Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

Hingna Road, Wanadongri, Nagpur - 441 110

Post Graduation (M. Tech.)

SoE & Syllabus 2014

1 to 4 Semester

Department of Civil Engineering

Environmental Engineering

Sl. No.	Course Code	Course Title	Contact Hours				Credits	% Weightage				ESE Duration Hrs.
			L	T	P	Total Contact Hrs.		MSE-I	MSE-II	TA	ESE	
I SEMESTER												
1	GE1901	Computational Methods	3	0	0	3	3	15	15	10	60	3
2	CV1951	Environmental Chemistry and Microbiology	3	0	0	3	3	15	15	10	60	3
3	CV1952	Lab: Environmental Chemistry and Microbiology	0	0	2	2	1			40	60	
4	CV1953	Water Supply and Wastewater Collection	3	0	0	3	3	15	15	10	60	3
5	CV1954	Municipal Water Treatment	3	0	0	3	3	15	15	10	60	3
6	CV1955	Municipal Waste Water Treatment and Disposal	3	0	0	3	3	15	15	10	60	3
7	CV1956	Seminar-I	0	0	2	2	1			100		
		Total	**15**	**0**	**4**	**19**	**17**					

II SEMESTER												
1	CV1961	Industrial Waste Water Treatment and Disposal	3	0	0	3	3	15	15	10	60	3
2	CV1962	Environmental Management	3	0	0	3	3	15	15	10	60	3
3	CV1963	Air Quality Management	3	0	0	3	3	15	15	10	60	3
4	CV1965	Lab: Air Quality Management	0	0	2	2	1			40	60	
5	CV1964	Municipal Solid Waste Management	3	0	0	3	3	15	15	10	60	3
6	**Professional Elective- I**		3	0	0	3	3	15	15	10	60	3
	CV1967	Hazardous Waste Management										
	CV1968	Water Resource Management										
	CV1969	Advanced Water Treatment										
7	CV1966	Seminar II	0	0	2	2	1			100		
		Total	**15**	**0**	**4**	**19**	**17**					

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Applicable for AY 2014-15 Onwards

Sl. No.	Course Code	Course Title	Contact Hours				Credits	% Weightage				ESE Duration Hrs.
			L	T	P	Total Contact Hrs.		MSE-I	MSE-II	TA	ESE	
III SEMESTER												
1	**Professional Elective- II**		3	0	0	3	3	15	15	10	60	3
	CV1971	Environmental Modeling										
	CV1972	Rural Water Supply and Sanitation										
	CV1976	**PE-II Remote Sensing And GIS In Water Resources And Environmental Engineering**										
2	**Professional Elective- III**		3	0	0	3	3	15	15	10	60	3
	CV1973	Applied Structures										
	CV1974	Environmental Biotechnology										
3	CV1975	Project Phase - I	0	0	16	16	8	100				
Total			**6**	**0**	**16**	**22**	**14**					

Semester - I

GE1901	Computational Methods			L=3	T=0	P=0	CREDITS = 6
EVALUATION SCHEME							
MSE – I	MSE – II	TA	ESE	TOTAL		ESE DURATION	
15	15	10	60	100		3 Hours	

COURSE OBJECTIVES

At the end of the course the student will be able to

- Understand different statistical methods.
- Understand different numerical methods and their applications.

SYLLABUS

UNIT – I
PROBABILITY AND STATICS:
Random Variables-discrete and continuous, cumulative distribution function and probability density function, concept of most probable member, elementary ideas of joint probability distribution, Sampling distribution t.F and x2 distribution, test of hypotheses.

UNIT – II
CALCULUS OF VARIATION:
Distributions and their extreme values. Variation of functional and its properties, Euler-Lagrange's equation. Minimization of functional. Gaderkin and Ritz method.

UNIT – III
NUMERICAL METHOD:
Solution of system of linear algebraic equation. Gansseidel method, Crout's method.
Solution of transcendental equation by Newton- Raphsons method and method of false position.

UNIT – IV
OPTIMIZATION:
Linear programming (up to simplex method). Non linear and dynamic programming

ARTIFICIAL NEURAL NETWORK (ANN)
Training method, fuzzy logic

Text Books:

1. Goyal M., Computer Based Numerical and Statistical Techniques
2. Shastri S.S.,Numerical methods

Reference Books:

1. Kreyszig, Advanced Engineering Mathematics.
2. Dass H.K., Advanced Engineering Mathematics.

CV1951	Environmental Chemistry and Microbiology			L=3	T=0	P=0	CREDITS = 3
EVALUATION SCHEME							
MSE – I	MSE – II	TA	ESE	TOTAL	ESE DURATION		
15	15	10	60	100	3 Hours		

Course Objective	Course Outcome
• To bring into focus those aspects of chemistry that are particularly valuable for solving problems of environmental monitoring and pollution control. • To give a fundamental perspective of the microbial technology for adopting cleaner environmental practices.	• Understand the concepts Environmental chemistry& to learn how the concepts of environmental chemistry can be put to practical applications. • To ensure applications of microbial technology in environmental engineering practices

UNIT – I

General Chemistry:-Theory of valancy, oxidation, numbers, oxidation-reduction reaction, law of mass action, Stochiometry, gas laws.

Physical Chemistry:- Buffer solution, indicators. Amphoteric hydroxide, chemical equilibrium Osmosis, Dialysis.

UNIT – II

Organic Chemistry and Biochemistry:-

Organic compounds of interest to environmental engineers, general properties of the functional groups of organic compounds.

