BabuBanarasi Das University, Lucknow

Department of Civil Engineering

School of Engineering

Master of Technology (Environmental Engineering) - Regular

Evaluation Scheme

SEMESTER I									
Course Category	**Course Code**	**Code Title**	**Contact Hours**			**Evaluation Scheme**			**Credits**
			L	**T**	**P**	**CIA**	**ESE**	**Course Total**	
C	MAS006	Applied Mathematics	4	0	0	40	60	100	4
C	MEV1101	Environmental Chemistry and Microbiology	4	0	0	40	60	100	4
C	MEV1102	Water Treatment and Distribution	4	0	0	40	60	100	4
C	MEV1103	Wastewater Treatment	4	0	0	40	60	100	4
C	MEV1011/ MEV1014	Generic Elective - I	4	0	0	40	60	100	4
C	MEV1151	Water and Waste Water Treatment Lab	0	0	2	100	0	100	1
C	MEV1152	Seminar	0	0	2	100	0	100	1
C	MEV1153	Technical Paper Writing	0	0	2	100	0	100	1
Total			**20**	**0**	**6**	**500**	**300**	**800**	**23**

Legends:

L Number of Lecture Hours per week
T Number of Tutorial Hours per week
P Number of Practical Hours per week
CIA Continuous Internal Assessment
ESE End Semester Examination

Category of Courses:

C Core Course
GE Generic Elective

BabuBanarasi Das University, Lucknow

Department of Civil Engineering

School of Engineering

Master of Technology (Environmental Engineering) - Regular

Evaluation Scheme

SEMESTER II									
Course Category	**Course Code**	**Code Title**	**Contact Hours**			**Evaluation Scheme**			**Credits**
			L	**T**	**P**	**CIA**	**ESE**	**Course Total**	
C	MEV1201	Solid Waste Management	4	0	0	40	60	100	4
C	MEV1202	Air and Noise Pollution and Control	4	0	0	40	60	100	4
C	MEV1203	Environmental Quality Management	4	0	0	40	60	100	4
C	MEV1021/ MEV1024	Generic Elective - II	4	0	0	40	60	100	4
C	MEV1031/ MEV1034	Generic Elective - III	4	0	0	40	60	100	4
C	MEV1251	Air and Noise Pollution Lab	0	0	2	100	0	100	1
C	MEV1252	Seminar	0	0	2	100	0	100	1
C	MEV1253	Technical Paper Presentation	0	0	2	100	0	**100**	**1**
Total			**20**	**0**	**6**	**500**	**300**	**800**	**23**

Legends:

L Number of Lecture Hours per week
T Number of Tutorial Hours per week
P Number of Practical Hours per week
CIA Continuous Internal Assessment
ESE End Semester Examination

Category of Courses:

C Core Course
GE Generic Elective

BabuBanarasi Das University, Lucknow

Department of Civil Engineering

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Master of Technology (Environmental Engineering) - Regular

Evaluation Scheme

SEMESTER III									
Course Category	Course Code	Code Title	Contact Hours			Evaluation Scheme			Credits
			L	T	P	CIA	ESE	Course Total	
C	MEV1351	State of the Art Seminar#	-	-	-	200	0	200	4
C	MEV1352	Thesis – I*	-	-	-	400	0	400	16
Total			**-**	**-**	**-**	**600**	**0**	**600**	**20**

\# Student need to perform a literature survey and will give a state of the art presentation and will submit a synopsis clearly mentioning the problem statement. The presentation and synopsis will be evaluated internally within two months of the start of the semester and the result will be intimated to the students so as to proceed for thesis.

* Student will develop the workable model for the problem they have supposed in synopsis.

SEMESTER IV									
Course Category	Course Code	Code Title	Contact Hours			Evaluation Scheme			Credits
			L	T	P	CIA	ESE	Course Total	
C	MEV1451	Thesis – II**	-	-	-	200	800	1000	28
Total			**-**	**-**	**-**	**200**	**800**	**1000**	**28**

** (a) This is in continuation with Thesis - I.

(b) The required experimental / mathematical verification of the proposed model will be done in this semester.

Legends:

L Number of Lecture Hours per week

T Number of Tutorial Hours per week

P Number of Practical Hours per week

CIA Continuous Internal Assessment

ESE End Semester Examination

Category of Courses:

C Core Course

GE Generic Elective

BabuBanarasi Das University, Lucknow

Department of Civil Engineering

School of Engineering

Master of Technology (Environmental Engineering) - Regular

Evaluation Scheme

Course Code	GenericElective-I
MEV1011	Earth and Environment
MEV1012	Environmental Sanitation and Ecology
MEV1013	Renewable Sources of Energy
MEV1014	Instrumental Method of Analysis

Course Code	Generic Elective-II
MEV1021	Environmental Remote Sensing
MEV1022	Disaster Management
MEV1023	Water Pollution
MEV1024	Rural Environmental Technology

Course Code	Generic Elective-III
MEV1031	Ground Water Management
MEV1032	Ground Water Hydrology
MEV1033	Design of Water Supply Systems
MEV1034	Industrial Wastewater Treatment

BabuBanarasi Das University, Lucknow

Department of Civil Engineering

School of Engineering

Master of Technology (Environmental Engineering) - Regular

Evaluation Scheme

Credit Summary Chart						
Course Category	**Semester**				**Total Credits**	**%age**
	I	**II**	**III**	**IV**		
C	19	15	20	28	**82**	**87.24**
GE	4	8			**12**	**12.76**
Total	**23**	**23**	**20**	**28**	**94**	**100**

Discipline wise Credit Summary Chart						
Course Category	**Semester**				**Total Credits**	**%age**
	I	**II**	**III**	**IV**		
Engg. Sciences	4				4	**4.25**
Professional Subject Core	13	13			26	**27.65**
Professional Subject - Generic Elective	4	8			12	**12.76**
Thesis, Seminar	2	2	20	28	52	**55.33**
Total	**23**	**23**	**20**	**28**	**94**	**100**

Legends:

L Number of Lecture Hours per week

T Number of Tutorial Hours per week

P Number of Practical Hours per week

CIA Continuous Internal Assessment

ESE End Semester Examination

Category of Courses:

