JABALPUR ENGINEERING COLLEGE, JABALPUR (MP)
(An Autonomous Institute of Govt. of M.P.)
Affiliated to Rajiv Gandhi Technological University, Bhopal (MP)
Scheme of Study and Examination (w.e.f. July 2010)
M.E. II Sem. Branch : Civil Engg. Specialization : Environment Engineering

Course Code	Subject	Periods			EVALUATION SCHEME					Credits
					SESSIONAL EXAM				SUB TOTAL	
		L	T	P	TA	CT	TOT	ESE		
CE-126	Water Treatment - II	3	1	-	10	20	30	70	100	4
CE-127	Waste Water Treatment - II	3	1	-	10	20	30	70	100	4
CE-128	Air Pollution	3	1	-	10	20	30	70	100	4
	Elective – I (Any One)									
CE-129A	Industrial water & Waste Treatment									
CE-129B	Environmental Accounting & Auditing	3	1	-	10	20	30	70	100	4
CE-129C	Environmental Degradation									
	Elective - II (Any One)									
CE-130A	Solid Waste Management and E.I.A.									
CE-130B	Hazardous Waste Management	3	1	-	10	20	30	70	100	4
CE-130C	Applied Environmental Structures									
(PRACTICAL/DRAWING/DESIGN)										
CE-131L	Advanced Enviro. Lab -II	-	-	2	60	-	60	90	150	6
CE132L	Field Testing Lab -II	-	-	2	60	-	60	90	150	6
	Total	**15**	**5**	**4**	**170**	**100**	**270**	**530**	**800**	**32**

T.A. Teachers Assessment, CT- Class Test, ESE - End Semester Examination, Total Marks 800
Total Periods : 24Total Credits : 32

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COURSE CONTENT & GRADE (w.e.f. July 2010)

Branch	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
	WATER TREATMENT – II	CE-126	Min "D"	Min "D"	5.0

WATER TREATMENT-II

UNIT- I : **Disinfection Processes:** Mode of Disinfection, Theories and rate of disinfection, Effects of different parameters on disinfection efficiency, Different methods of disinfection.

UNIT- II : Adsorption Processes : Causes and types of adsorption, Adsorption equilibrium and isotherms, Rate limiting steps, Factors influencing adsorption of mixed solutes, Nature of adsorbent, Batch and Continuous systems, Designing of Mixed bed adsorber.

UNIT- III : Membrane Process : Separation process and principle driving forces of separation of different processes, Reverse osmosis, Osmotic presser, Water and solute diffusion, Properties of cellulose acetate membrane, Feed temperature and pH effects on processes, Solute rejection, System design and applications, Ultra-filtration, Concentration polarization application, Electro-dialysis, Desalination.

UNIT- IV : Aeration and Gas Transfer : Gas transfer processes, Rate of gas transfer, Aeration and gas transfer systems, Factors affecting oxygen transfer rate, Transfer correlations.

UNIT- V : Advance Water Treatment : Advanced methods of water treatment. Alkaline water, Ionized water, Hexagonal water. Ionizer, Ozonation.

Reference Books :

1. Physiochemical Processes for treatment of Water By – W.J. Weber
2. Environmental Engineering By – H.S. Peary, DR. Rowe & G. Tehobanoglous
3. Manual on Water Supply and Treatment published by CPHEEO, Ministry of Urban Development, GOI, New Delhi.
4. Water Supply & Sewerage By – Ernest W. Steel (Mc-Graw Hill Book Co.)

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			T	P	
	WASTE WATER TREATMENT – II	CE-127	Min "D"	Min "D"	5.0

WASTE WATER TREATMENT-II

UNIT- I : Biological Unit Process: Role of Micro-organisms, Bacterial growth and Biological oxidation, Kinetics of biological growth, Techniques for evaluation of kinetic and stochio-metric parameters, Aerobic & Anaerobic suspended-growth treatment processes, Aerobic & attached growth treatment processes.

UNIT- II : Design of Biological Treatment units of Waste Water: Attached growth reactors (process description, design and applications), Aerated lagoon treatment, Trickling-Filter (Aerated attached-growth) treatment, Stabilization pond.

UNIT- III : Design of the Treatment and Disposal of sludge: Components of anaerobic reactions that influence process design; Sludge sources, Characteristics and quantities, preliminary operations concentrations, Thickening, Stabilization : Chemical and thermal processes, Stabilization : Anaerobic sludge Digestion process, Sludge conditioning, Dewatering, Heat Drying Composting.

