Revised Syllabus of

M.E. (Environmental Engineering)

[Effective from July-2013 - 2014]
The Degree of Master of Environmental Engineering

ELIGIBILITY

The candidates applying for M.E Environmental Engineering should have passed B.E./B. Tech. Degree examination in relevant discipline with minimum 55% marks. However, the candidates applying for Environmental Engineering should have passed B.E/B. Tech. Degree examination with minimum 55% marks in any one of the disciplines of Civil, Chemical, Mechanical, and Agriculture Engineering.
## FACULTY OF ENGINEERING AND TECHNOLOGY

**Proposed Revised Structure of M.E. (Environmental Engg)**

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<th>SUBJECT</th>
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### FACULTY OF ENGINEERING AND TECHNOLOGY

**Proposed Revised Structure of M.E. Second Year (ENVIRONMENTAL.ENG)**

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L. = Theory, P = Practical, CH= Contact Hours, CT = Class Test, TW = Term Work

Term Work of Dissertation part – II of Semester IV should be assessed jointly by the pair of internal and external examiner during oral examination.
MEV601: Computational and statistical methods in environmental

Teaching Scheme:
Lectures: 3 Hours/Week
Tutorial: 1 Hours

Examination Scheme:
Theory Paper: 80 Marks
Test: 20 Marks
Credit: - 4

UNIT-I
Linear system – Finite Difference, Gaussian elimination and Gauss, Jordan methods, matrix inversion, Gauss seidel method – Nonlinear equations – Regula falsi and Newton-Raphson methods, interpolation – Newton’s and Lagrange’s interpolation

UNIT-II
Linear Programming, Graphical and Simplex methods, Measures of central tendency, dispersion,

UNIT-III
Moments, Skewness and Kurtosis, Probability, conditional probability, Bayes’ theorem

UNIT-IV
Random variable – two dimensional random variables – standard probability distributions Binomial Poisson and normal distributions - moment generating function

UNIT-V
Sampling distributions – confidence interval estimation of population parameters – testing of hypotheses – Large sample tests for mean and proportion – t-test, F-test and Chi-square test – curve fitting-method of least squares

UNIT-VI
Regression and correlation – rank correlation – multiple and partial correlation – analysis of variance-one way and two way classifications – experimental design – Latin square design, Time series analysis.

Recommended Books:
3. Numerical Methods by Krishna Raju
4. Shanthakumar M.S. Numerical Methods & Analysis


MEV6O2: APPLIED ENVIRONMENTAL CHEMISTRY AND MICROBIOLOGY

Teaching Scheme                                            Examination Scheme
Lectures: 3 Hours/Week                                      Theory Paper: 80 Marks
Term Work: 25                                               Test: 20 Marks
Tutorial: 1 Hours/Weeks                                      Credit: - 4

UNIT I: ENVIRONMENTAL CHEMISTRY
Concept and scope of environmental chemistry, introduction definition of important term: pollutant, contaminant, receptor, sink, aerosols, particulates, carcinogens, chemistry of decaying compounds. Significance of Environmental Chemistry in Environmental Engineering, Units of measurement.

UNIT II: PRINCIPLES OF OPTICAL METHODS
Absorption, Spectrophotometry, Flame photometry, Fluorometry. Principles of Chromatographic Methods such as Gas chromatography, High Performance Liquid Chromatography and Ion chromatography.

UNIT III: GLOBAL ISSUES
Ozone depletion: Causes and effects. Global warming: Major greenhouse gases, causes and effects. Acid rain: Causes and effects.

UNIT IV: MICROBIOLOGY OF DRINKING WATER

UNIT V: INDUSTRIAL MICROBIOLOGY
General types of industrial processes, Microbial deterioration, Biodeterioration of buildings and industrial infrastructures.

UNIT VI: HUMAN DISEASES
Tuberculosis, typhoid fever, Cholera, Influenza, AIDS, Chikungunya, Swine flu, Malaria.
Recommended Books:

8. Environmental Chemistry : Dr. B.K.Sharma and Dr. H. Kaur
11. Air Pollution :M.N.Rao and H.V.N.Rao
MEV603: Advance Water Treatment Technology

Teaching Scheme:
Lectures: 3 Hours/Week
Tutorial: 1 Hours/Weeks

Examination Scheme:
Theory Paper: 80 Marks
Test: 20 Marks
Credit: - 4

UNIT I: WATER QUALITY
Physical, chemical and biological parameters of water- Water Quality requirement - Potable water standards - Wastewater Effluent standards - Water quality indices. Water purification in natural systems

UNIT II: PHYSICAL UNIT OPERATIONS
Factors in selection of unit operations and processes - Principal type of Reactors - Flow measurement – Screening - Flow Equalisation - Mixing - Static and Mechanical mixers - Coagulation and Flocculation - Perikineti c and Orthokinetic flocculation

UNIT III: SEDIMENTATION AND FLOATATION
Sedimentation - Type of settling - Removal ratio - Tray and Titled plate settlers - Flotation - Dissolved air flotation

UNIT IV: FILTRATION AND GAS TRANSFER

UNIT V: CHEMICAL UNIT PROCESS

UNIT VI: BIOLOGICAL UNIT PROCESSES
Kinetic of Biological growth - Suspended and attached growth processes - Aerobic and Anaerobic - Determination of kinetic coefficients.

