

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Scheme of Teaching & Examination

Master of Engineering in Environmental Science and Engineering (Part Time)

3. Third Semester:

S.No.	Code	Board of Studies	Subject	Periods per week			Scheme of Exam			Total	Credits L+ (T+P)/2
				L	T	P	Theory / Practical				
							ESE	TA	CT		
1	653311(53)	Environmental Science & Engg.	Environmental Policies and Legislations	4	2	-	100	20	20	140	5
2	653312 (53)	Environmental Science & Engg.	Science & Engineering of Water Pollution Control	4	2	-	100	20	20	140	5
3	Refer Table –I		Elective – I	4	2	-	100	20	20	140	5
4	653321 (53)	Environmental Science & Engg.	Science & Engineering of Water Pollution Control Lab	-	-	6	100	80	-	180	3
Total				12	6	6	400	140	60	600	18

L = Lecture, T = Tutorial, P = Practical or Term Work

Each period of 50 minutes, with 4 periods per day (6 to 9.20 PM) for six days in a week

Table - I			
Elective - I			
S.No.	Code	Board of Studies	Subject
1	653331 (53)	Environmental Science & Engg	Applied Statistics for Environmental Engineers
2	653332 (53)	Environmental Science & Engg	Energy and Environment
3	653333 (53)	Environmental Science & Engg	Groundwater Contamination and Pollution Transport
4	653334 (53)	Environmental Science & Engg	Environmental Auditing & EMS

Note (1) 1/4th of total strength of students subject to minimum of twenty students is required to offer an elective in the college in a particular academic session

Note (2) Choice of an elective course once made for an examination cannot be changed in future examinations.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C. G.)

Semester: M.E. III Sem.

Subject: Environmental Policies and Legislations

Total Theory Periods: 50

Specialization: Environmental Science & Engg.

Total Marks in End Semester Exam: 100

Code: 653311 (53)

Minimum number of class tests to be conducted: 02 **Total Tutorial Periods:** 28

- Unit-1** **Introduction:** Role of national, international, and UN agencies in dealing with the environmental aspects. Standards and setting criteria.
- Unit-II** **Historical aspects:** major legislations: USEPA 1969 to Clean Water and Air Act. Significant legislations in developing and developed countries.
- Unit-III** **Legislations in Indian context:** Indian Forest Act 1950, 1980, and amendments. Acts related to air and water pollution.
- Unit-IV** **Norms & Standards :** OHSAS 18001 and its significance. ISO 14000 and its significance, other acts in ESE and case studies. Feasibility Studies and Management issues.
- Unit-V** **Related Issues :** Principles of sustainable development and implications of finite biosphere and complexities for engineering design and decision-making. Design of controlled environments to enhance health and protection of natural resources for sustainable development. Resource problems and design with ecological, economic, demographic and social dimensions. Techniques to integrate knowledge and define policy.

TEXT

1. Meyers A. Robert (Eds.) Encyclopedia of Environmental Analysis and Remediation Vol. 1-8, John Wiley & Sons, 1998.
2. Handbook of Accident prevention, ILO Publication, 1998.
3. Encyclopaedia of Industrial Safety and Health, 1999.

REFERENCE

1. G.M.Masters, Introduction to Environmental Engineering & Science, Prentice Hall, New Delhi, 1997
2. J.G. Henry and G. W. Heike, Environmental Science & Engineering", Prentice Hall International Inc., New Jersey, 1996.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C. G.)

Semester: **M.E. III Sem.**

Subject: **Science & Engineering of Water
Pollution Control**

Total Theory Periods: **50**

Specialization : **Environmental Science & Engg.**

Total Marks in End Semester Exam: **100**

Code: **653312 (53)**

Minimum number of class tests to be conducted: **02**

Total Tutorial Periods: **28**

- Unit – I Aquatic Pollutant** : Chemistry of aquatic pollution with special emphasis on the Arsenic, fluoride and nitrate pollution. Source loading rates. River flow and reservoir analysis. Availability of groundwater resources. Diffusion, dispersion and pollutant transport mechanisms.
- Unit-II Water Quality Monitoring** : Mineral analysis, Demand analysis, and Nutrient analysis, metal analysis, organic analysis.
- Unit-III Microbiological Examination** : Rapid detection method. Hetrotopic plate count. Multiple tube fermentation technique, Membrane filters technique.
- Unit-IV Microbiological Examination** : Biological treatment of water pollution, Equalization: Volume requirement and effect of BOD mass loading rate, Coagulation does and aggregation Kinetics, Sedimentation: setting analysis, filtration: Head Loss, Chlorination, water and wastewater adsorption.
- Unit-V Related Chemistry** : Equilibrium and Kinetics, Aeration, Ion exchange Activated sludge: Rate of Substrate utilization rate, sludge growth rate, oxygen uptake rate and kinetics.

TEXT

1. G.M.Masters, Introduction to Environmental Engineering & Science, Prentice Hall, New Delhi, 1997
2. J.G. Henry and G. W. Heike, Environmental Science & Engineering", Prentice Hall International Inc., New Jersey, 1996.
3. W.J. Weber, Physicochemical processes for water quality control, John Wiley and sons, 1972.

