
DR. K. N. MODI UNIVERSITY

DEPARTMENT
OF
CIVIL ENGINEERING

STUDY AND EVALUATION SCHEME (2017-18)
M-TECH (ENVIRONMENTAL ENGINEERING)

DR. K. N. MODI UNIVERSITY
Course and Evaluation Scheme for
M. Tech. Course (Environmental Engineering)
(Effective from session 2017-2018) SEMESTER I

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme			Credit
			L	T	P	Continuous Assessment	Final Exam	Total	
1	01MTEVE101	Environmental chemistry and Microbiology	3	1	0	40	60	100	4
2	01MTEVE102	Water Treatment & Supply Systems	3	1	0	40	60	100	4
3	MOE 101- MOE 103	Elective -I	3	1	0	40	60	100	4
4	01MTEVE104	Research Process & Methodology	3	1	0	40	60	100	4
5	01MPEVE101	Environmental Engineering Lab-I	0	0	4	50	50	100	2
6	01MPEVE102	Environmental Engineering Lab-II	0	0	4	50	50	100	2
7	01MPEVE1010	Seamless Learning	0	0	2	0	100	100	1
8	01MPEVE1011	Co-Curricular Activities	0	0	2	0	100	100	1
TOTAL								800	22

List Of Subjects For Elective-I

MOE 101 Earth And Environment

MOE 102 System Analysis And Management

MOE 103 Hydrology And Hygrometry

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S. No	Subject Code	Name of the Subject	Periods			Evaluation Scheme			Credit	
			L	T	P	Continuous Assessment	Final Exam	Total		
1	01MTEVE201	Waste Water Treatment	3	1	0	40	60	100	4	
2	01MTEVE202	Air and Noise Pollution and Control	3	1	0	40	60	100	4	
3	MOE 201 - MOE 203	Elective-II	3	1	0	40	60	100	4	
4	01MTEVE204	Water Quality Modelling	3	1	0	40	60	100	4	
5	01MPEVE201	Environmental System Design Lab	0	0	4	50	50	100	2	
6	01MPEVE202	Seminar	0	0	4	50	50	100	2	
7	01MPEVE2010	Seamless Learning	0	0	2	0	100	100	1	
8	01MPEVE2011	Co-Curricular Activities	0	0	2	0	100	100	1	
		TOTAL							800	22

List of Subjects For Elective-II

MOE 201 Environmental Remote Sensing

MOE 202 Environmental Geology

MOE 203 Instrumental Method of Analysis

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S. No	Subject Code	Name of the Subject	Periods			Evaluation Scheme			Credit
			L	T	P	Continuous Assessment	Final Exam	Total	
1	02MTEVE301	Design of Water Supply Systems	3	1	0	40	60	100	4
2	MOE 301- MOE 303	Elective-III	3	1	0	40	60	100	4
3	02MPEVE301	Dissertation	0	0	16	200	200	400	8
4	02MPEVE3010	Seamless Learning	0	0	2	0	100	100	1
5	02MPEVE3011	Co-Curricular Activities	0	0	2	0	100	100	1
		TOTAL	6	2	20			800	18

List of Subjects For Elective-III

MOE 301 Disaster Management

MOE 302 Environmental Impact Assessment

MOE 303 Design of Waste Water System

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S. No	Subject Code	Name of the Subject	Periods			Evaluation Scheme			Credit
			L	T	P	Continuous Assessment	Final Exam	Total	
1	02MPEVE401	Dissertation (Final)	0	0	36	200	400	600	18
		TOTAL							

Note:

For dissertation, the students are required to compile a report including title of the dissertation,
Literature review, methodology of work to be pursued and activity schedule in the IIIrd semester. The compiled report shall be presented at the end of the IIIrd semester. Same dissertation shall be continued in the fourth semester.

M.Tech. I Semester

01MTEVE101: ENVIRONMENTAL CHEMISTRY AND MICROBIOLOGY

Unit-I

Introduction, Basic Concepts from General Chemistry, Colloidal Chemistry.

Unit-II

Environmental Biochemistry, Physico-Chemical examination of Water and Wastewater.

Unit-III

Biological examination of Water and Wastewater.

Unit-IV

Thermodynamics of Microbial systems, Mass and energy Balance of Microbial Process.

Unit-V

Aerobic and Anaerobic Microbial growth.