Enzymes, classification of enzymes catalyzed reaction, energy considerations, coupling of reaction. Breakdown and synthesis of carbohydrates, fats, proteins under aerobic and anaerobic conditions. CNP cycles under aerobic and anaerobic conditions.

Concept of BOD, COD, TOC.

UNIT – III

Colloidal Chemistry: -Colloids, dispersion of colloids, general and electro-kinetic properties of colloids, colloidal solution and mixtures.

Environmental Chemistry: -Chemistry involved in water treatment procedure like coagulation, softening, defluoridation, iron and manganese removal, demineralization, analysis of pesticide and heavy metals.

UNIT – IV

Environmental Microbiology

Introduction of microbiology, Haeckel's classification and characterization of microorganisms, viruses.

Morphology and structure of bacteria, nutrient requirement, growth of bacteria.

Basic microbiology of water and sewage. Basic principals involved in the analysis of feacal indicator bacteria – coli forms and streptococci, plankton analysis, analysis of pseudomonas & streptococci.

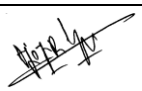
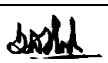
Kinetics of microbial growth.

Text Book:-

1. Sawyer, C.N. and McCarty, P.L., and Parkin, G.F. Chemistry for Environmental Engineers, 4th Edn. McGraw Hill, New Delhi, 1994.
2. Benefield, Judkins and Weand – Process Chemistry for Water and Wastewater Treatment, Prentice Hall
3. Maier R M, Pepper I L and Gerba C P. Environmental Microbiology, Second Edition, Elsevier- AP, 2009.
4. Pelczar, Jr, M.J., Chan, E.C.S., Krieg, R.N., and Pelczar M. F, Microbiology, 5th Edn., Tata McGraw-Hill Publishing Company Limited, New Delhi, 1996.
5. Rittman B, McCarty P L McCarty P, Environmental Biotechnology: Principles and Applications, 2nd edition, McGraw-Hill, 2000

References:-

1. Powar & Daginawala, General Microbiology Vol. I &II, Himalaya Publishing House, Latest.

Chairperson		Date of Release	May 2014	Applicable for AY 2014-15 Onwards
Dean (Acad. Matters)		Version	1.00	

CV1952	Lab: Environmental Chemistry and Microbiology			L=0	T=0	P=2	CREDITS = 1
EVALUATION SCHEME							
MSE – I	MSE – II	TA	ESE	TOTAL	ESE DURATION		
--	--	40	60	100	--		

Any TEN experiments of the following will be performed.

1. To determine Alkalinity of a water sample.
2. To determine Available Chlorine in given bleaching powder sample
3. To determine Total, Calcium and Magnesium hardness of given water sample.
4. To determine Dissolved Oxygen concentration in given water sample.
5. To determine Sulphates concentration in given water sample.
6. To determine Biochemical Oxygen Demand (B.O.D.)of a wastewater sample.
7. To determine Chemical Oxygen Demand (C.O.D.)of a wastewater sample.
8. To determine Maximum Probable Number (MPN) of coli form bacteria present in water sample by Multiple Tube Dilution (MTD) technique-presumptive test.
9. To determine Density of bacteria in a water sample pour plate (Standard Plate Count) method.
10. To determine concentration of Chlorides in a given water sample.
11. To determine Hydrogen ion concentration (p^H) of a solution
12. To determine Turbidity of a solution using Nepheloturbidimeter.
13. To determine optimum coagulant dose by Jar test.
14. To determine effective size and co-efficient of uniformity of a given sand sample and to separate required sand from given stack of sand for required effective size and coefficient of uniformity.
15. To determine total, dissolved and suspended solids in given water sample.

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CV1953	Water Supply and Waste Water Collection			L=3	T=0	P=0	CREDITS = 3
EVALUATION SCHEME							
MSE – I	MSE – II	TA	ESE	TOTAL	ESE DURATION		
15	15	10	60	100	3 Hours		

Course Objective	Course Outcome
• To provide an understanding of analysis, design and operation of water distribution system, including water storage tanks, pumping facilities, water mains, and service lines reservoir, sewers, drains and sewer appurtenances	• Understand different methods of analysis of pipe network for water distribution. • Understand methods of design of sewers.

UNIT – I
Analysis of Water Distribution System
Flow through pipes- Equation for flow through pipes, Moody diagram, Analysis of flow through pipe network
1. Hardy cross method 2. Newton Raphson's method 3. Linear Theory method

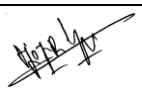
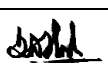
UNIT – II
Design of Water Distribution System
Reservoirs, pumps and valves in the distribution system, Node flow analysis.
Rising Main, water hammer, cause and prevention. Maintenance of distribution system
Critical path method for design of water distribution networks.

UNIT – III
Waste Water Collection
General – Objectives, types of system and sewers, requisites for sewerage system design – survey and investigations. Hydraulics of sewer – flow equations, pipe and open channel flow, self cleansing and scouring velocities through sewer, flow in partially filled sewers, velocity of equal cleansing, sewer shape vis-a-vis their usefulness, sewer invert drop.

UNIT – IV
Design Of Sewers And Sewer Appurtenances
Storm sewers- Estimation of design flow, rational and other method of estimation of design storm flow, rainfall intensity–duration–frequency relationships, design to a typical storm sewerage system.
Sanitary sewers- House plumbing system, estimation of design flows, fluctuation flows, and sewer ventilation. Sulfide generation in sewers, depth of sewer, design of a typical sanitary sewerage system.
Pumps and pumping stations
Manholes, street inlets, catch basins, building connections, sewer junctions, inverted siphon, flushing tanks, air ejectors, regular and measuring devices, design and operations.