C Core Course

GE Generic Elective

BabuBanarasi Das University, Lucknow

Department of Civil Engineering

School of Engineering

Master of Technology (Environmental Engineering) – Part Time

Evaluation Scheme

SEMESTER I									
Course Category	Course Code	Code Title	Contact Hours			Evaluation Scheme			Credits
			L	T	P	CIA	ESE	Course Total	
C	MAS006	Applied Mathematics	4	0	0	40	60	100	4
C	MEV1101	Environmental Chemistry and Microbiology	4	0	0	40	60	100	4
C	MEV1102	Water Treatment and Distribution	4	0	0	40	60	100	4
Total			**12**	**0**	**0**	**120**	**180**	**300**	**12**

Legends:

L Number of Lecture Hours per week

T Number of Tutorial Hours per week

P Number of Practical Hours per week

CIA Continuous Internal Assessment

ESE End Semester Examination

Category of Courses:

C Core Course

GE Generic Elective

BabuBanarasi Das University, Lucknow

Department of Civil Engineering

School of Engineering

Master of Technology (Environmental Engineering) – Part Time

Evaluation Scheme

SEMESTER II									
Course Category	**Course Code**	**Code Title**	**Contact Hours**			**Evaluation Scheme**			**Credits**
			L	**T**	**P**	**CIA**	**ESE**	**Course Total**	
C	MEV1201	Solid Waste Management	4	0	0	40	60	100	4
C	MEV1202	Air and Noise Pollution and Control	4	0	0	40	60	100	4
C	MEV1203	Environmental Quality Management	4	0	0	40	60	100	4
Total			**12**	**0**	**0**	**120**	**180**	**300**	**12**

Legends:

L Number of Lecture Hours per week

T Number of Tutorial Hours per week

P Number of Practical Hours per week

CIA Continuous Internal Assessment

ESE End Semester Examination

Category of Courses:

C Core Course

GE Generic Elective

BabuBanarasi Das University, Lucknow

Department of Civil Engineering

School of Engineering

Master of Technology (Environmental Engineering) – Part Time

Evaluation Scheme

SEMESTER III									
Course Category	Course Code	Code Title	Contact Hours			Evaluation Scheme			Credits
			L	T	P	CIA	ESE	Course Total	
C	MEV1103	Wastewater Treatment	4	0	0	40	60	100	4
C	MEV1011/ MEV1014	Generic Elective - I	4	0	0	40	60	100	4
C	MEV1151	Water and Waste Water Treatment Lab	0	0	2	100	0	100	1
C	MEV1152	Seminar	0	0	2	100	0	100	1
C	MEV1153	Technical Paper Writing	0	0	2	100	0	100	1
Total			**8**	**0**	**6**	**380**	**120**	**500**	**11**

Legends:

L Number of Lecture Hours per week

T Number of Tutorial Hours per week

P Number of Practical Hours per week

CIA Continuous Internal Assessment

ESE End Semester Examination

Category of Courses:

C Core Course

GE Generic Elective

BabuBanarasi Das University, Lucknow

Department of Civil Engineering

School of Engineering

Master of Technology (Environmental Engineering) – Part Time

Evaluation Scheme

SEMESTER IV									
Course Category	**Course Code**	**Code Title**	**Contact Hours**			**Evaluation Scheme**			**Credits**
			L	**T**	**P**	**CIA**	**ESE**	**Course Total**	
C	MEV1021/ MEV1024	Generic Elective - II	4	0	0	40	60	100	4
C	MEV1031/ MEV1034	Generic Elective - III	4	0	0	40	60	100	4
C	MEV1251	Air and Noise Pollution Lab	0	0	2	100	0	100	1
C	MEV1252	Seminar	0	0	2	100	0	100	1
C	MEV1253	Technical Paper Presentation	0	0	2	100	0	100	1
Total			**8**	**0**	**6**	**380**	**120**	**500**	**11**

Legends:

L Number of Lecture Hours per week

T Number of Tutorial Hours per week

P Number of Practical Hours per week

CIA Continuous Internal Assessment

ESE End Semester Examination

Category of Courses:

C Core Course

GE Generic Elective

BabuBanarasi Das University, Lucknow

Department of Civil Engineering

School of Engineering

Master of Technology (Environmental Engineering) – Part Time

Evaluation Scheme

SEMESTER V									
Course Category	Course Code	Code Title	Contact Hours			Evaluation Scheme			Credits
			L	T	P	CIA	ESE	Course Total	
C	MEV1351	State of the Art Seminar#	-	-	-	200	0	200	4
C	MEV1352	Thesis – I*	-	-	-	400	0	400	16
Total			**-**	**-**	**-**	**600**	**0**	**600**	**20**

\# Student need to perform a literature survey and will give a state of the art presentation and will submit a synopsis clearly mentioning the problem statement. The presentation and synopsis will be evaluated internally within two months of the start of the semester and the result will be intimated to the students so as to proceed for thesis.

* Student will develop the workable model for the problem they have supposed in synopsis.

SEMESTER VI									
Course Category	Course Code	Code Title	Contact Hours			Evaluation Scheme			Credits
			L	T	P	CIA	ESE	Course Total	
C	MEV1451	Thesis – II**	-	-	-	200	800	1000	28
Total			**-**	**-**	**-**	**200**	**800**	**1000**	**28**

** (a) This is in continuation with Thesis - I.

(b) The required experimental / mathematical verification of the proposed model will be done in this semester.

Legends:

L Number of Lecture Hours per week

T Number of Tutorial Hours per week

P Number of Practical Hours per week

CIA Continuous Internal Assessment

ESE End Semester Examination

Category of Courses:

C Core Course

GE Generic Elective

BabuBanarasi Das University, Lucknow

Department of Civil Engineering

School of Engineering

Master of Technology (Environmental Engineering) – Part Time

Evaluation Scheme

Course Code	Generic Elective-I
MEV1011	Earth and Environment
MEV1012	Environmental Sanitation and Ecology
MEV1013	Renewable Sources of Energy
MEV1014	Instrumental Method of Analysis

Course Code	Generic Elective-II
MEV1021	Environmental Remote Sensing
MEV1022	Disaster Management
MEV1023	Water Pollution
MEV1024	Rural Environmental Technology

Course Code	Generic Elective-III
MEV1031	Ground Water Management
MEV1032	Ground Water Hydrology
MEV1033	Design of Water Supply Systems
MEV1034	Industrial Wastewater Treatment

