analytical methods of environmental science.
CO2. Became aware of the Separation techniques.

Unit I : Statistical Analysis I

Introduction to analytical chemistry: Types of analysis-qualitative and quantitative. classification of analytical methods-classical and instrumental, basis of their classification with examples. Statistical analysis and validation: Errors in chemical analysis. Classification of errors-systematic and random, additive and proportional, absolute and relative. Accuracy and precision. Mean, median, average deviation and standard deviation.

Unit II : Statistical Analysis II

Correlation coefficient and regression analysis. Comparison of methods: F-test, T-test and Chi square test. Least square method and curve fitting. Applications of Computer in Environmental Science. Introduction to web browsing software and search engines with special reference to online environmental resources.

Unit III: Electrochemical Analysis

Electrochemistry: Electrochemical cells, Nernst equation and applications of Debye-Huckel-theory, Electrolytic conductivity and the Debye-Hückel-Onsangar treatment.
Electro Chemical Techniques: Introduction, Types of Electro Chemical Technique, Principle, Instrumentation and Application of Polarography in Environmental Chemical Analysis, Aniodic Stripping, Voltametry with its Application in Environmental Measurements

Unit IV: Classical Methods of Analysis

Volumetric analysis: General principle. Criteria for reactions used in titrations. Primary standards and secondary standards. Theory of indicators. Types of titrations with examples-Acid-base, precipitation, redox and complexometric. Titration curves for monoprotic and polyprotic acids and bases. Indicators used in various types of titrations. Masking and demasking agents.

Gravimetric analysis: General principles and conditions of precipitation. Concepts of solubility, solubility product and precipitation equilibria. Steps involved in gravimetric analysis. Purity of precipitate: Co-precipitation and post-precipitation. Fractional precipitation. Precipitation from homogeneous solution. Particle size, crystal growth, colloidal state, aging and peptization phenomena. Ignition of precipitates.

Unit V: Optical Methods of Analysis

Spectrophotometry and Colorimetry: Principle of colorimetry. Beer's law, its verification and deviations. Instrumentation in colorimetry and spectrophotometry (single and double beam). Sensitivity and analytical significance of molar extinction coefficient and λmax. Comparison method, calibration curve method and standard addition method for quantitative estimation. Role of organic ligands in spectrophotometric analysis of metal ions.

List of books:

1.Quantitative analysis: Day and Underwood (Prentice-Hall of India)
2.Vogel's Text Book of Quantitative norganic Analysis-Bassett, Denney, Jeffery and Mendham (ELBS)
3.Analytical Chemistry: Gary D. Christian (Wiley,India).
4.Instrumental Methods of Analysis: Willard, Merrit, Dean, Settle (CBS Publishers, Delhi, 1986)
5.Instrumental Methods of Chemical Analysis: Braun (Tata McGraw-Hill)
6.Advanced Analytical Chemistry: Meites and Thomas (McGraw-Hill)
7.Instrumental Methods of Analysis: G. Chatwal and S. Anand (Himalaya Publishing House)
8.Analytical Chemistry: Problems and Solution-S. M. Khopkar (New Age International Publication)
9.Basic Concepts in Analytical Chemistry: S. M. Khopkar (New Age International Publication)
10.Advance Analytical Chemistry: Meites and Thomas: (Mc Graw Hill)

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							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MSCENV302	**PG**	**Fundamentals of Environmental Chemistry**	4	1	2	6	60	20	20	30	20

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
*__Teacher Assessment__ shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

1. To provide student with an understanding of the fundamental chemical processes that are central to important environmental problems.
2. To encourage student to utilize this knowledge in making critical evaluations of these problems.

Course Outcomes:

1. Students learn the basic principles of environmental chemistry.
2. They will be able to apply previous knowledge on analytical chemistry to environmental processes and samples.
3. They will understand the interconnections between different sectors of the environment (soil, water, atmosphere) and the effect of human activities on the natural chemical processes.

Syllabus:

UNIT I

Concept and Scope of Environmental Chemistry: Definition and explanation for various terms, segments of environment. Principles and cyclic pathways in the environments.

Chemistry of Biologically Important Molecules: Chemistry of Water: Unusual physical properties, hydrogen bonding in biological systems, unusual solvent properties, changes in water properties by addition of solute. Protein structure and biological functions, enzymes, enzyme metabolism.

UNIT II

Chemistry of Various Organic and Inorganic Compounds. Carcinogenic compounds and their effects.

Hydrocarbons: Chemistry of hydrocarbon decay, environmental effects, effects on macro and microorganisms.

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SEMESTER III

UNIT III

Surfactants: Cationic, anionic and nonionic detergents, modified detergents.

Pesticides: Classification, degradation, analysis, pollution due to pesticides and DDT problems.

Synthetic Polymers: Microbial decomposition, polymer decay, ecological and consideration, Photosensitize additives.

UNIT IV

Lead and its compounds: Physical and chemical properties, behavior, human exposure, absorption, influence.

Destruction of some hazardous substances: Acid halides and anhydrides, alkali metals, cyanides and cyanogens bromides, chromium, aflotoxins, halogenated compounds.