Text Book:-
1. Bhave P. R. And Gupta R, Analysis of Water Distribution Networks, Narosa Publishing Co., New Delhi (2006).
2. Fair G. M., Geyer J. C. & Okun D. A., Water & Wastewater Engg. Vol.I & II, John-Willey & Sons, New York.
3. McGhee N. J. & Steel E. W., Water supply and sewerage, McGraw hill publications, 1991.
4. Bhave P.R, Optimal design of water distribution networks, Narosa Publishing Co., New Delhi (2003).

Reference:-
1. CPHEEO, Manual on water supply and treatment, Ministry of urban development, GoI.
2. CPHEEO, Manual on Sewerage and Sewage Treatment, Ministry of urban development, GoI.

Chairperson		Date of Release	May 2014	Applicable for AY 2014-15 Onwards
Dean (Acad. Matters)		Version	1.00	

CV1954	Municipal Water Treatment			L=3	T=0	P=0	CREDITS = 3
EVALUATION SCHEME							
MSE – I	MSE – II	TA	ESE	TOTAL		ESE DURATION	
15	15	10	60	100		3 Hours	

Course Objective	Course Outcome
• To provide a basic description and understanding of the principal unit operations used in the treatment of municipal water including coverage of the scientific basis of each unit process, as well as the conventional approach to their engineering design	• Understand the fundamental, scientific basis governing the design and performance of the treatment technologies. • Understand the role of each unit process within typical treatment process trains, their interaction and the context of when they are applied

UNIT I

Water quality criteria and standards, Requirement of water treatment facilities, Unit operation & Unit process, Synthesizing water treatment system, Site selection, Process selection.

Aeration: Objective, Principles, Types of aerator, Design of aerators.

UNIT II

Coagulation: History, Need of coagulation, Chemistry of coagulation, Various coagulants used in process, Factors affecting efficiency of coagulation process, Operation of feeders, Types of rapid mixing devices, design of flash mixer.

Flocculation: Theory of flocculation, Slow mixing devices.

UNIT III

Sedimentation: Principle, Stoke' law, Working of ideal sedimentation tank, Types of sedimentation tank, Design of working of clariflocculator, Operational problems in sedimentation tank.

UNIT IV

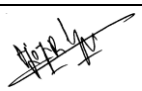
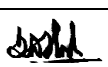
Filtration: Theory of filtration, Types of filters, working of slow and rapid sand filter, operational difficulties and design of rapid sand filter.
Disinfection: Methods of disinfection, Kinetics of chemical disinfection, Chlorination, Chemistry of chlorination, Methods of chlorination

Text books :

1. N.J. McGhee, Steel E.W., Water Supply and Sewerage, McGraw hill 1991.
2. N.J. Weber, Physicochemical Process for Water Quality Control, John Wiley & Sons 1972.
3. Fair Geyer & Okun, Water and Waste water Engineering, Vol I and II, John Wiley & Sons 1st.

Reference Book:-

1. Nordel, E, Water Treatment For Industrial And Other Uses, Reinhold Publishing Corporation, N.Y.
2. CPHEEO, Manual on Water supply and Treatment, Govt. of India Publication.

Chairperson		Date of Release	May 2014	Applicable for AY 2014-15 Onwards
Dean (Acad. Matters)		Version	1.00	

CV1955	Municipal Waste Water Treatment and Disposal			L=3	T=0	P=0	CREDITS = 3
EVALUATION SCHEME							
MSE – I	MSE – II	TA	ESE	TOTAL	ESE DURATION		
15	15	10	60	100	3 Hours		

Course Objective	Course Outcome
• Design various treatment units for sewage treatment • Design various units for sludge treatment and disposal.	• To understand different units and processes in sewage treatment. • To understand the design methodologies for all such sewage treatment units. • To understand different methods of treatment and disposal of sludge.

UNIT I

General objectives of sewage treatment, sewage characteristics, conventional sewage treatment flow sheet, functions of different unit processes.
Reactor types and their hydraulic characteristics, mass balance analysis, reaction order, rates and coefficients

UNIT II

Physical treatment: screening, gravity separation theory, grit removal, primary sedimentation. Chemical Treatment: chemical coagulation and precipitation, removal of phosphorus, heavy metals and dissolved organic substances.

UNIT III

Biological treatment:- Suspended and attached growth processes, aerobic and anaerobic treatment of sewage. Nitrification and Denitrification

Activated sludge process: process description, recent developments, process analysis, process design considerations

Tricking filter: process description, classification, process design considerations.

UNIT IV

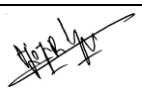
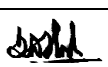
Treatment of biosolids: process flow diagram, pumping, preliminary operations, thickening, stabilization, aerobic and anaerobic digestion, conditioning, dewatering, heat drying.

Text Books:

1. S.J. Arceivala, Wastewater Treatment And Disposal, Marcel Dekker,1981.
2. Metcalf and Eddy, Wastewater Engineering, Treatment, Disposal And Reuse, Inc. Third edition McGraw – hill 1991.
3. Qasim S.R. Wastewater Treatment Plant Planning, Design And Operation, Holt, Rinehart and Winston, N.Y.