TEXT BOOKS:

1. Benefield D. L., Judkins F. J., Weand L. B., Process Chemistry for Water and Wastewater Treatment, 1st Edition, Prentice Hall, 1982
2. Bitton, G., Wastewater Microbiology, 3rd Ed., Wiley, 2005
3. Mitchell, R., and Gu, J.D., Environmental Microbiology, 2nd Ed., Wiley-Blackwell, 2010
4. Sawyer, C. N., McCarty, P. L., and Perkin, G.F., Chemistry for Environmental Engineering and Science, 5th edition McGraw-Hill Inc., 2002

01MTEVE102: WATER TREATMENT & SUPPLY SYSTEMS

Unit-I

Introduction and Sources of Water, Population Forecasting and Water Requirement.

Unit-II

Physical, Chemical and Biological Water Quality Parameters.

Unit-III

Solid Separation, Settling Operation, Coagulation, Softening.

Unit-IV

Filtration, Disinfection, Desalination, Dissolved Solids Removal, Adsorption and Ion Exchange, Electrolysis, Osmosis.

Unit-V

Special Treatments, Pumping and Distribution Systems.

TEXT BOOKS:

2. Water and Wastewater Engineering: Water Supply and Wastewater Removal- by Fair, Geyer and Okum. - John Wiley & Sons Canada, Limited
3. Physicochemical Processes: For Water Quality Control by W.J. Weber - John Wiley & Sons, 1972

REFERENCE BOOKS:

1. Unit operations of Sanitary Engineering by Linville Rich- Wiley, New York, 1961
2. Water and Wastewater Technology by Hammer Mark J., Hammer Mark J. - Prentice- Hall New Arrivals.

01MTEVE104: RESEARCH PROCESS AND METHODOLOGY

Unit-I

Introduction to Research and Problem Definition

Meaning, Objective and importance of research, Types of research, steps involved in research, defining research problem

Unit-II

Research Design Research design, Methods of research design, research process and steps involved, Literature Survey

Unit-III

Data Collection Classification of Data, Methods of Data Collection, Sampling, Sampling techniques procedure and methods, Ethical considerations in research

Unit-IV

Data Analysis and interpretation

Data analysis, Statistical techniques and choosing an appropriate statistical technique, Hypothesis, Hypothesis testing, Data processing software (e.g. SPSS etc.), statistical inference, Interpretation of results

Unit-V

Technical Writing and reporting of research

Types of research report: Dissertation and Thesis, research paper, review article, short communication, conference presentation etc., Referencing and referencing styles, Research Journals, Indexing and citation of Journals, Intellectual property, Plagiarism

Text Books:

1. C. R. Kothari, Gaurav Garg, Research Methodology Methods and Techniques , New Age International publishers, Third Edition.
2. Ranjit Kumar, Research Methodology: A Step-by-Step Guide for Beginners, 2nd Edition, SAGE, 2005
3. Business Research Methods – Donald Cooper & Pamela Schindler, TMGH, 9th edition
4. Creswell, John W. Research design: Qualitative, quantitative, and mixed methods approaches. Sage publications, 2013.

PRACTICAL COURSES

01MPEVE101: ENVIRONMENTAL ENGINEERING LAB-I

Group A

1. To determine the chlorine demand and residual chlorine in water.
2. To estimate the hardness of the given water sample.
1. To estimate the total solids, total dissolved solids and volatile solids of the given water sample.
2. To determine cations (Na, K, Li) and anions (sulfate, nitrate, fluoride).
3. To determine MPN count - total and fecal.
4. To estimate the chloride concentration of the given water sample

Group B

1. To determine the COD of the given sample.
2. To verify Class I sedimentation.
3. To determine the sludge volume index (SVI) of the given sludge sample.
4. To determine Heavy Metals (Pb, Cr, As, CN, Cd) in waste water.
5. To determine phenol compounds and total/kjeldahl nitrogen in wastewater.

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- To determine total phosphate in wastewater.
Field visit of water treatment plant.

NOTE:

From the above list of experiments minimum 4 experiments are required to be done from each group for the completion of practical course along with compulsory field visit.

Readings:

- Standard methods for the examination of water and wastewater, 21st Edition, Washington: APHA., 2012
- Sawyer, C. N., McCarty, P. L., and Perkin, G.F., Chemistry for Environmental Engineering and Science, 5th edition McGraw-Hill Inc., 2002
- B. Kotaiah and Dr. N. Kumara Swamy, Environmental Engineering Laboratory Manual, Charotar Publishing House Pvt. Ltd., 1st Ed., 2007
- Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, Environmental Engineering, McGraw Hill Inc., New York. 1995

01MPEVE102: ENVIRONMENTAL ENGINEERING LAB-II (Dry Lab)