BabuBanarasi Das University, Lucknow

Department of Civil Engineering

School of Engineering

Master of Technology (Environmental Engineering) – Part Time

Evaluation Scheme

Credit Summary Chart								
Course Category	**Semester**						**Total Credits**	**%age**
	I	**II**	**III**	**IV**	**V**	**VI**		
F								
C	12	12	3	3	20	28	78	**82.98**
GE			8	8			16	**17.02**
Total	**12**	**12**	**11**	**11**	**20**	**28**	**94**	**100**

Discipline wise Credit Summary Chart								
Course Category	**Semester**						**Total Credits**	**%age**
	I	**II**	**III**	**IV**	**V**	**VI**		
Engg. Sciences	4						4	**4.26**
Professional Subject Core	8	12	1	1			22	**23.40**
Professional Subject - Generic Elective			8	8			16	**17.02**
Thesis, Seminar			2	2	20	28	52	**55.32**
Total	**12**	**12**	**11**	**11**	**20**	**28**	**94**	**100**

Legends:

L Number of Lecture Hours per week

T Number of Tutorial Hours per week

P Number of Practical Hours per week

CIA Continuous Internal Assessment

ESE End Semester Examination

Category of Courses:

C Core Course

GE Generic Elective

MEV1101 Environmental Chemistry and Microbiology

Course Objective:

1. Study about Basic concept of .environmental chemistry
2. Learn about the various parameters of water and waste water
3. How to examine microbial contamination of water.
4. Study about the different –phases of of microbial growth.

Learning Outcome:

1. Introduction to the basic principles of environmental chemistry.
2. Detailed knowledge of different parameter of water and waste water.
3. To know the thermodynamics microbial system
4. Know the aerobic and anaerobic process involved in the water and waste-water.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	Introduction, Chemistry of Water, physical properties, hydrogen bonding in biological systems, changes in water properties by addition of solute.	30 Hours	1
II	Colloidal Chemistry, Protein structure and biological functions, enzymes,enzyme metabolism, biosynthesis of DNA and RNA Hydrocarbons: Chemistry of hydrocarbon decay, environmental effects, effectson macro and micro organisms.	30 Hours	1
III	Physio-chemicalparameters; Definition and determination of conductivity, pH, COD, BOD, Viscosity,surface tension, estimation of various elements at major, minor trace, concentrations; Choice of a technique; Principle, merits and demerits of the techniques–colorimetry, AtomicAbsorption Spectroscopy, Gas chromatography,	30 Hours	1
IV	Thermodynamics of Microbial systems, Mass and energy Balance Microbial Process, Aerobic and Anaerobic Microbial growth.	30 Hours	1

References :

1. MaierR.M., “Environmental Microbiology”,Academic Press, New York, 1999
2. Moore. J. W. and MooreE. A. “Environmental Chemistry” McGraw Hill
3. Sawyer C.N., McCarty PL and Parkin G.F, “Chemistry for Environmental Engineers”, 4thEdition, McGraw Hill, New Delhi, 1994.

MEV1102 Water Treatment and Distribution

Course Objective:

1. To know the different terminology used in water treatment process
2. Learn about the various parameters of water
3. Detailed study about the physico-chemical methods involved in water treatment process.
4. To know about the advance treatment process etc.

Learning Outcome:

1. To know the overview of waste water treatment process.
2. To understand the different parameter of waste water.
3. To develop knowledge about designing of waste water plant.
4. To analyze the industrial waste water and learn its characteristics.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	Introduction and Sources of Water, different methods of Population Forecasting and Water Requirement,	30 Hours	1
II	Physical, Chemical and Biological Water Quality Parameters, Solid Separation, Settling Operation, design of settling tank, strokes law, Coagulation, flocculation, clariflocculator	30 Hours	1
III	Filtration, theory of filtration ,rapid sand filter, slow sand filter, pressure filter, Softening,Disinfection, chlorination, Desalination, Dissolved Solids Removal,	30 Hours	1
IV	Adsorption and Ion Exchange, Electrolysis, Osmosis,Special Treatments, Pumping and Distribution Systems hardy cross method	30 Hours	1

References :

1. Garg S.K., "Water Supply Engineering (Environmental Engineering Vol. – I)", Khanna Publication
2. Peavy, "Environmental Engineering", McGraw Hill
3. Sawyer C.N, McCarty P.L and Parkin G.F, "Chemistry for Environmental Engineering and Science", 5th ed. Tata McGraw-Hill
4. Manual of water supply

MEV1103 Waste-Water Treatment

Course Objective:

1. To know the different terminology used in waste water process
2. Learn about the various parameters of waste water
3. Detailed study about the physico-chemical methods involved in waste water treatment process.
4. To know about the biological process, sludge thickening, advance treatment process etc.

Learning Outcome:

1. To know the overview of waste water treatment process.
2. To understand the different parameter of waste water.
3. To develop knowledge about designing of waste water plant.
4. To analyze the industrial waste water and learn its characteristics.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	Waste Water Characteristics-Constituent of sewage physical & chemical, oxygen demand, BOD, COD, Relative Stability, population equivalent, Biological Characteristics.	30 Hours	1
II	Water Treatment- Flow diagram of conventional sewage, treatment plant, Primary treatment – screens, Grit Chambers, detritus tank, skimming tank, Sedimentation – Plain & Chemical. Secondary treatment – Trickling fitters, Biological contactor, Activated sludge process, oxidation pond and ditches, aerated lagoon.	30 Hours	1
III	Anaerobic digestion of sludge- Design of low and high rate anaerobic digesters and septic tank, soak pit, soak trench.Basic concept of anaerobic contact process, anaerobic filter	30 Hours	1
IV	Anaerobic fixed film reactor, fluidized bed and expanded bed reactors and up flow anaerobic sludge blanket (UASB) reactor. Sludge disposal.	30 Hours	

References :

1. ArceivalaS.J. "Wastewater Treatment for Pollution Control", TMH, New Delhi,Second Edition, 2000.
2. Manual on "Sewerage and Sewage Treatment" CPHEEO, Ministry of UrbanDevelopment, Government of India, New Delhi, 1999.
3. Metcalf & Eddy, INC, "Wastewater Engineering – Treatment and Reuse", FourthEdition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2003.
4. SawyerC.N, McCarty P.L and ParkinG.F, "Chemistry for Environmental Engineeringand Science", 5th ed. Tata McGraw-Hill.