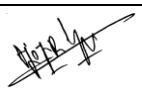
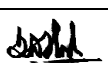
References:-

1. N.F. Grey Activated Sludge Process, Theory And Practices, Oxford University Press 1990

Chairperson		Date of Release	May 2014	Applicable for AY 2014-15 Onwards
Dean (Acad. Matters)		Version	1.00	

CV1956	**Seminar-I**		**L=0**	**T=0**	**P=2**	**CREDITS = 1**
EVALUATION SCHEME						
MSE – I	MSE – II	TA	ESE	TOTAL	ESE DURATION	
--	--	100		100	--	

Seminar on any related topic to environmental engineering will be presented by the student. The topic of seminar will be approved by the teacher in charge. Evaluation will be based on the subject contents and skill of presentation. Evaluation will be done by a panel of teachers from the department.

Chairperson		Date of Release	May 2014	Applicable for AY 2014-15 Onwards
Dean (Acad. Matters)		Version	1.00	

Semester - II

CV1961	Industrial Wastewater Treatment and Disposal			L=3	T=0	P=0	CREDITS = 3
EVALUATION SCHEME							
MSE – I	MSE – II	TA	ESE	TOTAL	ESE DURATION		
15	15	10	60	100	3 Hours		

Course Objective	Course Outcome
• Design various treatment units for treatment of industrial wastewater. • Design a treatment facility for a typical industrial wastewater.	• To understand importance of industrial wastewater treatment. • To understand the fundamentals of various treatment processes. • To understand treatment methodologies for various industrial wastewaters.

UNIT I

Environmental impact due to industrial water pollution, problems associated with industrial wastewater, sampling and analysis of wastewater, toxicity testing, statistical analysis of data, standards for waste disposal.

UNIT II

Reuse, recycling and resource recovery. **I**ndustrial waste volume and strength reduction methods.
Equalization and proportioning of wastewater, design of equalization tank.
Neutralization of wastewater, Floatation.

UNIT III

Stabilization pond, oxidation ponds, biological denitrification processes, membrane biological reactors.
Anaerobic treatment of industrial wastewater, general design considerations, UASB, attached growth processes.

UNIT IV

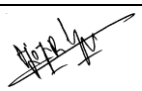
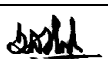
Treatment of specific industrial wastes: textile, dairy, tanning, sugar, brewery and distillery, iron and steel, food industries.
Common effluent treatment plant, concept, advantages.

Text Books:

1. Metcalf and Eddy, Wastewater Engineering, Treatment, Disposal And Reuse, Inc. Third Edition Mcgraw Hill 1991.
2. W.W. Eckenfielder, Industrial Pollution Control, McGraw Hill Int. Edition 1990.
3. W.J. Weber, Physicochemical Processes For Water Quality Control, John Wiley and Sons, 1972.
4. Nemerow, N.L. Theories and Practices Of Industrial Waste Treatment. New York : Addison Wisely.
5. Bess Elivievre, E.B. The Treatment Of Industrial Wastes, McGraw Hill Book co.
6. Culp R L et al, Handbook Of Advanced Wastewater Treatment Van No Strand Reinhold Publ. N.Y.
7. Arceivala, S.J., (1998) "Wastewater Treatment for Pollution Control ", Tata McGraw Hill.

References:

1. Central pollution control board, India, comprehensive industry document series.
2. World Bank Group (1998) "Pollution Prevention and Abatement Handbook – Towards Cleaner Production ", World Bank and UNEP, Washington D.C.

Chairperson		Date of Release	May 2014	Applicable for AY 2014-15 Onwards
Dean (Acad. Matters)		Version	1.00	

CV1962	Environmental Management			L=3	T=0	P=0	CREDITS = 3
EVALUATION SCHEME							
MSE – I	MSE – II	TA	ESE	TOTAL		ESE DURATION	
15	15	10	60	100		3 Hours	

Course Objective	Course Outcome
• Understand environmental policies of Government of India. • Understand different methods of environmental impact assessment. • Understand different national and international environmental laws	• Able to explain the fundamentals and identify the tools used for EM • Able to discuss environmental impact assessment (EIA) as an environmental management tools and trace the evolution of EIA • Able to discuss the evolution of environmental policies and laws and implications of international policies and laws for India.

UNIT I

Development and Environment, Global and Indian scenario.
National Environmental Policy, Environmental organizations for planning and implementation sustainable development. Concept of carrying capacity, assimilative and supportive capacityPreventive and reactive strategies for environmental pollution control, Nature of impact – primary, secondary, tertiary, short –term long-term, local and regional, reversible & irreversible impacts.

UNIT II

Environmental impact and risk assessment Methodologies: Ad hoc, check-lists, network, matrix etc. Environmental Management plan. Typical case studies of environmental impact assessment. MoEF questionnaire for environmental clearance

UNIT III

Eco Labeling, Concept of Cleaner Technology Environmental Audit definition, concept of EA, types of environmental audit benefits of environmental audit, scope & objectives, environmental statement, procedural aspects of conducting environmental audit, pre-audit phase, on-site audit phase & post-audit phase, waste minimization, economic benefits of environmental audit.

UNIT-IV

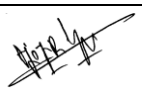
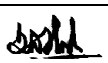
Environmental Legislations and its basic concepts, critical issues, civil liability, various enactment and their provisions – Water Act (1974, 1988), forest Conservation Act (1980), Air Act (1981, 1988), Water (Cess) Act 1977, Environmental Protection Act 1986, Role of State & Central boards of pollution control, local government social action groups, and environmental policies.