Group A

- Monitoring of ambient air quality for total suspended particulate matter and respirable SPM.
- Measurement of CO, HC, H₂S and NH₄ in exhausts.
- Measurements of SO₂ and NO_x in ambient air.
- Detection of levels of noise pollution in residential/commercial/industrial and silent/sensitive areas of Lucknow city.
- Demonstrate the feasibility of the geolocation of a sound source by simultaneous noise power measurements
- Demonstrate, with a bell jar, that a material medium such as air is needed for transmission of sound waves.
- Determine the relationship between air pressure and sound decibel.
Field visit of Industrial/wastewater treatment plant and stack monitoring by BIS/EPA methods

Group B (Software)

Design of water supply and sewerage systems using WATER CAD and SEWER CAD and design of other environmental systems using HYDRUS, MODFLOW VISUAL, MATLAB, ORIGIN, Arc GIS, GWM, Air MOD, SPSS, PSPP, JASP and other statistical software.

NOTE: From the above experiments minimum 4experiments are required to be done from Group A and Group B respectively. For the completion of practical course mandatory field visit is required along with field visit report.

TEXT BOOKS:

- Metcalf & Eddy, Inc., Waste water Engineering Treatment and Reuse, McGraw Hill Inc., New Delhi.,2003
- Air pollution: its origin and control by Kenneth Wark, Cecil Francis Warner, Wayne T. Davis - John Wiley & Sons Inc

01MTEVE201: WASTEWATER TREATMENT

Unit-I

Overview of Wastewater Engineering, Terminology in Wastewater Treatment.

Unit-II

Wastewater Flow rates, Wastewater Characteristics, Water Borne Disease, Physical and Chemical Unit Operations.

Unit-III

Biological Unit Processes including Kinetics of Biological growth, Sludge Thickening, Digestion, Disposal and Nutrient removal.

Unit-IV

Self-Purification of Streams, Advanced Treatment Processes, Wastewater Collection.

Unit-V

Disposal and Reuse, Introduction to generation of Industrial Waste Water.

TEXT BOOKS:

1. Wastewater Engineering by Metchal and Eddy- Tata McGraw-Hill Education
2. Environmental Systems Engineering by L.G. Rich - Tata McGraw-Hill
3. Water and Wastewater Engineering: Water Supply and Wastewater Removal- by Fair, Geyer and Okum. - John Wiley & Sons Canada, Limited
4. Biological Process Design for Wastewater Treatment (Prentice-Hall series in environmental sciences) by Clifford W. Randall, Larry W. Benefield - Prentice Hall (1980-01)
5. Water and Waste Treatment by E.D. Schroeder - Tata McGraw-Hill Education

01MTEVE202: AIR AND NOISE POLLUTION AND CONTROL

Unit-I

Introduction, Classification, Sources, Effects, Air Quality Standards.

Unit-II

Role of Meteorology and Natural Purification Processes, Sampling, Measurement and Analysis.

Unit-III

Control Devices for Particulate and Gaseous Contaminants, Industrial Pollution.

Unit-IV

Vehicular Pollution, Indoor Air Pollution.

Unit-V

Physics of Sound, Noise - Sources and Standards, Measurement and Control of Noise Pollution.

TEXT BOOKS:

1. Air pollution control theory by Martin Crawford - McGraw-Hill, 1976
2. Air pollution control by A.C. Stern.
3. Air pollution control by H.C. Perkins - McGraw-Hill, 1974
4. Air pollution control by Joe O. Ledbetter- Dekker, 1972
5. Atmospheric Chemistry and Physics: From Air Pollution to Climate Change, 2nd Edition by John H.Seinfeld, Spyros N. Pandis.
6. Fundamentals of air pollution engineering. Environmental engineering by Seinfeld, John H.

01MTEVE204: WATER QUALITY MODELLING

Unit-I

Introduction: Water Quality, Water quality characteristics, sampling and analysis, Analytical methods, Automated analysis and remote monitoring.

Unit-II

Water quality monitoring: Water Pollution, Sources of Pollution, Nature of pollutants, Existing Approaches for Control/ - Abatement of Water Quality Degradation, Water Quality Monitoring in River Basins

Unit-III

Water quality modeling: Modelling and Monitoring, Evolution of Water Quality Models, Types of Water Quality Models, DO and BOD in streams, Transformation and transport processes, Oxygen transfer, Turbulent mixing, Non-Point Source Pollution, Modelling Approaches For Modeling Non-point Sources.

Unit-IV

Water Quality Management: Water quality objectives and standards, Water quality control models, Flow augmentation, River and Lake water quality Models, Groundwater quality Models, Wastewater Transport Systems.

Unit-V

Legal Aspects of Water quality: Water pollution control acts and Legislation.

