

Chhattisgarh Swami Vivekanand Technical University, Bhilai

SCHEME OF TEACHING AND EXAMINATION

M.E. (Second Semester) Chemical Engineering (Environmental Engineering)

S.No.	Board of Studies	Code	Subject	Periods per week			Scheme of Exam			Grand Total	Credits L+(T+P)/2
				L	T	P	Theory / Practical				
							ESE	CT			
1	Chem. Engg	530211 (19)	Environment System Modeling	3	1	-	100	20	20	140	4
2	Chem. Engg	530212 (19)	Natural & Industrial Disaster Management	3	1	-	100	20	20	140	4
3	Chem. Engg	530213 (19)	Environmental Policy & Legislation	3	1	-	100	20	20	140	4
4	Chem. Engg	530214 (19)	Environmental Measurement & Impact Assessment	3	1	-	100	20	20	140	4
5	Refer Table - II	Elective-II		3	1	-	100	20	20	140	4
6	Chem. Engg.	530221 (19)	Natural & Industrial Disaster Management - Lab	-	-	3	75	-	75	150	2
7	Chem. Engg.	530222 (19)	Environmental Measurement & Impact Assessment -Lab	-	-	3	75	-	75	150	2
Total				15	5	6	650	100	250	1000	24

ESE: End Semester Examination

CT: Class Test

TA: Teacher's Assessment

L: Lecture

T: Tutorial

P: Practical

Table - II

Elective – II

S.No.	Board of Studies	Code	Subject
1	Chemical Engg.	530231 (19)	Advanced Water Supply Engg.
2	Chemical Engg.	530232 (19)	Membrane Separation Technology
3	Chemical Engg.	530233 (19)	Environment Statistics & Data Base Management System

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 elective course once made for an examination cannot be changed in future examinations.**

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: M.E. IInd
Subject: Environment System Modeling
Total Theory Periods: 40
Total Marks in End Semester Exam: 100
Minimum number of class tests to be conducted :02

Branch: Chemical Engg. (Environmental Engg.)
Code: 530211 (19)
Total Tutorial Periods: 12

Note: Internal choice may be given in any three units.

- Unit I** Definition, Classification and Example of Environmental Systems and Model, System Simulation.
- Unit II** Introduction to Air Quality Models: Air Pollution Meteorology, Atmospheric Turbulence, Gaussian Plume Model And Modifications.
- Unit III** Simulation of Special Meteorological And Topographic Conditions, Urban Diffusion Model, Gradient Transport Models, Model Calibration And Validation.
- Unit IV** Sensitivity Analysis, Applications, Models for Climatic Change.
- Unit V** Introduction to River, Estuarine And Lake Hydrodynamics, Dissolved Oxygen Model; Eutrophication And Nutrient Phytoplankton Models, Temperature Models, Prediction of Fate of Organism And Toxic Substances. Models For Management Applications.

Text Books:

1. R. V. Thommamn and J. A. Mullar Principles of Surface water quality Modeling and control .
2. G. T. Orlab, Mathematical Modeling of Water quality streams lakes and reservoirs.

Reference Books:

1. J. H. Seinfeld , Air pollution Mc. Grawhill.
2. Jerald L. Shnoor, Mathematical Modeling of Environmental Systems.

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,
BHILAI (C.G.)**

Semester: M.E. IInd
Subject: Natural & Industrial Disaster Management
Total Theory Periods: 40
Total Marks in End Semester Exam: 100
Minimum number of class tests to be conducted :02

Branch: Chemical Engg.(Environmental Engg.)
Code: 530212 (19)
Total Tutorial Periods: 12

- Unit I** Introduction: Anthropogenic Accidents And Disaster, Major Hazard Installation Storage, Handling, Transportation, Disposal of Hazardous Material.
- Unit II** Hazardous Wastes-- Exposure And Risk Assessment, Environmental Legislation, Characterization And Site Assessment, Waste Minimization And Resources Recovery.
- Unit III** Chemical, Physical And Biological Treatment, Thermal Processes, Transportation, Storage, Ground Water Contamination.
- Unit IV** Landfill Disposal, Injection Well Disposal, Process Selection And Facility Siting, And Site Remediation.
- Unit V** Major Natural Disaster: Earthquake, Cyclone, Flood, Drought, And Epidemics Rehabilitation Measures, Disaster Preparedness And Its Management, Public Health Hazards.

Text Books:

1. K.K.Saxena: Recent Advances in Environmental Engg.
2. C.A.Wentz: Hazardous Waste Management, Mc Graw Hill, 1995.

Reference books:

1. E.J.Martin and J.H. Johnson: Hazardous Waste Management Engineering, Van Nostrand 1987.
2. F.P.Lees, Vol. I, II, Loss Prevention in Process Industries.

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,
BHILAI (C.G.)**

Semester: M.E. IInd

Branch: Chemical Engg.(Environmental Engg.)