Text Books :-

1. S. Mushraf, Legal Aspects of Environmental Pollution and Its Management, C.B.S. publishers, Delhi 1932.
2. R. K. Jain, L.V. Urban G.S. Stacey, H.E. Balbach, Environmental Assessment McGraw – Hill, Inc. N.Y.
3. Rao, J.G. and Wooten, Environmental Impact Analysis, Hanfbook, 1980.
4. Canter, L.W. Environmental Impact Assessments,-- N.Y. McGraw – hill book Co.1977.

Reference

1. Rosencrannz, S. Divan, M.L. Noble, Environmental Law and Policy in India, Cases, Materials And Statutes, Tripathi Pvt. Ltd. Bombay.

Chairperson		Date of Release	May 2014	Applicable for AY 2014-15 Onwards
Dean (Acad. Matters)		Version	1.00	

CV1963	Air Quality Management			L=3	T=0	P=0	CREDITS = 3
EVALUATION SCHEME							
MSE – I	MSE – II	TA	ESE	TOTAL		ESE DURATION	
15	15	10	60	100		3 Hours	

Course Objective	Course Outcome
• To provide the knowledge of major air pollutants; their sources and their effects (environmental, economic and health) • To provide insight into the dispersion of air pollution in the atmosphere • To provide insight into the control equipment's of air pollution • To provide insight about the laws and legislations for the control & prevention of air pollution.	• Understand various sources & their effects • Understand the meteorological factors that influence wind and turbulence, the relationship of air current stability, and the effect of each of these factors on air pollution , transport and dispersion; understand the role of topography and its influence on air pollution • Understand of the basic principles, equipment, and methods used to control particulate matter, gaseous emission and automobile emission • Understand of the different types of laws, the constitutional limitations on governmental actions and laws, basic administrative law, and where laws are recorded

UNIT I

Sources & classification of air pollutants: Nature of air pollutants, Industrial processes causing air pollution, Effects of pollutants on health, vegetation, materials & atmosphere

UNIT II

Meteorology & Dispersion of pollutants: Stability, Inversions, Diffusion of pollutants, Dispersion models.

UNIT III

Control of air pollutants: Particulate emission control, Gaseous emission control, Automobile Exhaust Emission Control

UNIT IV

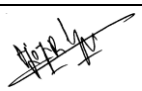
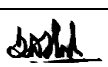
Air quality standards and legislation:- Ambient air quality standards, air quality emission standards, air pollution control legislation, Air pollution index. IndoorAir Pollution.

Text Book:

1. Air Pollution, M.N. Rao., Tata McGraw Hill, 2006.
2. Fundamentals of Air Pollution, Stern, Wohlers, Bouble and Lower, Academic Press, 1984.
3. Air Pollution and Control, P. P. Mowli and N. Venkata Subbayya., Divyajyoti Prakashan, Jodhpur, 1989.
4. Environmental Pollution Control Engineering, C.S. Rao, New Age International, 2007

References:-

1. Air Quality Monitoring- A Course Manual, NEERI, 1981.
2. Air Pollution, Vol. I to IX, A. C. Stern, Academic, New York, 1968.

Chairperson		Date of Release	May 2014	Applicable for AY 2014-15 Onwards
Dean (Acad. Matters)		Version	1.00	

CV1965	**Lab : Air Quality Management**			**L=0**	**T=0**	**P=2**	**CREDITS = 1**
EVALUATION SCHEME							
MSE – I	MSE – II	TA	ESE	TOTAL		ESE DURATION	
--	--	40	60	100		--	

Any FIVE of following experiments will be conducted:

1. To measure CO % & NO % of the exhaust gases from vehicles or gasoline engine.
2. Determination of Particulate (SPM and RSPM) matter concentration in atmosphere by using high volume sampler
3. Statistical Calculations of observed air pollution data.
4. Sampling and analysis of SO_2 in atmosphere
5. Determination of dust fall in atmosphere.
6. Study of various sampling and analytical equipment in air pollution
7. Determination of wind velocity, wind direction, temperature, cloud cover, humidity & preparation of wind rose diagram.

CV1964	Municipal Solid Waste Management			L=3	T=0	P=0	CREDITS = 3
EVALUATION SCHEME							
MSE – I	MSE – II	TA	ESE	TOTAL		ESE DURATION	
15	15	10	60	100		3 Hours	

Course Objective	Course Outcome
• Develop insight into the collection, transfer, and transport of municipal solid waste. • To examine the engineering and scientific principles of municipal solid waste (MSW) management. • Processing and disposal methods for solid waste.	• Understand different characteristics of solid waste. • Understand different methods of collection, Transfer and Transport of solid waste. • Understand different Processing and disposal methods for solid waste.

UNIT I

Problems and impacts of solid waste in developing countries, Solid waste management and organization.Sources, Types, Quantity and Composition of municipal solid waste.
Characteristicsof solid waste – Sampling – physical, chemical and biologicalAnalysis.
Functional Elements of MSWM,Legislation and byelaws in solid waste management.

UNIT II

Storage, Collection, Transportation, Optimization of roots, Tools and equipment, Transfer station, Volume reduction.

UNIT III

Composting – Process microbiology, Aerobic and anaerobic composting.
Sanitary Landfill – Process, mechanism, Classification, types, site considerations,Maintenance of site.
Incineration- Mechanism, types and Operation.

UNIT IV

Future processing method, Pyrolysis, Refuse derived fuel.

Text Books:

1. Solid waste management in developing countries – A.D. Bhide, B.B.Sudresan
2. Solid waste water management – D. JoshepHangertey, Joseph L. Pavoni.
3. George Techobanoglous etal,"Integrated Solid Waste Management", McGraw-Hill Publication, 1993.