UNIT- IV : Different Advanced Waste Water Treatment: Concepts and principles of Carbon Oxidation, Chemical constituents in wastewater, Nitrogen conversion and removal. Nitrification, Nitrogen Removal of refraction organisms, De-nitrification, Methanogenasis.

UNIT- V : Decentralized wastewater treatment systems: Engineered systems, Biological nutrient removal; Low-cost options, Constructed wetlands. Reliability and cost effectiveness of wastewater systems.

Reference Books :

1. "Waste Water Engineering Treatment & Reuse" By- Metcalf & Eddy (Tata Mc-Graw Hill).

2." Water & Wastewater Technology" By- Mark J. Hammer (Prentice-Hall of India).

3. "Manual on Sewerage & Sewage Treatment" By- CPHEEO, Ministry of Urban Dev. New Delhi.

4. "Waste Water Treatment for Pollution Control" By- Soli J. Arceiwala.

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Branch	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
	AIR POLLUTION	CE-128	Min "D"	Min "D"	5.0

AIR POLLUTION

UNIT- I : Air-pollution : Definition, Atmosphere and global effects, Pollutants and their sources, classification. Air Pollution Meteorology : Interaction of Meteorology parameters, Transport and Diffusion Models and mechanism, Wind rose diagram, Particulates Visibility. Dynamics of pollutant dispersion and disposal. Effects on environment including living and non-living matter.

UNIT- II : Air Pollutant Chemistry: Properties of Pollutant, Units for expression of concentrations, Effects on Vegetation, Physical Environment and Human Health Mechanisms of Effect, Estimation Methodology. Human Health Hazard: Units of Measurement, Measurement of Concentration on Human Health. Nature of process Emissions: Mobile Combustion. Sources, Stationary Source, Measurement of Monitoring.

UNIT- III : Ambient air quality monitoring techniques: Air pollution indices, standards, norms, rules and regulations. Removal processes. An introduction to air pollution meteorology. Air Laboratory - High Volume Sampling, Handy Sampling, Bio aerosols sampling, Indoor Air Sampling, Stack Sampling.

UNIT- IV : Prevention and Control of Air Pollution: Regulated Release of Air Pollutant Practicability, Mechanisms of Control, Equipment Mathematical Model of Control Processes, Mechanical Collectors, Wet Collectors, Filtration, Electrostatics Precipitators Of Form Bed Reactors and Ventury Scrubbers, After Burners And Dispersion. Industrial Application: Wood Working Operation, Open Hearth Neel Making, Manufacture of Sulfuric Acid, Coffee Roasting, Environmental Industrial Location, Theories And Facilities, Impact of Industrial Products.

UNIT- V : Legislation : Standards of Air Qualities in Various Countries , Evolution of Standards, Standards and Criteria, Emission Standards and Air Qualities Standards, Clean Air Act, Total Environmental Protection, Social Responsibility, Economics and Production..

Reference Books :

1. "Air Pollution : It's Origin and Control" By Kenneth Wark & Cecil F. Warner.
2. "Air Pollution Control Volume (I to VII)" By A.C. Stern.
3. "Air Pollution" By Henery C. Perkins (Mc-Graw Hill Publication)
4. "Air Pollution and It's Control" By M.N. Rao & C.S. Rao.

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COURSE CONTENT & GRADE (w.e.f. July 2010)

Branch	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
	INDUSTRIAL WATER & WASTE WATER TREATMENT	CE-129A	Min "D"	Min "D"	5.0

INDUSTRIAL WATER & WASTE WATER TREATMENT

UNIT- I : Introduction to Water Conditioning : Processes, Production Water, Boiler Feed Water, Internal Treatment Of Boiler Feed Water, Control Of Hardness, Conditioning Of Precipitate Corrosion Control, Control Of Carry Over, Blow Down In Boiler, External Treatment Of Water, Ionic Strength Of Water, Langelier Index, Ryzner Index, Saturation Index,

UNIT- II : Water Conditioning Processes : Lime Soda Process, Hotline Soda Process, Hot Phosphate Process, Water Conditioning By Equilibrium Diagram Use Of Lawrence-Caldwell Diagram, Ion-Exchange Process, Cooling Water And It's Treatment.

UNIT- III : Preliminary treatment of Industrial waste water : Volume Reduction, Strength Reduction, Neutralization, Equalization and Prepositioning, Removal of Suspended Solid, Removal of Colloidal Solids, Removal of Inorganic Dissolved Solids.

