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

Scheme of Teaching & Examination

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

First Semester:

S. No.	Code	Board of Studies	Subject	Periods per week			Scheme of Exam Theory / Practical			Total	Credits L+ (T+P)/2
				L	T	P	ESE	CT	TA		
1	680111(20)	Civil Engineering	Principles of Environmental Engineering	3	1	–	100	20	20	140	4
2	680112 (20)	Civil Engineering	Hydraulics of Water and Waste Water	3	1	–	100	20	20	140	4
3	680113 (20)	Civil Engineering	Optimization Techniques	3	1	–	100	20	20	140	4
4	680121 (20)	Civil Engineering	Principles of Environmental Engineering Lab	–	–	4	100	80	–	180	2
Total				**9**	**3**	**4**	**400**	**140**	**60**	**600**	**14**

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

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Semester: M.E. I Sem.
Total Theory Periods: 40
Total Marks in End Semester Exam: 100
Minimum number of class tests to be conducted: 02

Subject: Principles of Environmental Engineering
Branch: **Civil Engineering**
Code: 680111 (20)
Total Tutorial Periods: 12

Unit – 1: History
History of Environmental Pollution and its control, Population, economic growth, industrialization urbanization and energy-use, as causes of environmental pollution. Air quality and emission standards classification of air pollutants.

Unit – 2: Fundamentals of aerosol behavior
Fundamentals of aerosol behavior – sedimentation, inertial impaction, connective diffusion; fundamentals of gaseous pollutant behavior – adsorption, absorption.

Unit – 3: Water and Wastewater quality and effluent standards
Water and Wastewater quality and effluent standards, physical chemical and biological water quality parameters. Processes in Natural Water systems. Dissolved oxygen models;

Unit – 4: Solid Waste Management
Solid – waste generation, properties and composition; solid waste management techniques, 4Rs in SWM, Solid Waste Collection, Collection and Disposal of SWM.

Unit – 5: Sedimentation
Sedimentation: Types, Aeration and gas transfer, Coagulation and flocculation, coagulation processes - stability of colloids - destabilization of colloids transport of colloidal particles, Clari flocculation.

Text Books:

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 Jersy, 1996.

Reference Books:

1. H.S. Peavy, D.R. Rowe, G. Tchobanoglous, Environmental Engineering, McGraw Hill, 1985.
2. S.K. Friedlander: Smoke Dust and Haze: Fundamentals of Aerosol Behaviour, Wiley 1977.
3. Metcalf and Eddy: Wastewater Engineering – Treatment Disposal and Reuse, 6th Edition Tata McGraw Hill, 1995.
4. Reible D.D.:Fundamentals of Environment Engineering, Lewis Publishers, 1999.

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Semester: M.E. I Sem.
Total Theory Periods: 40
Total Marks in End Semester Exam: 100
Minimum Number Of Class Tests To Be Conducted: 02

Subject: Hydraulics of Water and Wastewater
Branch: **Civil Engineering**
Code: 680112 (20)
Total Tutorial Periods: 12

Unit – 1: General hydraulics and flow measurement
Fluid properties; fluid flow – continuity principle, energy principle and momentum principle; frictional head loss in free and pressure flow, minor heads losses, Carrying Capacity–Flow measurement.

Unit – 2: Water transmission and distribution
Need for Transport of water and wastewater-Planning of Water System –Selection of pipe materials, pipe thickness calculations. Water transmission main design- gravity and pumping main; Selection of Pumps-characteristics-economics; Specials, Jointing, laying and maintenance, water hammer analysis.

Unit – 3: Water distribution systems
Water distribution pipe networks, Methods, Design, analysis and optimization – appurtenances – corrosion prevention – minimization of water losses – leak detection Storage reservoirs. Use of computer software in water transmission and water distribution.