MEV1151 Water and Waste-Water Lab

Course Objective:

1. To know the ph, conductivity, total solid etc of water.
2. Learn about the various parameters of water
3. Characterization of water and waste water.

Learning Outcome:

1. To develop awareness of different water quality parameter.
2. To understand the environmental significance of various parameter of water and waste water.

Course Contents:

1. To estimate the hardness of the given water sample.
2. To estimate the pH and electrical conductivity of the given water sample.
3. To estimate the acidity and alkalinity of the given water sample.
4. To estimate the chloride concentration of the given water sample.
5. To estimate the total solids, total dissolved solids and volatile solids of the given water sample.
6. To determine the BOD, COD of the given sample.
7. To verify Class I, Class II, Class III sedimentation.
8. To estimate the fluoride concentration of the given water sample
9. To determine MPN count - total and fecal.
10. To determine Heavy Metals (Cr, As, CN, Cd) in waste water.

References :

1. Peavy, "Environmental Engineering", McGraw Hill
2. GargS.K.,"water supply engineering", vol-1 Khanna Publications
3. Sawyer C.N., McCarty PL and Parkin G.F, "Chemistry for Environmental Engineers", 4thEdition, McGraw Hill, New Delhi, 1994.

MEV1201 Solid Waste Management

Course Objective:

1. Study about classification of solid wastes.
2. Study the properties of solid wastes and their reduction techniques.
3. To study how to handle wastes.
4. To study how to deal with waste.

Learning Outcome:

1. Introduction to the different types of solid wastes.
2. Detailed knowledge on properties of solid waste.
3. To know the handling and transportation techniques for solid wastes.
4. Know the processesinvolved in processing of wastes.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	Sources, Classification and Regulatory Framework: Types and Sources of solid and hazardous wastes, Need for solid and hazardous waste management, Elements of integrated waste management and roles of stakeholders - Salient features of Indian legislations on management and handling of municipal solidwastes, hazardous wastes, biomedical wastes, lead acid batteries, electronic wastes , plastics and fly ash – Financing waste management	30 Hours	1
II	Waste Characterization and Source Reduction:Waste generation rates and variation - Composition, physical, chemical and biologicalproperties of solid wastes Hazardous Characteristics , TCLP tests, waste sampling and characterization plan - Source reduction of wastes, Waste exchange, Extendedproducer responsibility - Recycling and reuse	30 Hours	1
III	Storage, Collection and Transport of Wastes**:** Handling and segregation of wastes at source storage and collection of municipal solidwastes, Analysis of Collection systems - Need for transfer and transport – Transferstations Optimizing waste allocation– compatibility, storage, labeling and handling ofhazardous wastes – hazardous waste manifests and transport Waste Disposal :Waste disposal options – Disposal in landfills - Landfill Classification, types and methods– site selection - design and operation of sanitary landfills, secure landfills and landfillbioreactors – leachate and landfill gas management – landfill closure and environmentalmonitoring	30 Hours	1

IV	Waste Processing Technologies : Objectives of waste processing, material separation and processing technologies, biological and chemical conversion technologies, methods and controls of Composting-thermal conversion technologies and energy recovery, incineration	30 Hours	1

References :

1. T. Hilary and Samuel A, Vigil, "Integrated Solid Waste Management", Mc-Graw Hill International edition, New York
2. LaGrega M., Philip L .Buckingham, "Hazardous waste Management", Mc-Graw HillInternational edition, New York
3. CPHEEO, "Manual on Municipal Solid waste management, Central Public Health
   and Environmental Engineering Organisation , Government of India, New Delhi
4. Vesilind&Worrell, "Solid waste Engineering" Thomsonb Learning Inc., Singapore

MEV1202 Air and Noise Pollution and Control

Course Objective:

1. Study about Structure and composition of Atmosphereand learn about the various parameters of air pollution.
2. Effects of meteorology on Air Pollution and study factors affecting Selection of Control Equipment
3. To study the factors affecting Selection of Control Equipment.
4. To study about sound and noise and control measures for noise pollution.

Learning Outcome:

1. Introduction to the basic composition of atmosphere and the pollutants present.
2. Detailed knowledge to study air pollution and standard emissions.
3. Control of particulate contaminants.
4. Know about the noise pollution and its control.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	Introduction:Structure and composition of Atmosphere – Definition, Scope and Scales of Air Pollution– Sources and classification of air pollutants and their effect on human health,vegetation, animals, property, aesthetic value and visibility- Ambient Air Quality andEmission standards – Air Pollution Indices – Emission Inventories – Ambient and stacksampling and Analysis of Particulate and Gaseous Pollutants.	30 Hours	1
II	Meteorology: Effects of meteorology on Air Pollution - Fundamentals, Atmospheric stability, Inversion,Wind profiles and stack plume patterns- Atmospheric Diffusion Theories – Dispersionmodels, Software application, Plume rise, Effective stack height Control of Gaseous Contaminants:Factors affecting Selection of Control Equipment – Working principle, Design andperformance equations of absorption, Adsorption, condensation, Incineration, Bioscrubbers, Bio filters – Process control and Monitoring - Operational Considerations -Costing of APC Equipment – Case studies for stationary and mobile sources	30 Hours	1
III	Control of Particulate Contaminants: Factors affecting Selection of Control Equipment – Gas Particle Interaction, Workingprinciple, Design and performance equations of Gravity Separators (cyclone) , Centrifugal separators Fabric filters, Particulate Scrubbers, Electrostatic Precipitators –Operational Considerations - Process Control and Monitoring – Costing of APCequipment – Case studies for stationary and mobile sources.	30 Hours	1

IV	Noise Pollution And Control: Definition of decibel, sound power level, sound intensity level and sound pressure level; measurement of noise level; basic concept of community noise, transportation noise and industrial noise; acceptable outdoor and indoor noise levels; effects of noise and control measures.	30 Hours	1

References :

1. Nevers N. " Air Pollution Control Engineering", McGraw Hill, New York,
2. David.H.F,BelaG., "Air Pollution", Lweis Publishers.
3. AnjaneyuluY., "Air Pollution and Control Technologies", Allied Publishers (P)
   Ltd., India
4. SternArthur C, "Air Pollution (Vol.I – Vol.VIII) ", Academic Press New Delhi
5. Warner F., Wark K. "Air Pollution: Its Origin and Control (3rd Edition)" Prentice Hall publication
6. *Seinfeld* J. H. "Atmospheric Chemistry and Physics of *Air Pollution*" John Wiley &. Sons publication

MEV1203 Environmental Quality Management

Course Objective:

1. Study about the instrumentation methods for sample analysis.
2. Learn about spectroscopic techniques to assess the sample.
3. Learn about chromatographic techniques to assess the sample.
4. Study about the continuous monitoring equipments.