UNIT- IV : Joint Treatment : Joint Treatment of Raw Industrial waste water with Domestic Sewage, Site selection of plant, Solid waste from Industries,

UNIT- V : Origin, Characteristics and Treatment of Waste Water : From Sugar, Tannery, Textile, Brewery, Distillery, Pharmaceutical, Metal Plating, Pulp and Paper Industries.

Reference Books :

"Liquid Waste Of Industries" (Theories, Practices And Treatment) By Nelson L. Nemerow (Addition-Wesley Pub Co.)

"Managing Industrial Pollution" By S. C. Bhatia (Mac millan India Ltd)

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Branch	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
	ENVIRONMENTAL ACCOUNTING & AUDITING	CE-129B	Min "D"	Min "D"	5.0

ENVIRONMENTAL ACCOUNTING AND AUDITING

UNIT –I : History of Environmental Auditing in India and Other Asian Countries , Components of Auditing, Assessment, Verification, Pre-audit activities, Audit process ,

UNIT – II : Definitions of Environmental Auditing, A systematic, documented, periodic and objective review by a regulated entity of facility operations and practices related to meeting environmental requirements.

UNIT – III : Types of Environmental Audits. Compliance Audits, Environmental Management Audits, Liability Definition or due Diligence Audits, Supplier Audits, Program Audits, Single Issue Audits, Risk Definition or Hazard Identification,

UNIT – IV : Post audit activities, Facilitating management control of environmental practices, Assessing compliance with company policies, including observance of the existing regulatory requirements, Eco-Management and Audit Regulation,

UNIT (V) Auditor Roles, Audit Personal Attributes (ISO 14012), Auditor Training(ISO 14012) EMS: Definition, ISO 14001 defines an EMS as Environmental Management Policy

Reference Books :

1. Environmental Statement (as part of Environmental Audit) Govt. of India, Ministry of Environment and Forests, New Delhi, 1993.
2. Environmental Auditing, UNEP/IEO, Industry and Environment Review, 1990.
3. Environmental Audits,. 5th edition, Lawrence B.Cahill (ed.) Government Institutes, Rockville, USA, 1987.
4. Environmental Auditing - Fundamentals and Techniques, 2nd edition, Centre for Environmental
5. Assurance, Author D. Little Inc. Cambridge, Mass., USA, 1988.
6. The Environmental Audit, Handbook Series. Executive Enterprises Publication Co., NY, 1988.
7. Benefits to Industry of Environmental Auditing, Centre for Environmental Assurance, Arthur D. Little Incl, Cambridge, Mass., USA, 1983..ISO 14000 Series.

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Branch	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
	ENVIRONMENTAL DEGRADATION	CE-129C	Min "D"	Min "D"	5.0

ENVIRONMENTAL DEGRADATION

UNIT – I : Environmental degradation : Definition, Destruction of ecosystems and the extinction of wildlife., Environmental degradation as one of the Ten Threats officially cautioned by the High Level Threat Panel of the United Nations. The World Resources Institute (WRI), UNEP (United Nations Environment Program), UNDP (United Nations Development Program).

UNIT –II : The United Nations International Strategy for Disaster Reduction, Environmental degradation as "The reduction of the capacity of the environment to meet social and ecological objectives, and needs".

UNIT –III : Types of Environmental degradation: Natural habitats degradation, Natural resources depletion, Environmental Change and Human Health, Preventable illnesses and premature deaths in very large numbers. Improvements in human health for living longer & healthier lives.

UNIT – IV : Child mortality (In poorest regions of the world an estimated 11 million children, or about one in five, will not live to see their fifth birthday, primarily because of environment-related diseases), Child mortality is larger than the combined populations of Norway and Switzerland, and mostly due to malaria, acute respiratory infections or diarrhea — illnesses that are largely preventable,

UNIT – V : Environmental issues, Ecological collapse, Ecologically sustainable development, Exploitation of natural resources, High Level Threat, Panel of the United Nations, Ten Threats identified by the United Nations.

Reference Books :

1. Johnson, D.L., S.H. Ambrose, T.J. Bassett, M.L. Bowen, D.E. Crummey, J.S. Isaacson, D.N. Johnson, P. Lamb, M. Saul, and A.E. Winter-Nelson. 1997. Meanings of environmental terms. Journal of Environmental Quality 26: 581-589.
2. "ISDR : Terminology". The International Strategy for Disaster Reduction. 2004-03-31.