Reference

1. Municipal Refuse Disposal – Institute of America Public Health Association, Interstate printer and publisher inc – TanvilElinoy

Chairperson		Date of Release	May 2014	Applicable for AY 2014-15 Onwards
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CV1967	PE-I Hazardous Waste Management			L=3	T=0	P=0	CREDITS = 3
EVALUATION SCHEME							
MSE – I	MSE – II	TA	ESE	TOTAL		ESE DURATION	
15	15	10	60	100		3 Hours	

Course Objective	Course Outcome
• To provide insight into sources of hazardous waste & the treatment given thereafter.	• Able to understand principle of methods given to hazardous waste.

UNIT I

Definition of hazardous waste, U.S.E.P.A. classification, global scenario, episodes. Hazardous waste (management and handling) rules, 1989 and Indian scenario.

UNIT II

Source of hazardous waste, types of waste inventorisation procedures.Sampling and analytical procedures.Overview of treatment and disposal method – waste minimization.

UNIT III

Physicochemical method and biological method. Thermal Processes. Solidification/stabilization and innovation techniques.

UNIT IV

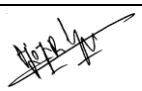
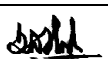
Secure landfill.
Site selection methodology for establishing treatment and disposal methods and EIRA methodology.

Text Books:

1. Charles A. Wentz; " Hazardous Waste Management ", McGraw-Hill Publication, 1995

Reference:-

1. The safe disposal of hazardous waste. Vol. I, II, & III Bat stone, Smith, Wilson, Joint study Sponsored by the world bank, the WHO, & UN Environmental Program UNEP,
2. The world bank Freeman, H.M. standard Handbook of Hazardous Waste Treatment and Disposal, 1989.

Chairperson		Date of Release	May 2014	Applicable for AY 2014-15 Onwards
Dean (Acad. Matters)		Version	1.00	

CV1968	PE-I Water Resources Management		L=3	T=0	P=0	CREDITS = 3
EVALUATION SCHEME						
MSE – I	MSE – II	TA	ESE	TOTAL	ESE DURATION	
15	15	10	60	100	3 hours	

Course Objective	Course Outcome
• To understand water resources planning • To understand water policies and application of remote-sensing. • To understand different methods of conservation and recharging of water resources • To understand interbasin transfer and EIA of water Resource development projects	• Understand water resources planning • Understand water policies and application of remote-sensing. • Understand different methods of conservation and recharging of water resources • Understand interbasin transfer and EIA of water Resource development projects

UNIT I

Introduction: water resources planning, multi–objective planning role in national development, basic concepts of hydrology and hydrogeology.
River monitoring, gauging silting, silt load etc.

UNIT II

National water policy. Water resources planning and processes. Management of water bodies.
Application of remote sensing Techniques. Integrated approach – carrying capacity based planning.

UNIT III

Water resources conservation : quantity aspects, surface and ground water development,
Rain water harvesting, ground water recharge, conjunctive use of ground and surface water.

UNIT IV

Water resources development in coastal areas.
Basic concepts of economics, welfare economics.
Inter basin transfer of water.
EIA of water Resource development projects.

Text Books:

1. Linsey, R. K. &Franzini, J.B. water resources Engineering. New Delhi : McGraw Hill
2. Grigg N.S. Water Resources planning McGraw Hill Book company.

Reference

1. Neil S. Grigg, Water resource management – principles, regulations and cases New Delhi : McGraw Hill

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CV1969	PE-I Advanced Water Treatment			L=3	T=0	P=0	CREDITS = 3
EVALUATION SCHEME							
MSE – I	MSE – II	TA	ESE	TOTAL	ESE DURATION		
15	15	10	60	100	3 Hours		

Course Objective	Course Outcome
• To provide insight into various advanced methods used for the treatment of municipal and industrial water including coverage of the scientific basis of each operation/process, as well as the conventional approach to their engineering design	• Understand the fundamental, scientific basis governing the design and performance of the treatment technologies. • Understand the role of each unit operation /process within typical treatment process trains, their interaction and the context of when they are applied

UNIT I

Necessity of Advances/modifications/modern development in water treatment. Industrial water quality requirement, specific treatment for industrial purpose.
Softening of water, Boiler feed water, lime soda process, ion exchange process.

UNIT II

Desalination: Theory of desalination, various methods of Desalination- Distillation,
Electro dialysis, Freezing, Demineralization, Solar evaporation. Membrane filtration process

UNIT III

Adsorption: Theory, Granular and powder activated carbon, Performance and Reactivation.
Materials and Reactions, Kinetics, Applications.

UNIT IV

Fluoride Removal, Arsenic Removal, Fe and Mn removal, Taste, odor and colour removal.
Water treatment for Swimming Pool.

Text Book:

1. N.J. McGhee, Steel E.W., Water Supply and Sewerage, McGraw hill 1991.
2. N.J. Weber, Physicochemical Process for Water Quality Control, John Wiley & Sons 1972.
3. Fair Geyer & Okun, Water and Waste water Engineering, Vol I and II, John Wiley & Sons 1st.

Reference Book:-

1. Nordel, E, Water Treatment For Industrial And Other Uses, Reinhold Publishing Corporation, N.Y.
2. CPHEEO, Manual on Water supply and Treatment, Govt. of India Publication.

CV1966	**Seminar-II**			**L=0**	**T=0**	**P=2**	**CREDITS = 1**
EVALUATION SCHEME							
MSE – I	MSE – II	TA	ESE	TOTAL		ESE DURATION	
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Seminar on any related topic to environmental engineering will be presented by the student. The topic of seminar will be approved by the teacher in charge. Evaluation will be based on the subject contents and skill of presentation. Evaluation will be done by a panel of teachers from the department.