UNIT V

Principle, merits and demerits of the techniques – Neutron Activation Analysis, isotope dilution analysis, calorimetric, colourimetry, Atomic Absorption Spectroscopy, Gas chromatography, HPLC, Ion exchange Chromatography and Polarography. XRF, XRD.

Text Books/ Reference Books

1. Environmental Chemistry : B.K. Sharma, and H. Kaur.
2. Elements of Environmental Chemistry : H.V. Jadhav.
3. Environmental Chemistry : S. K. Banerjee.
4. Environmental Chemistry : J. W. Moore and E. A. Moore.
5. Destruction of hazards chemicals in the laboratory : G. Lunn and E.B. Sansone.
6. A text book of Environmental Chemistry and Pollution Control : S.S. Dara.
7. Instrumental Methods of Analysis : G. W. Ewing.
8. Instrumental Methods of Analysis : Chatwal and Anand.
9. Environmental Pollution Analysis : Khopkar.
10. Environment Chemistry : A. K. de.

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							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MSCENV303	**PG**	**Environmental Geosciences**	4	1	2	6	60	20	20	30	20

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

1. To understand geological hazards and environmental land use planning and management.
2. To study the prevention, analysis and correction of interactions between human activities and natural systems, in terms of natural and cultural resources, environmental impacts (including impacts on geological heritage), geological hazards and environmental land use planning and management.

Course Outcomes:

1. The students will acquire broad knowledge about man-made perturbations to physical-chemical processes at the Earth surface related to the utilisation of geo-resources.
2. Students learn the methodology to assess some of the impacts of human changes to environmental processes.

Syllabus:

UNIT I

Atmosphere: Earth's Atmosphere: Evolution, structure and chemical composition of atmosphere.

Solar radiation and terrestrial radiation electromagnetic spectrum latitudinal and seasonal variations, effect of atmosphere, green house effect heat budget.

UNIT II

Temperature measurements and controls, Environmental lapse rate, dry and wet adiabatic lapse rate, inversion of temperature and atmospheric stability.

Atmospheric pressure and winds: Pressure measurements and distribution; Wind observation, measurement, factors affecting wind; geostrophic wind and gradient wind, local winds, model of general circulation of the atmosphere, Jet stream.

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SEMESTER III

UNIT III

Atmospheric moisture: Forms of condensation; Precipitation, Hydrological cycle.

Atmospheric disturbances: Thunderstorms, Cyclones, lightening, flood, and drought.

UNIT IV

Earth science: Internal structure of Earth, Geological evolution, Rocks and their classification, minerals and their classification. Weathering and soil formation, soil profile, soil classification, soils of India.

Water Resources and Environment: Global Water Balance. Ice sheets and fluctuations of sea levels. Origin and composition of seawater. Hydrological cycle. Factors influencing the surface water. Types of water. Resources. Human use of surface ground waters.

UNIT V

Environmental Geochemistry: Concepts of major, trace and REE. Classification of trace elements, mobility of trace elements, Geochemical cycles. Biochemical factors in environmental health. Human use, trace elements and health. Possible effects of imbalance of some trace elements. Diseases induced by human use of land.

Geological Hazards and its mitigation measures: Earthquake and Tsunamis, Volcanoes, Landslides

References:

1. Valdiya, K.S. 1987, Environmental Geology.

2. Keller, E.A. Environmental Geology & Turk and Turk. UoP, revised M.Sc. (Env.Sci.) Syllabus - 2008

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SEMESTER III

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							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MSCENV304	**PG**	**Solid Waste Management**	4	1	2	6	60	20	20	30	20

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Objectives

1. To ensure the protection of the environment through effective waste management measures.
2. Ensure the design and manufacture of products that avoid or minimize waste generation.
3. Increase reuse and recycling rates of products.

Outcomes

By the end of the course, the student will have demonstrated ability to:

1. Develop national and local awareness on the social importance of waste management
2. Promote waste minimization and recycling.

Syllabus:

UNIT I

SOURCES AND TYPES

Sources and types of municipal solid wastes-waste generation rates-factors affecting generation, characteristics-methods of sampling and characterization; Effects of improper disposal of solid wastes-Public health and environmental effects. Elements of solid waste management –Social and Financial aspects – Municipal solid waste (M&H) rules – integrated management-Public awareness; Role of NGO"s.

UNIT II

ON-SITE STORAGE AND PROCESSING

On-site storage methods – Effect of storage, materials used for containers – segregation of solid wastes – Public health and economic aspects of open storage – waste segregation and storage – case studies under Indian conditions – source reduction of waste – Reduction, Reuse and Recycling.

UNIT III

COLLECTION AND TRANSFER

Methods of Residential and commercial waste collection – Collection vehicles – Manpower– Collection routes – Analysis of collection systems; Transfer stations – Selection of location, operation & maintenance; options under Indian conditions – Field problems- solving.

UNIT IV

OFF-SITE PROCESSING

Objectives of waste processing – Physical Processing techniques and Equipments; Resource recovery from solid waste composting and biomethanation; Thermal processing options – case studies under Indian conditions.