TEXT BOOKS:

1. Tebutt, T.H.Y., (1998), "Principles of Water Quality Control", Pergamon Press, Oxford
2. Gerard Kiely, (1998), "Environmental Engineering", McGraw Hill Publications
3. Viessman, W. Jr and M.J. Hammer (1985), "Water Supply and Pollution Control", Harper and Row Publishers, New York.
4. Jerald L. Schnoor, (1996), "Environmental Modeling – Fate and Transport of Pollutants in Water, Air and Soil", John Wiley & Sons Inc., New York.

PRACTICAL COURSE

01MPEVE201: ENVIRONMENTAL SYSTEM DESIGN LAB

From the following design problem minimum 4 designs are required to be done for completing Laboratory work:

1. Design problem: Design of Wastewater Treatment plant
2. Design problem: Determination of Rate Constants and Ultimate BOD
3. Design problem: Kinetics of Biological Processes
4. Design problem: Kinetics of Chemical Processes
5. Design problem: Design integrated solid waste management system
6. Design problem : Analysis of Precipitation Data

7. Design problem : Analysis of Distribution Networks
8. Design problem : Design of water Treatment plant
9. Experimental Design Problems
10. Design of Noise barrier
11. Response, Assessment and Analysis (survey and questioner based modelling)
12. Design of Air Pollution Control Devices
13. Determine the efficiency of Class II sedimentation tank for a given wastewater sample.
14. To perform Class III type settling test to determine the zone settling rate of sludge.
15. Design of Health Effect Monitoring System

On the basis of expertise subject teacher can add more design problem which are relevant to Environmental Engineering Programme.

M.Tech. III Semester

02MTEVE301: DESIGN OF WATER SUPPLY SYSTEMS

Unit-I

Concepts of Planning of Water Supply Projects.

Unit-II

Topographic Surveys.

Unit-III

Design of Intake wells and rising mains.

Unit-IV

Detailed Design and drawings of Water Treatment Systems.

Unit-V

Design of Distribution Systems, Working Drawings.

ELECTIVE-I

MOE-101 EARTH AND ENVIRONMENT

UNIT-1

Introduction, Biosphere and Environment, Importance of Clean Environment, Assimilation Capacity of Environment,

UNIT-2

Conservation of Environment, Impact of Development on Environment, Thermal Pollution, Radioactive and Non-Radioactive Pollution,

UNIT-3

Soil and Land Pollution, Impact of Mining and Deforestation,

UNIT-4

Green House Effect and Global Warming, Depletion of Ozone,

UNIT-5

Biodiversity, Sustainable Development, e-Waste, Plastic Waste.

MOE-102 SYSTEM ANALYSIS AND MANAGEMENT

UNIT-1

Introduction to Computer languages, Linear, Quadratic, Geometric, Direct and Non-Linear Programming,

UNIT-2

Concepts of Optimization, Application of Optimization techniques,

UNIT-3

Theory of Random Variables, Modeling and Simulation,

UNIT-4 Design and Management of information systems applicable in Environmental Management.

MOE-103 HYDROLOGY AND HYGROMETRY

Unit-I

Introduction: Historical background, Hydrological cycle, forms of precipitation, its Arial and time variation, missing records, hydrological abstraction.

Unit-II

Runoff, hydrograph analysis, unit hydrograph, IUH, Nash and Clarke models. Rainfall runoff models, black-box type and physics based models.

Unit-III

Statistical Methods: Correlation coefficient, curve fitting, regression analysis, multiple regression. Various distribution and their use in hydrology, plotting positions, frequency factors, extreme value theory. Generation of random numbers and synthetic data when persistence is absent.

Unit-IV

Flow Generation: Stochastic processes, their classification, time series and its components, cor-relogram, autoregressive processes. Synthetic generation of yearly and monthly flows in hydrology.

Unit-V

Floods and Droughts: Flood estimation by various methods, design for various hydraulic structures, flood forecasting, droughts.

ELECTIVE-II

MOE 201 ENVIRONMENTAL REMOTE SENSING

UNIT-1

Definition of terms, Space and Airborne imageries,

UNIT-2

Characteristics of Photographic images, Color, Tone and texture, Techniques of photo-interpretation, Ground truth collection and verification, Principles of remote sensing, Spectral Characteristics of various earth features. The Multi-concept,

UNIT-3

Remote Sensing through Visible and other Spectral Regions. Different methods

of remotely sensed data interpretation, Machine processing of remotely sensed data,

UNIT-4

Geographical Information System (GIS), Global Positioning System (GPS).

Applications of

Remote Sensing for Environmental studies, Land use and land cover analysis, Water resources management,

UNIT-5

Flood Zoning and Damage Estimation, Pollution Studies, Survey and Management of Natural Resources.