Semester - III

CV1971	**PE-II Environmental Modeling**			**L=3**	**T=0**	**P=0**	**CREDITS = 3**
EVALUATION SCHEME							
MSE – I	MSE – II	TA	ESE	TOTAL	ESE DURATION		
15	15	10	60	100	3 Hours		

Course Objective	**Course Outcome**
• To provide an emphasis on the role and nature of modeling environmental system	• To understand the role and nature of environmental modeling

UNIT I

Computational methods in Environmental modeling, Definition; Classification; Examples and Models of Environmental Systems.

UNIT II

Introduction to Air Quality Models;
Metrology; Atmospheric Stability and Turbulence; Gaussian Plume Model and Modifications; Numerical Models, Urban Diffusion Models;

UNIT III

Introduction to river, estuarine and lake thermodynamics, Stratification of lakes, Dissolved Oxygen Model for streams, Temperature Models, Prediction of fate of organisms and toxic substances.

UNIT IV

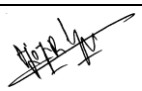
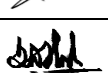
Models for predicting water quality changes in water distribution systems, Environment model for Stationary and mobile sources.

Text Book:-

1. Introduction To Environmental Engineering and Science ,Gilbert M. Masters Practice hall, India
2. Principles Of Surface Water Quality Modelling And Control,Thomann R. V. And Muller J.A,Harper, International edition,1987

Reference Book:

1. Water Quality, Technobangolous G., Schroader E.D., Addison Wesley publishing co., Reading Massachusetts

Chairperson		Date of Release	May 2014	Applicable for AY 2014-15 Onwards
Dean (Acad. Matters)		Version	1.00	

CV1972	PE-II Rural Water Supply and Sanitation			L=3	T=0	P=0	CREDITS = 3
EVALUATION SCHEME							
MSE – I	MSE – II	TA	ESE	TOTAL		ESE DURATION	
15	15	10	60	100		3 hours	

Course Objective	Course Outcome
• To understand scheme of rural water supply and sanitation. • To understand improvised method of treatment of wastewater • To understand compact systems of treatment and disposal.	• Student will acquire knowledge regarding rural water supply and sanitation scheme. • Students will be in a position to tell different compact units of treatment of rural water supply. • Students will be able to tellsimple wastewater treatment for rural water supply.

UNIT I

Concept of environmental and scope of sanitation in rural areas. Magnitude of problem of water supply and sanitation, National policy. Various approaches for planning of water supply systems in rural areas.

UNIT II

Selection and development of preferred sources of water, springs, wells, Infiltration wells, radial wells and infiltration galleries, collection of raw water from surface source. Specific problems in rural water supply and treatment e.g. iron, manganese, fluorides etc. Low cost treatment.

UNIT III

Improvised methods and compact system of treatment of surface and ground waters such as MB settlers, slow sand filter, chlorine diffusion cartridges etc. Water supply through spot sources, hand pumps, open dug wells Planning of distribution system in rural areas Water supply during fairs, festivals and emergencies

UNIT IV

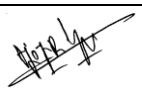
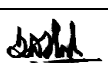
Treatment and disposal of wastewater/sewage various methods of collection and disposal of night soil Onsite sanitation system and community latrines, Ecosan system, Phytorid system. Simple wastewater treatment system for rural areas and small communities such as stabilization ponds, septic tank and soakage pits etc. Disposal of solids waste: Compostingand Biogas plants

Text Books

1. Low cost on site sanitation option, Hoffman and Heijno Occasional Nov.1981 Paper No.21 P.O. Box 5500 2280 HM Rijswijk, Yhe Netherlands offices,J.C.Monkeniaan,5Rijswijk(The Haque)
2. Wagner, E.G. and Lanoik, J.N., Water supply for Rural areas and small communities, Geneva: WHO 19593.

Reference

1. Manual of water supply and treatment, 3rd Edition,CPHEEO,GOI, New Delhi

Chairperson		Date of Release	May 2014	Applicable for AY 2014-15 Onwards
Dean (Acad. Matters)		Version	1.00	

CV1976	PE-II Remote Sensing And GIS In Water Resources And Environmental Engineering	L=3	T=0	P=0	CREDITS = 3

EVALUATION SCHEME					
MSE – I	MSE – II	TA	ESE	TOTAL	ESE DURATION
15	15	10	60	100	3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1. To learn basic concepts of Remote sensing process and GIS 2. To Carry out spatial analyses for resource management	1. Able to Apply basic principles of remote sensing for resource mapping and evaluation 2. Able to Develop geospatial database of water resources and environmental engineering systems

UNIT-1:

Introduction to remote sensing and Geographical Information Systems (GIS**),** Databases and database Management systems, spatial databases, Coordinate systems and georeferencing, Interpolation methods: Deterministic and Statistical, Digital elevation models and their applications.

UNIT-2:

Surface-Water Hydrologic Data, Spatial techniques for Surface-Water Hydrology Modeling, Applications of Geoinformatics for spatial management of resources: Run-off estimations, infiltration characteristics, groundwater potential and recharge characteristics, Watershed management, Sediment yield estimation, reservoir capacity studies.

UNIT-3:

Geospatial techniques for planning and design of Water-Supply and Irrigation Systems, Spatial Database Development for Wastewater and Storm water Systems, GIS-Based Wastewater Collection System Design and Management Applications.