Learning Outcome:

1. Introduction to the basic instrumentation techniques.
2. Detailed knowledge of spectroscopic techniques.
3. To know the chromatographic techniques.
4. Know the other monitoring equipments.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	Environmental impact assessment: Introduction, Concepts and aims, Impact statement,Methods and Processes, Mitigation processes.Prediction and assessment of impact on air, water and noise. Public participation in environment decision making	30 Hours	1
II	Environment education and awareness, Environmental economics, Economics of Pollution control, Cost benefit analysis. Prediction and assessment of impacts on the biological, cultural and socio-economic environment, Introduction and basic concepts. Environmental impact assessment of major development projects	30 Hours	1
III	Concepts of Environmental Audit, Objectives of audit. Types of audits, programme, Audit Report, Action Plan & Management of audits. Waste management contractor audits, Lifecycle approach	30 Hours	1
IV	Introduction, Principles and Elements of Successful environmental management. ISO Principles, EMS, Creating an environmental management system in line with ISO 14000	30 Hours	1

References :

1. Willard Dean., and Settle. 'Instrumental methods of analysis Edn. Words Worth, New York, 2004.
2. PaulR, "Environmental Quantitative Analysis: Principles, Techniques, and Applications", Marcel Dekker; 1 edition
3. Ewing, "Instrumental Methods of Chemical Analysis", 5th Edition, McGraw Hill, New York

MEV1251 Air and Noise Pollution Lab

Course Objective:

1. Study about basic concepts of air pollutant
2. To determine the PM_{10} and $PM_{2.5}$ level
3. To find out the SO_2, NO_2
4. To determine the sound level

Learning Outcome:

1. Awareness about air pollution modelling
2. Detailed study of air pollutant
3. To develop knowledge about environmental significance of pollutants
4. To know the handling noise meter and different equipments.

Course Contents:

1. Measurement of PM_{10} and $PM_{2.5}$
2. Measurement of $PM_{2.5}$
3. Measurement of CO and HC in exhausts.
4. Measurements of SO_2 in ambient air.
5. Measurement of NO_2in ambient air.
6. Stack monitoring by BIS/EPA methods by field visit.
7. Detection of levels of noise pollution in residential, commercial, industrial and sensitive areas of Lucknow city.
8. Measurement of H_2S, $O_3$and NH_3 in ambient air
9. Plotting of windrose diagram by AERMOD software

References :

1. "Guidelines for Sampling and Measurement of notified Ambient *Air Quality*method." *NAAQS* CPCB guidelinewww.cpcb.nic.in/NAAQSManualVolumeI
2. Warner F., Wark K. "Air Pollution: Its Origin and Control (3rd Edition)"Prentice Hall; publication

MEV1011Earth and Environment

Course Objective:

1. To know the different terminologyin ecosystem
2. Conservation of environment
3. Detailed study of soil and land pollution
4. To know about theozone depletion and other environmental issue

Learning Outcome:

5. Basic concept of Ecology
6. To understand thermal pollution and radiation pollution
7. Case study of e-waste and plastic waste.
8. Detailed study on global warming

Course Contents:

Module	Course Topics	Total Hours	Credits
I	Introduction, component of environment, Importance of Clean Environment, Ecosystem, Ecological Pyramid.	30 Hours	1
II	Conservation of Environment, Source, Cause and Effect of Thermal Pollution, Radioactive and Non-Radioactive Pollution.	30 Hours	1
III	Source,Cause and Effect Soil and Land Pollution, Impact of Mining and Deforestation, Green House Effect and Global Warming, Depletion of Ozone.	30 Hours	1
IV	Biodiversity, Sustainable Development, e-Waste, Plastic Waste. Land filling.	30 Hours	1

References :

1. Mukherjee Biswarup, "Environmental Biology", Tata McGraw Hill Publishing Company Limited, New Delhi, 1997
2. Manohaan S.E., "Environmental Science and Technology", Lewis Publication, New York,1997
3. Sawyer C.N., P.L. McCartyand, G.F Parkin,. "Chemistry for Environmental Engineers", 4thEdition, McGraw Hill, New Delhi, 1994
4. DeA.K, "Environmental Chemistry", New Age International Limited, New Delhi, 1995

MEV1012Environmental Sanitation and Ecology

Course Objective:

1. To know the different terminology used in sanitation.
2. To know about basics of the ecosystem.
3. Gives the knowledge of solid waste management.
4. To know about the biological process.

Learning Outcome:

1. Exposure on the basic concepts of pollution and it's effects.
2. Detailed study about solid waste management.
3. To know about the biological process.
4. Awareness of different programme running by government.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	Introduction and terminology, Pollution types and Sources, Health Hazards,	30 Hours	1
II	Water Supply and Sanitary Installations in Buildings, Ecology and Environment, Principles of Ecology, Ecosystems, Energy Flow, Trophic Level, Food chain and Food Web, Eco-cycles of Pollutants and Species	30 Hours	1
III	Waste disposal options – Disposal in landfills - Landfill Classification, types and methods– site selection - design and operation of sanitary landfills, secure landfills and landfill bioreactors – leachate and landfill gas management – landfill closure and environmental monitoring – Rehabilitation of open dumps – landfill remediation	30 Hours	1
IV	Various problems in implementation of sanitationscheme in lndia. biogas plants, role of W.H.O. in rural sanitation of India.	30 Hours	1

References :

1. MukherjeeBiswarup, "Environmental Biology", Tata McGraw Hill Publishing CompanyLimited, New Delhi, 1997
2. ManohaanS.E.,"Environmental Science and Technology", Lewis Publication, New York, 1997
3. SawyerC.N., McCarty P.L.and. ParkinG.F, "Chemistry for Environmental Engineers", 4thEdition, McGraw Hill, New Delhi, 1994
4. DeA.K., "Environmental Chemistry", New Age International Limited, New Delhi, 1995

MEV1013 Renewable Sources of Energy

Course Objective:

1. To learn the basic concept of renewable energy resource.
2. To study the about solar energy, tidal energy, wind energy etc.
3. Detailed study of nuclear energy, hydrogen energy.
4. To develop green technology.