MOE202 ENVIRONMENTAL GEOLOGY

Unit-I

Earth science and its application in environmental engineering, interior of the earth, Character and capabilities of the terrain.

Unit-II

Geological work of streams, wind and glacier and its significances. Soil erosion and conservation, rock weathering.

Unit-III

Conservation of Mineral resources and Environmental Impact of Mining. Desertification: Its causes and method of combating the desertification problems.

Unit-IV

Geological consideration for the suitable sites for dams and reservoirs, roads, tunnels and bridge and their environmental impact. Movement of surface and underground water, water-logging and its impact on environment and remedial measures.

Unit-V

Natural hazards such as like earthquake, landslides, flood, cyclones, their effects, causes and migration. Geological consideration for site selection for disposal of waste and pollutants.

MOE203 INSTRUMENTAL METHOD OF ANALYSIS

UNIT-1

Introduction, Concepts of Quantitative Chemistry, Electron Paramagnetic Resonance, X-Ray Fluorescence,

UNIT-2

Infrared Spectroscopy, Emission Spectroscopy, Flame Photometry, UV-Visible spectroscopy, Atomic Absorption Spectroscopy,

UNIT-3

Nephelometry and Turbidimetry, Gas Chromatography, Gas-Solid Chromatography, Gas-Liquid Chromatography, High Pressure

UNIT-4

Liquid Chromatography, Polarography, Voltametry and Chronopotentiometry, Colorimetry,

UNIT-5 Fluorimetry, Laser Techniques, Electron Microscopy, Ion Chromatography, Nuclear Magnetic Resonance, TOC analyser.

ELECTIVE-III

MOE 301 DISASTER MANAGEMENT

UNIT-1

Disaster: Type, causes, consequences and mitigation technique with respect to earthquake, landslides, floods, avalanches, cyclones,

UNIT-2

Tsunamis and drought, dam failure due to reservoir included seismic city.

Glacier: Type, characteristics protection of important monuments from glacial flow.

UNIT-3

Disaster Management: Scope, concept and terms in disaster management, tools and methods of disaster management, technologies of disaster management.

UNIT-4

Disaster preparedness and mitigation: Preparedness planning, role and responsibility, public awareness and warning, basic principles and elements of disaster mitigation.

TEXT BOOKS:

1. Natural Disaster Management: New Technologies and Opportunities by Subir Ghosh; Icfai University Press
2. Earth and Atmospheric Disasters Management by N.Pandharinath and C.K.Rajan, BS Publication

REFERENCE BOOK:

1. Natural Hazards and Disaster Management by R.B.Singh; Rawat Publication

MOE 302 ENVIRONMENTAL IMPACT ASSESSMENT

UNIT-1

Basic concept of EIA and Methodologies: Initial environmental Examination, Elements of EIA, -factors affecting EIA Impact evaluation and analysis, preparation of Environmental

UNIT-2

Base map, Classification of environmental parameters E I A Methodologies: Introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/Benefit Analysis. Impact of Developmental Activities and Land use. Introduction,

UNIT-3

Methodology for the assessment of soil and ground water, Delineation of study area, Identification of activities. Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation. Prediction and Assessment of Impact: Quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures. E I A in surface water, Air and Biological environment: Methodology for the assessment of Impacts on surface water environment, Air pollution sources, generalized approach for assessment of Air pollution Impact.

UNIT-4

Environmental Audit & Environmental legislation: objectives of Environmental Audit, Types of environmental Audit, Audit protocol, stages of Environmental Audit, on-site

activities, evaluation of Audit data and preparation of Audit report. Post Audit activities:

UNIT-5

The Environmental pollution Act, The water; Act, the Air (Prevention & Control of pollution Act.), Mota Act. Wild life Act. Case studies and preparation: of Environmental Impact assessment statement for various Industries.

TEXT BOOKS:

1. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B.S. Publication, Sultan Bazar, Hyderabad.
2. Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke – Prentice Hall Publishers

REFERENCE BOOKS:

1. Environmental Science and Engineering, by Suresh K. Dhaneja – S.K.,Katania & Sons Publication., New Delhi
2. Environmental Pollution and Control, by Dr. H.S. Bhatia – Galgotia Publication (P) Ltd, Delhi

MOE 303 DESIGN OF WASTEWATER SYSTEMS

Unit-I

Concepts of Planning of Wastewater Collection.

Unit-II

Treatment and Disposal Projects, Topographic Surveys.

Unit-III

Design of Sewerages.

Unit-IV

Detailed Design and drawings of Wastewater Treatment Systems.

Unit-V

Design of Disposal Systems, Working Drawings.