UNIT V

DISPOSAL

Land disposal of solid waste; Sanitary landfills – site selection, design and operation of sanitary landfills – Landfill liners – Management of leachate and landfill gas- Landfill bioreactor– Dumpsite Rehabilitation.

Text Books/References

1. Tchobanoglous, G., Theisen, H. M., and Eliassen, R. “Solid. Wastes: Engineering Principles and Management Issues”. McGraw Hill, New York, 1993.

2. Vesilind, P.A. and Rimer, A.E., “Unit Operations in Resource Recovery Engineering”, Prentice Hall, Inc., 1981.

3. Paul T Willams, “Waste Treatment and Disposal”, John Wiley and Sons, 2000.

4. Government of India, “Manual on Municipal Solid Waste Management”, CPHEEO, Ministry of Urban Development, New Delhi, 2000.

5. Bhide A.D. and Sundaresan, B.B. “Solid Waste Management Collection”, Processing and Disposal, 2001.

6. Manser A.G.R. and Keeling A.A.,” Practical Handbook of Processing and Recycling of Municipal solid Wastes”, Lewis Publishers, CRC Press, 1996.

7. George Tchobanoglous and Frank Kreith”Handbook of Solidwaste Management”, McGraw Hill, New York, 2002.

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SEMESTER III

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MSCENV305	**PG**	**Forestry and Water Resources**	4	1	2	6	60	20	20	30	20

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Objectives

1. To express the need of water conservation.

2. To understand the importance of forests and its resources.

3. To make aware of the Principles of forest management and their applications.

4. To understand the Physical, Chemical and Biological Characteristics of Water and determination of important physical and chemical parameters of water quality.

Outcomes

By the end of the course, the student will have demonstrated ability to:

1. Understand the importance of forests and its resources.

2. Express the need of water conservation.

Syllabus:

UNIT I

Forest Management

Introduction: definition and scope. Principles of forest management and their applications. Objects of management, purpose and policy. General definitions – management and administrative units, felling cycle, cutting section. Rotations: definition, kinds of rotations, choice of rotations, length of rotations and conversion period. Normal forest: definition and concept. Even aged and unevenaged models.

UNIT II

Introduction to Agroforestry

Agroforestry - definition, aims, objectives, need and scope. Classification of agroforestry system - structural, functional, socio-economic and ecological basis. Traditional agroforestry systems: Taungya system,Shifting cultivation, wind break, shelterbelts, Homestead gardens'. Multipurpose tree species and their characteristics. Tree architecture. Agroforestry for coastal and hilly areas.

UNIT III

Water Resources:

Hydrology, the hydrological cycle and its components, drainage systems, classification of water resources, characteristics of water resources. Surface run-off, stream flow estimation, problems of water and ground water resource depletion, watershed types and Functions .

Water Quality Characteristics: Physical, Chemical and Biological Characteristics of Water. Standard methods of determination of important physical and chemical parameters of water quality, eg. PH, turbidity, electrical conductivity, total Solids, alkalinity, hardness etc., Units of measurements and expression of results, Bacteriological Indicators, and determination of Coliforms.

UNIT IV

Types of Hydropower Plants:

Classification of hydropower plants, Run-of-river plants, Valley dam plants, High head diversion plants, Diversion Canal plants, Pumped storage plants, Tidal power plants.

Dams:

Selection of site, preliminary investigations, Final investigations, Types of dams:- Rigid dams, Gravity dams, Arch and buttress dams, Basic principles of design and details of construction.

UNIT V

Natural Hazards:

Flood types and causes, drainage basins, nature and frequency of floods, effects. Flood hydrographs., types and causes of landslides, coastal hazards including cyclones, tsunamis, the effects of tides and tidal effect prediction, nature of destruction, causes and consequences of forest fires.

Text Books/References

1. Ram Prakash. Forest management, 2006, IBD Publication, Dehradun
2. Osmaston, F.C. Management of Forests, 1984. IBD Publication, Dehradun B.ScSc.Forestry Syllabus, School of Forestry and Environment SHIATS-DU, Allahabad 44
3. Speight, M.S. and D. Wainhouse 1989. Ecology and Management of Forest Insects. Clarendon Press, Oxford.
4. Brown, A. 1990. Forest Fire and its Control. Natraj Publishers, Dehra Dun.
5. Gupta, V.K. and N.K. Sharma. 1988. Tree Protection. Indian Society of Tree Scientists, Solan.
6. Herrick, G.W. 1988. Insect Enemies of Trees. Pioneer Publishers, Jaipur.
7. Khanna, L.S. 1984. Forest Protection, Khanna Bandhu, Dehra Dun.
8. Kumar, V. 1995. Nursery and Plantation practices in Forestry. Scientific Publishers Jodhpur.
9. Metcalf And Edduy, Inc.; Waste Water Engineering, Treatment, Disposal, Reuse, Tata McGraw Hill.
10. Masters G.M.; Introduction to Environmental Engineering and Science, Pretice hall of India, 1994.
11. Garg, S.K.” Water Supply Engineering”, Vol.1, Khanna Publishers,New Delhi,2003.