Recommended Books:
MEV6O4: ENVIRONMENTAL MANAGEMENT

Teaching Scheme:
Lectures: 3 Hours/Week
Tutorial: 1 Hours/Weeks

Examination Scheme:
Theory Paper: 80 Marks
Test: 20 Marks
Credit: - 4

UNIT I: GENERAL
Global and Indian scenario. National environmental policy.

UNIT II: SUSTAINABLE DEVELOPMENT.
Environmental organization for planning and implementation.

UNIT III: LIFE CYCLE ASSESSMENT AND ENVIRONMENTAL MANAGEMENT SYSTEMS

UNIT IV: ENVIRONMENTAL IMPACT ASSESSMENT
Developmental Activity and Ecological factors. EIA, EIS, FONSI, Need for EIA studies, Baseline information, step-by-step procedure for conducting EIA, limitation of EIA.

UNIT V: FRAMEWORK OF IMPACT ASSESSMENT
Development project in environmental setting. Objectives and scope of EIA. Contents of EIA, methodologies, Techniques of EISA. Assessment and prediction of impacts on Attributes air, water, noise, land, ecology soil, cultural and socio-economic environment, IAA guidelines for development projects, Public participation in environmental decision making. Practical considerations in preparing Environmental Impact Assessment and statements.

UNIT VI: SALIENT FEATURES OF THE PROJECT ACTIVITY
Environmental parameters-Activity relationships-matrices. EIA for water resource development projects, Nuclear power plant project, mining project (coal, aluminum, iron ore, bauxite), Thermal power plant (coal based) project, Pharmaceutical industries, etc. Evolution of EIA-Concept-Methodologies screening-Scoping-Baseline

Recommended Books:
MEV6O5. INDUSTRIAL WASTE WATER TREATMENT

Teaching Scheme:                                       Examination Scheme:
Lectures: 3 Hours/Week                                Theory Paper: 80 Marks
Tutorial: 1 Hours/Weeks                               Test: 20 Marks  Credit: - 4

UNIT I: Sources of Pollution
Physical, Chemical, Organic and Biological properties of Industrial Wastes – Differences between industrial and municipal waste waters – Effects of industrial effluents on sewers and treatment plants.

UNIT II: Pre and Primary Treatment

UNIT III: Waste Water Treatment Methods

UNIT IV: Manufacturing process and sources of effluent from the process of industries
Fertilizer, petroleum, petro-chemical, paper, sugar, distillery, textile, tannery food processing, dairy and steel manufacturing.

UNIT V: Characteristics and composition of effluent and different methods of treatment & disposal of effluent

UNIT VI: Common Effluent Treatment Plants (CETPs)
Location, Need, Design, Operation & Maintenance Problems and Economical aspects.

Recommended Books:
1. W. Wesley Eckenfelder Jr., Industrial Waste Water Pollution Control.
3. Frank Woodard, Industrial waste treatment Handbook, Butterworth Heinemann, New Delhi
MEV621: LABROTARY -I

Teaching Scheme:  Exam Scheme:
Practical: 02 Hours / Week  Term work: 50 Marks
Credit: - 1

- Microscopic Examination of Microorganisms-study experiment
- Determine the Examination of Microorganisms with the help of pour plate metal
- Determine the Examination of Microorganisms with help of E-Coli test

MEV621: LABROTARY -II

Teaching Scheme:  Exam Scheme:
Practical: 02 Hours / Week  Practical Exam: 50 Marks
Credit: - 2

- Determine the residual chlorine present in the drinking water
- Determine the hardness of portable water
- Determine the solids in water using gravimetric analysis
- Determine the alkalinity of portable water
- Determination of phosphate by spectrophotometer
MEV622: SEMINAR –I

Teaching Scheme:
Practical: 02 Hours / Week

Exam Scheme:
Practical Exam: 50 marks
Credit: - 1

Each candidate is required to give one seminar on any chosen topic connected with the field of specialization. The topic shall be chosen in consultation with the concerned Faculty and Head of the Department. Preparation and presentation of a seminar is intended to investigate an in-depth review of literature; to prepare a critical review and to develop confidence for making a good presentation. A report has to be submitted in the prescribed format and the seminar shall be evaluated by the respective department committee.