Learning Outcome:

1. Learn conventional and nonconventional type of energy resource.
2. To enhance knowledge about different renewable resources like solar energy, tidal energy etc.
3. To study about lithium cell.
4. To analyze characteristics of LNG and CNG.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	Introduction to Renewable Sources of Energy, Wind energy, Ocean and tidal energy etc	30 Hours	1
II	Solar Radiation – Measurements of solar Radiation and sunshine – Solar Thermal Collectors – Flat Plate and Concentrating Collectors – Solar Applications – fundamentals of photo Voltaic Conversion – solar Cells – PV Systems – PV Applications..	30 Hours	1
III	Wind Data and Energy Estimation – wind Energy Conversion Systems – Wind Energy generators and its performance – Wind Energy Storage – Applications – Hybrid systems	30 Hours	1
IV	Hydrogen, generation, storage, transport and utilization, Applications : power generation, transport – Fuel cells – technologies, types – economics and the power generation LPG/ CNG, Bio-Diesel	30 Hours	1

References:

1. BoyleG., "Renewable Energy, Power for a Sustainable Future", Oxford University Press, U.K., 1996
2. Twidell, J.W. & Weir, "Renewable Energy Sources", EFN Spon Ltd., UK, 1986
3. TiwariG.N., "Solar Energy–Fundamentals Design,Modelling and applications", Narosa Publishing House, New Delhi, 2002
4. FrerisL.L., "Wind Energy Conversion systems", Prentice Hall, UK, 1990
5. SukhatmeS.P., "Solar Energy", Tata McGraw Hill Publishing Company Ltd., New Delhi, 1997

MEV1014 InstrumentalMethod of Analysis

Course Objective:

1. To learn the basic concept of quantitative chemistry.
2. To study the about photometry, chromatography.
3. To develop green technology.
4. To study about Colorimetry.

Learning Outcome:

1. To learn the basic concept of X-Ray Fluorescence.
2. To study the about Chromatography.
3. To develop green technology.
4. To learn NMR technique.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	Introduction, Concepts of Quantitative Chemistry, Electron Paramagnetic Resonance, X-Ray Fluorescence.	30 Hours	1
II	Infrared Spectroscopy, Emission Spectroscopy, Flame Photometry, UV-Visible spectroscopy, Atomic Absorption Spectroscopy, Nephelometry and Turbidimetry, Gas Chromatography.	30 Hours	1
III	Gas-Solid Chromatography, Gas-Liquid Chromatography, High Pressure Liquid Chromatography, Polarography, Voltametry and Chronopotentiometry, Colorimetry, Fluorimetry, Laser Techniques.	30 Hours	1
IV	Electron Microscopy, Ion Chromatography, Nuclear Magnetic Resonance, TOC analyser.	30 Hours	1

References :

1. Willard H.H, MeritL.L, DeanJ.A. and SettleF.A., "Instrumental Methods of Analysis", 7th Ed. CBP Publishers and Distributors, New Delhi 1986
2. SkoogD.A., WestD,M, and NiemanT.A, "Principles of Instrumental Analysis", 5th Ed.ThomsonAsion (P) Ltd. Singapore, 2004
3. MendhamJ., DenneyR.C, BarnesJ.D and ThomasM., "Vogel's Textbook of Quantitative Chemical analysis", 6th Ed. Pearson Education Ltd New Delhi 2002.
4. Sawyer C.N., McCarty P.L and ParkinG.F., "Chemistry for Environmental Engineers", 4th Edition, McGraw Hill, New Delhi, 1994.

MEV1021Environmental Remote Sensing

Course Objective:

1. To know the thermodynamics microbial system.
2. Learn about the technique.
3. How to examine microbial contamination of water.
4. Study about the different –phases of microbial growth.

Learning Outcome:

1. Introduction to the basic principles of environmental chemistry.
2. Detailed knowledge of different parameter of water and waste water.
3. Overview of remote sensing.
4. Know the aerobic and anaerobic process involved in the water and waste-water.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	Historical Perspective, Principles of remote sensing, components of Remote Sensing,Energy source and electromagnetic radiation, Energy interaction, Spectral responsepattern of earth surface features	30 Hours	1
II	Classification of Remote Sensing Systems, Energy recording technology, Aerial photographs, Photographic systems – Across track and along track scanning,Multispectral remote sensing, Thermal remote sensing, Microwave remote sensing – Active and passive sensors, RADAR, LIDAR, Satellites and their sensors, Indian spaceprogramme - Research and development	30 Hours	1
III	Characteristics of Remote Sensing data, Photogrammetry – Satellite data analysis – Visual image interpretation, Digital image processing – Image rectification,enhancement, transformation, Classification, Data merging, RS – GIS Integration, Image processing software.	30 Hours	1
IV	GIS Concepts – Spatial and non spatial data, Vector and raster data structures, Data analysis, Database management – GIS software, Conservation of resources, Sustainableland use, Coastal zone management – Limitations	30 Hours	1

References :

1. Kiefer R.W, “Remote sensing and image interpretation”, JohnWiley and sons, New York, 2004.
2. KonechyG., “Geoinformation: Remote sensing, Photogrammetry andGeographical Information Systems”, CRC press, 1st Edition, 2002.
3. BurroughP.A, McDonnellR.A, “Principles of Geographic Information Systems” Oxford University Press, New York, 2001.
4. Lintz.J, “Remote sensing of Environment”, Addison WesleyPublishing Company, New Jersey, 1998.

MEV1022 Disaster Management

Course Objective:

1. Study about Basic concept of .environmental chemistry.
2. Learn about the various parameters of water and waste water.
3. How to examine microbial contamination of water.
4. Study about the different –phases of ofmicrobial growth.