Unit – 4: Wastewater collection and conveyance
Planning factors – Design of sanitary sewer; partial flow in sewers, economics of sewer design. Handling and transport of slurry. Wastewater pumps and pumping stations- sewer appurtenances; material, construction, inspection and maintenance of sewers; Design of sewer outfalls-mixing conditions; conveyance of corrosive wastewaters. Use of computer software in sewer design, handling and transport of slurries.

Unit – 5: Storm water drainage
Necessity - combined and separate system; Estimation of storm water run off Formulation of rainfall intensity duration and frequency relationships- Rational methods. Use of computer software in storm water design.

Text Books:

1. Fluid Mechanics – Dr. P.N. Modi (Standard Book House)
2. Mechanics of Fluid – Irving H. Shames (McGraw Hill)
3. Introduction to Fluid Mechanics – James A. Fay (Prentice Hall India)
4. Fluid Machines – Dr. Jagdish Lal (Metropolitan Book Company Private Ltd.)
5. Fluid Machines – John P. Douglas (Pearson Publication)

References Books:

1. Bajwa, G.S. Practical Handbook on Public Health Engineering, Deep Publishers, Simla, 2003.
2. "Manual on water supply and Treatment", CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999.
3. "Manual on Sewerage and Sewage Treatment", CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1993.

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Semester: M.E. I Sem.
Total Theory Periods: 40
Total Marks in End Semester Exam: 100
Minimum Number Of Class Tests To Be Conducted: 02

Subject: Optimization Techniques
Branch: **Civil Engineering**
Code: 680113 (20)
Total Tutorial Periods: 12

Unit – 1: Optimization Techniques
Basic Concepts and introduction of engineering optimization, single-variable optimization, Multivariable optimization with no constraints, equality constraints and inequality constraints.

Unit – 2: Linear Programming
Basic concepts of Linear programming, Applications of Linear Programming, standard forms of a Linear programming problems, solution of a system of linear simultaneous equations, Decomposition principle, Quadratic programming.

Unit – 3: Non Linear Programming
Basic concepts of Non-linear programming, Uni-modal function, Elimination methods, Interpolation methods, classification of unconstrained minimization methods- Direct search methods, Indirect search methods, characteristics of a constrained problem-Direct methods, Indirect methods.

Unit – 4: Geometric Programming
Unconstrained minimization problem, constrained minimization, Applications of Geometric programming.

Unit – 5: Special Optimization Techniques
Separable programming, transformation of a non-linear function to separable form, multi objective optimization, calculus of variations, optimal control theory.

Text Books:

1. Rao S.S., Engineering Optimization Theory and Practice, New Age Publishers, Delhi.
2. Deb K., Optimization for Engineering Design, Algorithms & examples, Prentice Hall of India, Delhi.

Reference Books:

1. Arora J.S., Introduction to optimum Design, TMH, Delhi.
2. Fox R.L., Optimization methods for Engineering Design, Addison Wesley Publishing.

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Semester: M.E. I Sem.
Total Practical Periods: 50
Total Marks in End Semester Exam: 100
Minimum Number Of Class Tests To Be Conducted: 02

Subject: Principles of Environmental Engineering Lab
Branch: **Civil Engineering**
Code: 680121 (20)

Experiments to be performed (Minimum 08 experiments to be performed)

1. Determination of dissolve oxygen and carbon dioxide.
2. Determination of calcium and total hardness.
3. Estimation of B.O.D.
4. Estimation of Total Solids in water.
5. Determination of Optimum coagulant dose in water treatment.
6. Study of acidity and alkalinity of water.
7. Determination of pH of water.
8. Determination of available chlorine / free chlorine / chloride in given water samples.
9. Determination of Chemical Oxygen Demand in water.

Text Books:

1. H.H. Ramp and H. Krist, Laboratory manual for the Examination of water, waster water and soil, VCH Publishers, 1988.
2. S.S. Dara, Experiments and Calculations in Environmental Chemistry, S. Chand, 2000.
3. G.M. Masters, Introduction to Environmental Engineering & Science, Prentice Hall, New Delhi, 1997