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COURSE CONTENT & GRADE (w.e.f. July 2010)

Branch	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
	SOLID WASTE MANAGEMENT & EIA	CE-130A	Min "D"	Min "D"	5.0

SOLID WASTE MANAGEMENT AND EIA

UNIT- I : Introduction and Basic Data : Concept and dimension of third pollution, Survey and discussion of Generation and Characterization of solid waste (Physical, Biological and Chemical); Waste Reduction at the Source, Community collection methods, Critical appraisal, Rate Variation, Management Options for Solid Waste.

UNIT- II : Collection and Conveyance Systems: Volume reduction during and prior collection, Transformations and Disposal Techniques, Size reduction and classification, Collection management systems, Routing and Scheduling, Special collection problems of reuse and recycling for waste alleviation, Problems of sorting and separation..

UNIT- III : Disposal Methods: Unit operations in composting practices, Vermi-Composting, Health problems and bio-degradation, Soil microbes and their influence in waste disposal, Public relation and marketing problems, unit operation of sanitary land fill, site selection and land use planning technical and economic aspects and incinerator operations, components and unit operation for waste incinerator, operation problems, high temperature, incinerator, analysis and disposal of hazardous wastes.

UNIT- IV : Solid Waste System: Solid Waste Management, Collection and conveyance system , Drying and Incineration Systems, Dewatering and Conditioning Systems , Refuse Derived fuels, Land filling, Discussion of solid waste acts, resources and recovery act of other countries rate of solid waste in total environment protection, necessity of public education and persuasion managed solutions to collection and disposal problems.

UNIT- V : EIA : Planning and Management of Environmental Impact Studies. Impact indentation methodologies : base line studies, screening, scooping, checklist, networks, overlays. Prediction and assessment of impacts on the socio-economic environment. Environmental cost benefit analysis. Sustainable development; global environmentalism.

Reference Books :

"Manual on Solid Waste Management" published by CPHEEO, Ministry of Urban Development, Government of India, New Delhi.

"Solid Waste management" By A. D. Bhide and B. Sundaresan, NEERI,. Book on solid waste management in developing countries.

"Hand Book on Solid Waste Management" By Frank Kreith, George Tchobanoglous

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Branch	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
	HAZARDOUS WASTE MANAGEMENT	CE-130B	Min "D"	Min "D"	5.0

HAZARDOUS WASTE MANAGEMENT

UNIT – I : Definition of hazardous waste, U.S.E.P.A. classification, global scenario, episodes.

UNIT – II : Hazardous waste (management and handling) rules 1989 in Indian scenario.

UNIT – III : Source of hazardous waste, types of waste, Invent oxidation procedures. Sampling and analytical procedures. Overview of treatment and disposal methods- waste minimization.

UNIT–IV: Physicochemical method and biological methods, Thermal Processes, Solidification/stabilization and innovation techniques, Secure landfill.

UNIT – V : Site selection methodology for establishing treatment and disposal methods and EIRA methodology.

Reference Books :

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.

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Branch	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
	APPLIED ENVIRONMENTAL STRUCTURES	CE-130C	Min "D"	Min "D"	5.0

APPLIED ENVIRONMETAL STRUCTURES

UNIT – I : Structural design of water supply and water collection systems: Design of pipes such as R.C.C./ pre-stressed/ 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 pre-stressed structures for water and waste water such as circular and hopper bottom, settling tanks, pump and pump house, intakes, channels, water storage tanks, etc.

UNIT – V : Durability criteria for environmental structures.

Reference Books:

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

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Branch	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
	ADVANCED ENVIRONMENTAL LAB – II	CE-131L	Min "D"	Min "D"	5.0

ADVANCED ENVIRONMENTAL LAB- II

The exercises in this component shall be designed to demonstrate the basic principles outlined in different units of the theory paper. After completing the exercises the student should have developed a good grasp of the practical utilities of the theory content.

(Suggested Exercise)

1. Measurement of conductivity of water.
2. Measurement of Nitrates in water.
3. Measurement of Total solids in sewage.
4. Measurement of Total dissolved solids in sewage.
5. Measurement of settleable solids in sewage.
6. Ambient air quality monitoring by "High Volume Sampler"
7. Stack exhaust sampling by "Stack Monitoring Kit"
8. Ambient noise level measurement by "Noise Meter"
9. Bacterial count by "Colony Counter"
10. Measurement of sulfate in water.

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COURSE CONTENT & GRADE (w.e.f. July 2010)

Branch	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
	FIELD TESTING LAB – II	CE-132L	Min "D"	Min "D"	5.0

FIELD TESTING LAB – II

The exercises in this component shall be designed to demonstrate the basic principles outlined in different units of the theory paper. After completing the exercises the student should have developed a good grasp of the practical utilities of the theory content.

(Suggested Exercise)

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