Subject: Environmental Policy & Legislation

Code: 530213(19)

Total Theory Periods: 40

Total Tutorial Periods: 12

Total Marks in End Semester Exam: 100

Minimum number of class tests to be conducted :02

- Unit I** Introduction: Role of National, International And UN Agencies in Dealing With The Environmental Aspects, Standards And Setting Criteria.
- Unit II** Historical Aspects: Major Legislations, International Protocols (Kyoto Protocol, Montreal Protocol, Rio Declaration,) Significant Legislations in Developing And Developed Countries,
- Unit III** Indian Forest Act 1950, 1980 and Amendments, Air Pollution Control Act 1981
- Unit IV** Water Pollution Control Act 1974, OSHA and Significance
- Unit V** ISO 14001 and Its Significance, Other Acts in ESE and Case Studies

Text Books: 1. Environmental Laws in India – S.K.Shastrri
2. Handbook of Accident Prevention – H.O. Publication 1998

Reference Books: 1. Encyclopedia of industrial Safety and Health, 1999

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,
BHILAI (C.G.)**

Semester: M.E. IInd

Branch: Chemical Engg.(Environmental Engg.)

**Subject: Environmental Measurement &
Impact Assessment**

Code: 530214 (19)

Total Theory Periods: 40

Total Tutorial Periods: 12

Total Marks in End Semester Exam: 100

Minimum number of class tests to be conducted :02

Note: Internal choice may be given in any three units.

Unit I Evolution of EIA; EIA at Project, Regional, And Policy Levels, EIA Process on India And Other Countries.

Unit II EIA Methodologies, Screening and Scoping Criteria, Rapid & Comprehensive EIA, Economic Evaluation Methods, Practical Applications of EIA.

Unit III Lifecycle Design and Analysis, Environmental Auditing, and Ecolabeling, Biodiversity.

Unit IV Methodology of Environmental Management --Review National And International Protocols, Environmental Quality Criteria And Standards, Significant Sources of Water & Air Pollution, Indices of Environmental Quality.

Unit V Preparation of Management Plan --Case Studies, And Metropolitan Air Quality Improvement Plan.

Text Books:

1. G.J. Rau and C.D.Wooten, Environmental impact analysis handbook, McGraw-Hill
2. Rosencranz S. Divan, M.L.Noble, Environmental Law and Policies in India-cases, material and status, Tripathi Pvt. Ltd. Bombay

Reference books:

1. S.Musharraf, Legal aspects of environmental pollution and its Management, C.B.S.Publishers, Delhi

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,
BHILAI (C.G.)**

Semester: M.E. IInd

Subject: Advanced Water Supply Engg.

Total Theory Periods: 40

Total Marks in End Semester Exam: 100

Minimum number of class tests to be conducted :02

Branch: Chemical Engg.(Environmental Engg.)

Code: 530231 (19)

Total Tutorial Periods: 12

Note: Internal choice may be given in any three units.

Unit I Sources of water: Type, Quantity, Quality, Surface and Subsurface sources, dams and anicuts, deep and shallow wells, water bearing strata, water devining. Demand for water: Various method of population forecasting. Demand for various industries.

Unit II Quality of water: physical, chemical, biological characteristics & impurities, standards for potable water and water for industry. Treatment of water: various stages of treatment, aeration, sedimentation, filtration etc., along with the methods.

Unit III Flow chart of water treatment plant, Methods of hardness removal, Iron removal, Fluoridation; Storage and distribution of treated water: General construction of sumps & overhead reservoirs.

Unit IV Layout of distribution system, Types of pipes & their fittings, Layout of pipes in a building; Pumping installation: Intake wells, Details of tube wells, Boring machines: Yield of water, Blasting & drilling for yield augmentation.

Unit V Water recharging: Importance, principles, methods, layout of water recharging systems stop dams & under ground curtains for ground water augmentation Types of pumps electrical equipment required, Water harvesting: Under ground tanks, small ponds, yield from catchments.

Text Books: 1. Water supply and sewerage, E.W.Steell and J.M. Ghee.
2. Water supply Engg., S.K.Garg.

Reference Books: 1. Water supply and sanitary Engg.,G.S Birdi
2. Wastewater Engineering, By Metcalf and Eddy

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,
BHILAI (C.G.)**

Semester: M.E. IInd

Subject: Membrane Separation Technology

Total Theory Periods: 40

Total Marks in End Semester Exam: 100

Minimum number of class tests to be conducted :02

Branch: Chemical Engg.(Environmental Engg.)

Code: 530232 (19)

Total Tutorial Periods: 12

Note: Internal choice may be given in any three units.

Unit I Rate Based Model For Separation, Rate Models, Transport Rate Expression, and Estimation of Transport Coefficient; Membrane Separation, Introduction And Classification: Transport Models.