Learning Outcome:

1. Introduction to the basic principles of environmental chemistry.
2. Detailed knowledge of different parameter of water and waste water.
3. To know the thermodynamics microbial system.
4. Know the aerobic and anaerobic process involved in the water and waste-water.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	Concept of Environmental Hazards, Environmental stress & Environmental Disasters.Types of Environmental hazards & Disasters:Natural hazards and Disasters, Volcanic Hazards/ Disasters, - Causes and distribution of Volcanoes, - Hazardous effects of volcanic eruptions, - Environmental impacts of volcanic eruptions, Earthquake Hazards/ disasters, - Causes of Earthquakes, - Distribution of earthquakes, - Flood control measures (Human adjustment, perception & mitigation), Droughts: - Impacts of droughts, - Drought hazards in India, - Drought control measures	30 Hours	1
II	Mechanics & forms of Soil Erosion, - Factors & causes of Soil Erosion, Conservation measures of Soil Erosion, Chemical hazards/ disasters-- Release of toxic chemicals, nuclear explosion, Sedimentation processes, - Global Sedimentation problems, Regional Sedimentation problems, Sedimentation & Environmental problems, Corrective measures of 23 Erosion & Sedimentation, Biological hazards/ disasters, Population Explosion	30 Hours	1
III	Three Stages: Pre- disaster stage (preparedness)- Preparing hazard zonation maps, Predictability/ forecasting & warning, Preparing disaster preparedness plan, Land use zoning, Pre-disaster stage (mitigation) Disaster resistant house construction, Population reduction in vulnerable areas, Awareness . Emergency Stage:-Rescue training for search & operation at national & regional level, Immediate relief, Assessment surveys. Post Disaster stage-Rehabilitation- Political Administrative Aspect, Social	30 Hours	1

IV	Provision of Immediate relief measures to disaster affected people, Prediction of Hazards & Disasters, Measures of adjustment to natural hazards Mitigation-discuss the work of following Institution, Meteorological observatory, Seismological observatory, Hydrology Laboratory, Industrial Safety inspectorate, Institution of urban & regional planners, Chambers of Architects, Engineering Council, National Standards Committee, Integrated PlanningContingency management Preparedness Education on disasters, Community involvement, The adjustment of Human Population to Natural hazards & disasters,	30 Hours	1

References :

1. Singh. Savinder, "Environmental Geography", PrayagPustakBhawan.
2. Sharma V.K., "(Ed) Disaster Management", IIPA Publication New Delhi.

MEV1023 Water Pollution

Course Objective:

1. Study about water, its characteristics and its constituent minerals.
2. Learn about the sedimentation principles of wastes in water.
3. How to treat waste water: primary, secondary, tertiary treatment.
4. Study about digestion of sludge.

Learning Outcome:

1. Introduction to the water quality and assessment.
2. Detailed knowledge of settling laws of particulate contamination.
3. To know the details of water treatment process.
4. Know the anaerobic process to stabilize sludge.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	Beneficial uses of water and quality requirements, standards.Concepts of water and wastewater quality: physical, chemical and bacteriologicalexamination of water and wastewater. Water borne diseases and their control. Wastewater characteristics: Temperature, pH, colour and odour, solids, nitrogen andphosphorus, chlorides, toxic metals and compounds, BOD, COD etc.Objectives of treatment: Water and wastewater treatment, unit operations and processesand flow sheets.	30 Hours	1
II	Determination of settling velocity, efficiency of ideal sedimentation tank,short circuiting; different classes of settling; design of primary and secondary settling tanks; removal efficiency for discrete and flocculent settling.Coagulation: Mechanisms of coagulation, coagulants and their reactions, coagulant aids;design of flocculators and clariflocculators.	30 Hours	1
III	Preliminary, primary, secondary and tertiary treatment processes.Primary Treatment: Screens, grit chamber and their design, sedimentation and chemicaltreatment to be given.Secondary Treatment: Theory of organic matter removal; activated sludge process,design of different units and modifications, extended aeration systems; trickling filters;aerated lagoons, waste stabilization ponds, oxidation ditches, R.B. C. etc.	30 Hours	1
IV	Design of low and high rate anaerobic digesters and septictank.Basic concept of anaerobic contact process, anaerobic filter, anaerobic fixed film reactor, fluidized bed and expanded bed reactors and upflow	30 Hours	1

	anaerobic sludge blanket (UASB)reactor. Disposal of wastewater on land and in water bodies. Introduction to Duckweed pond, vermiculture and root zone technologies and other emerging technologies for wastewater treatment.		

References :

1. Metcalf and Eddy Inc.: "Wastewater Engineering", TMH
2. Garg S.K., "Water Supply Engineering (Environmental Engineering Vol. – I)", Khanna Publication
3. Garg S.K.: "Sewage Disposal and Air Pollution Engineering (Environmental Engineering Vol. – II)", Khanna Publication

MEV1024 Rural Environmental Technology

Course Objective:

1. Study about water, its characteristics and its constituent minerals.
2. Learn about the sedimentation principles of wastes in water.
3. How to treat waste water: primary, secondary, tertiary treatment.
4. Study about digestion of sludge.

Learning Outcome:

1. Introduction to the water quality and assessment.
2. Detailed knowledge of settling laws of particulate contamination.
3. To know the details of water treatment process.
4. Know the anaerobic process to stabilize sludge.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	General: Concept of environment and scope of sanitation in rural areas. Magnitude of problems of rural water supply and sanitation. Population to be covered, difficulties. National policy. Water supply. Design population and demand loads.	30 Hours	1
II	Various approaches of planning of water supply schemes in rural areas. Development of proffered 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..	30 Hours	1
III	Improved methods and compact systems of treatment of surface and ground waters for rural water supply, slow sand filter, chlorine diffusion cartridges. Pumps, pipes materials, appurtenances and improved devices for use in rural water.	30 Hours	1
IV	Planning of distribution system in rural areas. Treatment and Disposal of waste water. Various methods of collection and disposal of night soil. simple waste water treatment units and systems in rural areas such as stabilization ponds, septic tanks.	30 Hours	1

References :

4. Metcalf and Eddy Inc.: “Wastewater Engineering” TMH
5. Garg S.K.,“Water Supply Engineering (Environmental Engineering Vol. – I)”, Khanna Publication

6. Garg S.K.: "Sewage Disposal and Air Pollution Engineering (Environmental Engineering Vol. – II)", Khanna Publication

MEV1031 Ground Water Management

Course Objective:

1. To know source of water
2. Learn about the various parameters of water
3. Ground water modeling.
4. To understand the mechanism of ground water recharge.