UNIT-4:

Geographic Data for Environmental Modeling and Assessment, GIS for Water-Quality Database Development, GIS for Water-Quality Management Decision Support, Land Use Planning and Environmental Impact Assessment Using Remote sensing and Geographic Information Systems.

Text Books:

1. Agarwal, C. S., Garg P. K., Remote Sensing in Natural Resources Monitoring and Management, A. H. Wheeler & Co. Ltd., New Delhi.
2. C.P LO Albert KW Yeung Concepts and techniqes of Geographic Infromation Systems Pritince Hall of India, 2002.

Chairperson		Date of Release	June 2015	Applicable for AY 2015-16 Onwards
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CV1973	PE-III Applied Structures			L=3	T=0	P=0	CREDITS = 3
EVALUATION SCHEME							
MSE – I	MSE – II	TA	ESE	TOTAL		ESE DURATION	
15	15	10	60	100		3 Hours	

Course Objectives	Course Outcomes
• To provide detailed concept of structural design of various environmental structures	• Understand structural design of various environmental structures.

UNIT I

Structural design of water supply and water collection system:
Design of pipes such an R.C.C. prestressed mild steel asbestos cement, cast iron etc.

UNIT II

Estimation of loads such as gravity earth forces, super imposed loads, moving loads etc. On rigid and flexible conduits under various types of field conditions

UNIT III

Design of pipe, supports, beddings, shallow and deep manholes, inverted siphons and other appurtenances etc.

UNIT IV

Design of tanks and prestressed structures for water and waste water such as circular and hopper bottom, setting tanks, pump and pump house, intakes, channels, water storage tanks, etc. Durability criteria for environmental structures.

Text Book:

1. Jai Krishna & Jain O.P. plain & reinforced concrete, Vol. II, Roorkee: New chand & Bros, 1980.

Reference Book:

1. N. Krishna Raju, advanced concrete structures, Tata McGraw Hill 1995

CV1974	PE-III Environmental Biotechnology			L=3	T=0	P=0	CREDITS = 3
EVALUATION SCHEME							
MSE – I	MSE – II	TA	ESE	TOTAL		ESE DURATION	
15	15	10	60	100		3 Hours	

COURSE OBJECTIVES	COURSE OUTCOMES
• To learn basic concepts of biochemistry and microbial interaction. • To learn basic concepts of genetic engineering and mutation of DNA.	• Able to explain the range of chemical reaction that are undergone by the hydroxyl group of carbohydrates, proteins, fats and nucleic acids' • Able to understand the Relationship between cell signaling and gene transcription.

UNIT-1:

Basic concept of microbial biochemistry-carbohydrates, proteins, fats and nucleic acids
Basic concept of biodegradation, biotransformation, biobenification, biorestoration / bioreclammation, microbial interaction

UNIT-2:

Environmental monitoring-signification of monitory bacterial viral and protozoan pathogens.
Technique of monitoring-standard methods of monitoring viral bacterial and protozoan pathogens, Advance techniques-gene probes biosensor, immunoassay.

UNIT-3

Basic concept of genetic engineering-chromosomal DNA, plasmid DNA transformation, transudation conjugation, protoplast fusion, mutation recombinant DNA techniques Biotransformation of biomass/organic waste into value added chemicals, energy, fertilizers and single cell protein

UNIT-4:

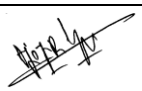
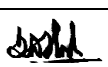
Aerobic and anaerobic waste treatment processes-microorganisms involved and biochemical changes of different pollutants present in liquid and solid waste, reactor technology, mathematical modeling and simulation, design and optimization.

Text Books:

1. C.S. Forster and D.A. John Wase,, Environmental Biotechnology, Ellis Harwood, 1987
2. Trehan K. Biotecnology, New Delhi, Willey Eastern Ltd.1990

Reference Books:

1. Forster C.F.N Biotechnology and Wastewater Treatment ,Cambridge 1992
2. N.F. Grey, Biology of Wastewater Treatment Oxford University Press ,1989

Chairperson		Date of Release	May 2014	Applicable for AY 2014-15 Onwards
Dean (Acad. Matters)		Version	1.00	

CV1975	**Project Phase I**			**L=0**	**T=0**	**P=16**	**CREDITS =8**
EVALUATION SCHEME							
MSE – I	MSE – II	CA	ESE	TOTAL		ESE DURATION	
--	--	100		100		--	

The Project Phase – I shall start in semester III, and should preferably be literature survey.

The work shall be continuously evaluated as per the norms/ guidelines set up by the B.O.S. for its assessment of 100 marks.

Evaluation of Project Phase – I shall consist of submission of report in a prescribed format based on review of literature related to the topic selected for dissertation. Report should cover introduction, literature review, objective and scope of investigation and pilot studies carried out during the semester. The student will deliver the seminar thereon which will be assessed by panel of examiners.

CV1981	**Project Phase II**			**L=0**	**T=0**	**P=24**	**CREDITS = 12**
EVALUATION SCHEME							
MSE – I	MSE – II	CA	ESE	TOTAL	ESE DURATION		
--	--	40	60	100	--		

Project Phase – II shall consist of detailed study of a work that the student has executed in continuation with report submitted by the student in the Project Phase – I and should involve scientific research, design, collection and analysis of data, determining solutions and must preferably bring out the individuals contribution.

The work shall be continuously evaluated as per the norms/ guidelines set up by the B.O.S. for its assessment of 40 marks.

End Semester Evaluation of Project Phase –II shall consist of submission of dissertation in a prescribed format. The student shall present the entire work on Dissertation, followed by viva-voce which will be assessed by panel of examiners.