Unit II Manufacture of Membranes, Membrane Module, Module Flow Pattern, Membrane Selection Procedure, Reverse Osmosis Process: Its Mechanism, Design Considerations, Modules, Application.

Unit III Ultra filtration, Nanofiltration, Microfiltration, Pervaporation: Mechanism, Design Considerations, Modules, and Application.

Unit IV Gas Separation Processes: Mechanism, Design Considerations, Modules And Application; Ion Exchange and Electro Dialysis, Liquid Membrane, Design Consideration.

Unit V Enhanced and Hybrid Distillation Process, Swing Distillation, Heterogeneous, Azeotropic Distillation, Reactive Distillation: Theory And Design Consideration, Supercritical Fluid Extraction: Theory And Design Consideration.

Text Books:

1. Separation Process Principles –Seader J.D. and Henley. J.E.
2. Basic Principles of Membrane Technology - Baker
3. Membrane Process –Rautenback, R and Albretch R.

Reference Books:

1. Multi Component Mass Transfer - Taylor R and Krishna R,
2. Super Critical Fluid Extraction – Principles and Practice – Hugh, M.C. and Krukniis, M

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,
BHILAI (C.G.)**

Semester: M.E. IInd

Branch: Chemical Engg.(Environmental Engg.)

**Subject: Environment Statistics &
Data Base Management System**

Code: 530233 (19)

Total Theory Periods: 40

Total Tutorial Periods: 12

Total Marks in End Semester Exam: 100

Minimum number of class tests to be conducted :02

Note: Internal choice may be given in any three units.

- Unit I** Stochastic Processes in The Environment: Probability Concepts, Conditional Probability And Baye's Theorem, Environmental Data Analysis And QA/QC; Descriptive Statistics, Averaging Times, Sample Size Determination, Sampling Frequency And Duration; Measurement Uncertainty, Accuracy And Precision, Sample And Dynamic Blank.
- Unit II** Error Propagation, Linear Least Square Regression, Trend Analysis, Non-Parametric Statistics.
- Unit III** DBMS: Overview of DBMS, Data Information And Knowledge, Increasing Use of Data And Fields, Advantages of DBMS, Entity Relationship Model, Relation Model, QER Diagram.
- Unit IV** Relational Model: Definition of Relation, Properties of Relational Model, Concept Key, Candidate Key, Primary Key, Alternate Key, Foreign Key, Fundamental Integrity & Entity Integrity, Type of Joins, Queries Using Relational Algebra.
- Unit V** SQL: Construct C Select, From, Where Group By Having Order By Insert, Delete, Update View, Nested SQL, ODBC Introduction, Normalization (1NF, 2NF, 3NF, 4NF)

Text Books:

1. Atkinson A.C., Donev A.N., Optimum Experiment Design, Clarendon Press, Oxford.
2. Ott .W.R., Environmental Statistics & data analysis, Lewis Publishers, New Jersey.

Reference books:

1. Maxwell S.E. and Delaney H.D., Designing Experiments and analysis data, Wadsworth Publishers

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,
BHILAI (C.G.)**

Semester: M.E. IInd

Branch: Chemical Engg.(Environmental Engg.)

Subject: Natural & Industrial Disaster Management Lab Code: 530221 (19)

Total Practical Periods: 40

Total Marks in End Semester Exam: 75

Experiments to be performed:

Modeling using MATLAB / C++:

1. Model the step function response to a 50% decrease in total phosphorus loading to lake assuming a completely mixed lake using the mass balance model.
2. Model to simulate DO concentration and deficit for a river.
3. Using Streeter Phelps Model calculate and plot BOD (ultimate) Vs. Downstream Distance.
4. Using Streeter Phelps Model calculate and plot DO Deficit Vs. x.
5. Using Streeter Phelps Model calculate and plot Instream reaeration rate & deoxygenating rate Vs. x.
6. Find the condition when min. DO concentration occurs.

List of Equipments/Machines Required:

1. MATLAB Soft wares
2. C++

Recommended Books:

1. Jerald . L. Shnoor, "Mathematical Modeling of Environmental Systems", John Wiley Publications

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,
BHILAI (C.G.)**

Semester: M.E. IInd
**Subject: Environmental Measurement &
Impact Assessment Lab**

Branch: Chemical Engg.(Environmental Engg.)
Code: 530222 (19)

Total Practical Periods: 40
Total Marks in End Semester Exam: 75

Experiments to be performed:

1. Collection of data & EIA study for a developing project and preparation of report for an existing project.

List of Equipments/Machines Required:

1. High Volume sampler.
2. DB Meter.
3. Soil Testing Kit.
4. Stereoscope.
5. Flame Photometer.
6. Water Testing Kit.

Recommended Books:

1. G.J. Rau and C.D.Wooten, Environmental impact analysis handbook, McGraw-Hill.
2. L.W.Canter, Environmental Impact Assessment
3. ISO 14000 Series.