REFERENCE

1. G. Tchobanoglous and F.G Bustin, Wastewater engineering treatment disposal and reuse, McGraw Hill INC, 1991.
2. Meyers A. Robert (Eds.) Encyclopedia of Environmental Analysis and Remediation Vol. 1-8, John Wiley & Sons, 1998.
3. Standards methods for the Examination of Water and Wastewater, APHA / AWWA / WPCF Publishing, 19th Ed. 1995.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C. G.)

Semester: **M.E. III Sem.**

Subject: **Applied Statistics for Environmental Engineers**

Total Theory Periods: **50**

Specialization : **Environmental Science & Engg.**

Total Marks in End Semester Exam: **100**

Code: **653331 (53)**

Minimum number of class tests to be conducted: **02**

Total Tutorial Periods: **28**

Unit – I

EMPIRICAL STATISTICS: Measures of Central tendency, dispersion, skewness and kurtosis - Principle of least squares - Correlation and regression - rank correlation.

Unit – II

SAMPLING DISTRIBUTIONS AND ESTIMATION: Sampling distributions - Point and interval estimates for population proportions, mean and variance - Maximum likelihood estimate method - Method of moments.

Unit – III

TESTING OF HYPOTHESIS: Sampling distributions - Tests based on Normal, t, Chi-square and F distributions - Analysis of variance – oneway and two-way classifications.

UNIT – IV

DESIGN OF EXPERIMENTS: Completely randomized design - Randomized block design - Latin square design - 2 power 2 factorial design.

UNIT – V

LINEAR PROGRAMMING: Basic concepts - Graphical and Simplex methods - Transportation problem - Assignment Problem.

Text Books:

1. Berthouex, P.U., " Statistics for Environmental Engineers ", Lewis Publ., 1994.
2. Freund, J.E. and Miller, I.R., " Probability and Statistics for Engineers ", Prentice – Hall of India, 5th Edition, New Delhi, 1994.

Reference Books:

1. Gupta, S.C. and Kapur, V.K., " Fundamentals of Mathematical Statistics ", Sultan Chand & Sons, New Delhi, 1999.
2. Ang, A.H.S. and Tang W.H., " Probability concepts in Engineering Planning and Design - Basic Principles Vol.1 ", John Wiley and Sons, Inc. New Delhi, 1975.
3. Taha, H.A., " Operations Research : An Introduction ", Prentice - Hall of India, 6th Edition, New Delhi, 1997.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C. G.)

Semester: M.E. III Sem.
Total Theory Periods:50

Subject: Energy and Environment
Specialization : Environmental Science & Engg.

Total Marks in End Semester Exam: 100
Minimum number of class tests to be conducted: 02

Code: 653332 (53)
Total Tutorial Periods: 28

- Unit – I** **Energy Conversions** :Principles of energy conversion methods: Thermal nuclear, hydro solar Energy
- Unit – II** **Fuels** : Introduction to fuels, combustion fundamentals, thermodynamics of combustion rates and properties of combustion products.
- Unit – III** **Pollutants in the Energy Sector** : Formation of pollutants, measurement and controls; Physical phenomena governing the transport of contaminants in different environments: advection, dispersion, diffusion, sorption, ion exchange, precipitation, dissolution, volatilisation, equilibrium partitioning of contaminants amongst air, water, soil, sediments and biota.
- Unit- IV** **Automobile Pollutants** : Fundamental of engine processes, sources of emissions from automobiles, effects of operating and design parameters on emissions; Exhaust emissions test, procedures standards and legislation;
- Unit – V** **Related Issues** : Combustion in stationary sources, power production, cogeneration. Alternative energy sources utilization, economics, environmental impacts and management.

TEXT

1. G.M.Masters, Introduction to Environmental Engineering & Science, Prentice Hall, New Delhi, 1997
2. J.G. Henry and G. W. Heike, Environmental Science & Engineering”, Prentice Hall International Inc., New Jersey, 1996.

REFERENCE

1. W.J. Weber, Physiochemical Processes for Water Quality Control, John Wiley & Sons. 1972.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C. G.)

Semester: M.E. III Sem.

Subject: Groundwater Contamination and
Pollution Transport

Total Theory Periods: 50

Specialization : Environmental Science & Engg.

Total Marks in End Semester Exam: 100

Code: 653333 (53)

Minimum number of class tests to be conducted: 02 **Total Tutorial Periods:** 28

Unit – I

Introduction: Ground water and the hydrologic cycles-Ground water as a resource-Ground water contamination-Ground water as a Geotechnical problem-Ground water and geologic processes. Physical properties and principles-Darcy's Law-Hydraulic Head and Fluid Potential-piezometers and Nests. Hydraulic conductivity and permeability-Homogeneity and Anisotropy-porosity and voids Ratio-Unsaturated flow and the water table-Steady state flow and Transient Flow-compressibility and effective stress-Transmissivity and storativity-Equations of Ground water flow-Limitations of Darcian Approach-hydro dynamic dispersion.