Learning Outcome:

1. To study about the different source of water and their availability.
2. To analyze the different parameter of water in lab.
3. To study quality aspect of ground water and surface water
4. To understand ground water management technique.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	Introduction, Occurrence of ground water, Hydrological Cycle, Ground water contamination Sources and Mechanisms of Groundwater Pollution from Landfills and Waste Dumps.	30 Hours	1
II	Physical, Chemical and Biological Characteristics of Water. Standard methods ofdetermination of important physical and chemical parameters of water quality, eg.pH, turbidity, total Solids, alkalinity, hardness etc.	30 Hours	1
III	Well Hydraulics and Water Wells, Ground Water quality, Ground Water Modeling Techniques, Surface and Subsurface Investigations of Ground water	30 Hours	1
IV	Artificial discharge and Recharge of Ground Water, Ground Water Management Techniques.	30 Hours	1

References :

1. Sawyer C.N., MacCartyP.L. and Parkin G.F., "Chemistry for EnvironmentalEngineering and Science", Tata McGraw – Hill, Fifth edition, New Delhi
2. "Manual on water supply and Treatment", CPHEEO, Ministry of UrbanDevelopment,Government of India, New Delhi
3. G.M.; Masters Introduction to Environmental Engineering and Science, Prentice Hall of India
4. GargS.K, "Water Supply Engineering-Vol.1", KhannaPublishers,NewDelhi

MEV1032 Ground Water Hydrology

Course Objective:

1. Hydrological cycle of water
2. Study the working and types of well
3. Study on ground water pollution.
4. Design of rain water harvesting.

Learning Outcome:

1. To study about the different source of water
2. Study about well hydraulics.
3. design of water treatment process
4. Application of GIS in ground water study.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	Darcy's law, General hydro-dynamic equations, flow-nets in isotropic medium, confined and unconfined aquifers,	30 Hours	1
II	Schwartz-Christoffel Transformation and its application for groundwater flow and Seepage problems. Multiple well system, partially wells, Image wells, Mutual interference of wells. Contamination of groundwater, control of Ground water	30 Hours	1
III	Control of ground water pollution.Storage and exploration of groundwater, drainage, construction and maintenance of wells, groundwater recharge and runoff, water quality, budgeting	30 Hours	1
IV	Stimulation of groundwater basin application of GIS and remote sensing for groundwater. Roof-top Rainwater Harvesting and Recharge.	30 Hours	1

References :

1. C.N Sawyer,.,P.L.MacCarty, and G.F Parkin,., Chemistry for EnvironmentalEngineering and Science, Tata McGraw – Hill, Fifth edition, New Delhi
2. "Manual on water supply and Treatment", CPHEEO, Ministry of UrbanDevelopment, Government of India, New Delhi

MEV1033 Design of Water Supply Systems

Course Objective:

1. To know the different source of water
2. Learn about the various parameters of water
3. Detailed study about the methods involved in water treatment process.
4. To know about the different types of pumping system and distribution system.

Learning Outcome:

1. To study about the different source of water and their availability.
2. Study about different method of population forecasting.
3. Learn the hydraulic design of water treatment process

Course Contents:

Module	Course Topics	Total Hours	Credits
I	Estimation of water demand for various uses, factors affecting consumption and fluctuation of demand.	30 Hours	1
II	Source of Water- Surface source - types, selection, storage reservoir – yield and capacity estimation by mass-curve method, concept of service and balancing reservoirs.	30 Hours	1
III	Water borne diseases and their control, water quality standard – potable and industrial.Water Purification- Sedimentation, Coagulation and Flocculation, Filtration, Disinfection, Miscellaneous Methods.	30 Hours	1
IV	Softening, Filtration, Disinfection, Desalination Dissolved Solids Removal, Adsorption and Ion Exchange, Electrolysis, Osmosis,Special Treatments, Pumping and Distribution Systems	30 Hours	1

References :

1. Hendricks D. "Water Treatment Unit Processes – Physical and Chemical" CRC Press, New York
2. Manual on "Sewerage and Sewage Treatment" CPHEEO, Ministry of UrbanDevelopment, Government of India, New Delhi, 1999.
3. Metcalf & Eddy, INC, "Wastewater Engineering – Treatment and Reuse", FourthEdition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2003.

4. Sawyer C.N, McCarty P.L and Parkin G.F, "Chemistry for Environmental Engineeringand Science", 5th ed. Tata McGraw-Hill

MEV1034 Industrial Wastewater Treatment

Course Objective:

1. To know general characteristic of industrial waste water
2. Learn about the various parameters of water
3. To study about the methods involved in industrial water treatment process.
4. Disposal of industrial waste water

Learning Outcome:

1. To study about the regulation of industrial waste water
2. Case studies of different industries
3. Learn about zero discharge method
4. To understand concept of common effluent treatment plant

Course Contents:

Module	Course Topics	Total Hours	Credits
I	Industrial scenario in India– Industrial activity and Environment - Uses of Water by industry – Sources and types of industrial wastewater – Nature and Origin of Pollutants - Industrial wastewater and environmental impacts – Regulatory requirements for treatment of industrial wastewater –	30 Hours	1
II	Industrial wastewater monitoring and sampling - generation rates, characterization and variables –Toxicity of industrial effluents ,Typical Industrial Wastes Characteristics and Treatment Planning of Sugar Industry, Distillery, Tannery, Electroplating Industry, Petroleum Industry,	30 Hours	1
III	Pesticide and Fertilizer Industry, Pharmaceutical Industry Textile Industry, Pulp and Paper Industry,Chlor-Alkali Industry, Soap and Detergent Industry, Atomic Power Plants, Dairy, Steel, Thermal Power Plants,	30 Hours	1
IV	General Standards for Disposal of Effluents, Concept of Common Effluent Treatment Plant.Common Effluent Treatment Plants – Joint treatment of industrial and domestic wastewater - Zero effluent discharge systems -	30 Hours	1

References :

1. Metcalf and Eddy, “Wastewater Engineering, Treatment and Reuse”, Tata McGraw Hill, New Delhi, 2003
2. Jaya P. , Reddy R. , “hydrology” Laxmi Publication
3. Sawyer C.N, McCarty P.L and Parkin G.F, “Chemistry for Environmental Engineering and Science”, 5th ed. Tata McGraw-Hill
4. GargS.K,.” Water Supply EngineeringVol.1”, KhannaPublishers,New Delhi