Unit – II

Hydrologic Cycle And Flownet: Flow nets-Graphical construction-Flow nets by numerical simulation, steady state Regional Ground water Flow-Steady state hydrologic-budgets-Fluctuations in ground water levels.

Unit – III

Resource Evaluation: Development of Ground water Resources-Exploration for Aquifers-the response of Ideal aquifers to pumping-Measurement of parameters -Laboratory tests-Piezometer test-pumping tests-Estimation of saturated hydraulic conductivity-Numerical simulation for aquifer yield prediction-Artificial recharge and induced infiltration-Land subsidence-sea water intrusion

UNIT – IV

Chemical Properties And Principles: Constituents-chemical equilibrium- Association and Dissociation of dissolved species-effects of concentration gradients-Mineral dissolution and solubility-Oxidation and Reduction Process-Ion exchange and Adsorption- Environmental isotopes-Field Measurement of Index parameters. Chemical Evolution: Hydro Chemical Facies-Ground water in carbonate terrain-Ground water in crystalline rocks-Ground Water in complex sedimentary systems-Geochemical interpretation of ¹⁴C Dates-process rates and molecular diffusion.

Unit – V

Solute Transport : Water Quality Standards-Transport Process-Nonreactive Constituents In Homogeneous Media And Heterogenous Media-Transport In Fracture Media-Hydrochemical Behaviour Of Contaminants-Trace Metals-Nitrogen-Trace Nonmetals Organic Substances-Measurement Of Parameters-Velocity-Dispersivity-Chemical Partitioning-Sources Of Contamination-Land Disposal Of Solid Wastes-Sewage Disposal On Land.

Text Books:

1. Randall J. Charbeneau, " Ground Water Hydraulics and Pollutant Transport ", 2000.
2. Allen Freeze, R. and John A. Cherry, "Ground Water ". Prentice Hall.Inc.1979.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C. G.)

Semester: M.E. III Sem.

Total Theory Periods: 50

Total Marks in End Semester Exam: 100

Minimum number of class tests to be conducted: 02

Subject: Environmental Auditing & EMS

Specialization : Environmental Science & Engg.

Code: 653334 (53)

Total Tutorial Periods: 28

Unit – I

Concepts of Environmental Audit, Objectives of audit. Types of audits, Features of effective auditing, Programme Planning, Organisation of auditing programme, Pre-visit data collection, Audit protocol, Onsite audit, Data Sampling: Inspections, Evaluation and presentation, Exit interview.

Unit – II

Audit Report – Action Plan – Management of audits. Waste management contractor audits, Life cycle approach.

UNIT – III

Introduction, Principles and Elements of Successful environmental management. ISO Principles, EMS, Creating an environmental management system in line with ISO 14000. Benefits of an environmental management system.

Unit – IV

Principles and elements of successful environmental management: Leadership, Environmental management planning, Implementing an environmental management system, Measurement and evaluations required for an environmental management system, Environmental management reviews and improvements.

Unit – V

Legal and regulatory concerns. Integrating ISO 9000 and ISO 14000.

Text Books:

1. Maheswar Dayal, "Renewable Energy Environment & Development", Konark Pub. Pvt. Ltd., 1998.
2. Girdhar Gyani and Amit Lunia, "Planning & Implementation of ISO 14001, Environmental Management System", Raj Publishing House, Jaipur, 2000

Reference Books:

1. Joseph Caseion (Ed.) "The ISO 14000 Handbook", CEMM Information Services.
2. Don Sayre, "INSIDE ISO 14000 – The Competitive Advantage of Environmental Management", Vinity Books International, New Delhi, 2001
3. Ritchie, I & Hays, W., "A Guide to Implementation of the ISO 14000 Series on Environmental Management", Prentice Hall, New Jersey, 1998.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C. G.)

Semester: M.E. III Sem.

Subject: Science & Engineering of Water
Pollution Control Lab

Total Theory Periods: 72

Total Marks in End Semester Exam: 100

Specialization: Environmental Science & Engg.

Code: 653321 (53)

List of Experiments to be conducted:

1. Use of water test kits for the determination of various water pollution parameters
2. To measure common parameters using Ion Selective Methods
3. To measure common parameters using other conventional methods
4. Analysis of water quality
5. Analysis of water samples for metals using AA Spectrometer
6. Analysis of Phosphate by using ascorbic acid method
7. Field visit to an analytical laboratory
8. Field visit to a water treatment plant
9. Field visit to a wastewater treatment plant
10. Preparation of project report of the field visit
11. Delivering a seminar on field visit

TEXT

1. H.H. Ramp and H. Krist, Laboratory manual for the Examination of water, wastewater and soil, VCH Publishers, 1988.
2. S.S. Dara, Experiments and Calculations in Environmental Chemistry, S.Chand, 2000.

List of Equipments:

Fully equipped chemical analysis laboratory with relevant Instruments reagents, Calibration and Standardization facility, pH Meter, Conductivity meter, ORP Meter, DO Meter, Temperature meter, Ion meter, ISE Electrodes, AA Meter, Light intensity meter, Biodisc etc.