Seminar shall be a term work submitted in the form of a technical report of research, analysis and design on any current topic in the concerned or allied field. It is expected that the students should refer the journals, and proceedings of National and International seminar / conference. Student should follow standard practices of seminar report writing (International journals). The candidate will deliver a talk on the topic and the assessment will be made on the basis of term work and the talk thereon by internal examiner appointed by the Principal of the Institution. Seminar topics from text and reference books will not be accepted.
MEV651: AIR POLLUTION CONTROL TECHNOLOGY

Teaching Scheme:
Lectures: 3 Hours/Week
Tutorial: 1 Hours/Weeks

Examination Scheme:
Theory Paper: 80 Marks
Test: 20 Marks
Credit: - 4

UNIT- 1. INTRODUCTION
Air pollutants – Sources and classification of pollutants and their effect on vegetation and property.
Effects - Reactions of pollutants and their effects Smoke, smog and ozone layer disturbance -
Greenhouse effect – Ambient and stack sampling Air quality standards.

UNIT- II. CONTROL OF PARTICULATES
Settling chambers, cyclone separation, Wet collectors, fabric filters Electrostatic precipitators and
other removal methods like absorption and adsorption

UNIT-III. METEOROLOGY
The Measurements of a meteorological variable. Meteorology and Air pollution: Atmospheric
stability and inversions- turbulence,-plume behavior- plume rise estimation

UNIT-IV. MODELING OF DISPERSION OF AIR POLLUTANTS
Dispersion of Air pollutants. Theories on modeling of Air pollutants. Gaussian model etc.
Effective stack height and mixing depths.

UNIT-V. AUTOMOBILE POLLUTION
Sources of pollution, composition of auto exhausts, Control methods.

UNIT VI. NOISE CONTROL
Noise Standards; measurement, control and preventive measures

Recommended Books:
- H. C. Perkins, Air Pollution.
- Peavy and Rowe, Environmental Engineering, Mc-Graw Hill Publication.
MEV652. Advance Waste Water Treatment Technology

Teaching Scheme:
Lectures: 3 Hours/Week
Tutorial: 1 Hours/Weeks

Examination Scheme:
Theory Paper: 80 Marks
Test: 20 Marks
Credit: - 4

UNIT-I Waste Water Characteristics:
Physical, Chemical, Biological characteristics of waste water, sampling, flow measurement.

UNIT-II Physical and Chemical Treatment of Waste Water:
Screening, Grit removal, Flow equalization, Chemical precipitation, other solids removal operations. Disinfection with Chlorine compound, Aeration, Control of odour, Control of volatile organic compounds

UNIT-III Aerobic Treatment of Waste Water:
Design and construction aspects and the relevant parameters of significance of the following units. Activated Sludge Process, Trickling Filters, Aerated Lagoons, Rotating Biological Contactors, Sequential Batch Reactors (SBR) and Stabilization pond.

UNIT-IV Anaerobic Treatment of Waste Water:
Sludge digestion theory and principles, Septic tank design and Effluent disposal. Disposal of digested sludge, Anaerobic ponds, UASB reactors and various modifications in UASB process and anaerobic filters.

UNIT-V Construction Operations and Maintenance Aspects:

UNIT-VI Conventional and sewage treatment plants:
Industrial water treatment plants – Sludge management facilities – Wastewater reclamation plants

Reference Books:

MEV653. Solid and Hazardous Waste Management

Teaching Scheme:
Lectures: 3 Hours/Week
Tutorial: 1 Hours/Weeks

Examination Scheme:
Theory Paper: 80 Marks
Test: 20 Marks
Credit: - 4

UNIT-I. Introduction:
Definition of solid waste - waste generation in a technological society - major legislation, monitoring responsibilities, sources and types of solid waste - sampling and characterization - Determination of composition of MSW- storage and handling of solid waste

UNIT-II. Waste processing:

UNIT-III. COLLECTION AND TRANSPORT OF SOLID WASTE:
Transfer and Transport: need for transfer operation, transport means and methods, transfer station types and design requirements. Landfills: Site selection, design and operation, drainage and leachate collection systems - requirements and technical solutions, designated waste landfill remediation - Integrated waste management facilities.

UNIT-IV. HAZARDOUS WASTE MANAGEMENT:
Definition and identification of hazardous wastes - sources and characteristics - hazardous wastes in Municipal Waste - Hazardous waste regulations -minimization of Hazardous Waste- compatibility, handling and storage of hazardous waste - collection and transport

UNIT-V. HAZARDOUS WASTE TREATMENT AND DESIGN:
Hazardous waste treatment technologies - Design and operation of facilities for physical, chemical and thermal treatment of hazardous waste - Solidification, chemical fixation and encapsulation, incineration. Hazardous waste landfills: Site selection, design and operation- remediation of hazardous waste disposal sites
UNIT-VI. Environmental Waste monitoring:
Elements of integrated waste management. Economy and financial aspects of waste management.
Other Waste Types: Nuclear and Radio Active Wastes. TCLP tests and leachate studies

Recommended Books:
EV654. Environmental Geotechnology

Teaching Scheme:
Lectures: 3 Hours/Week
Tutorial: 1 Hours/Weeks

Examination Scheme:
Theory Paper: 80 Marks
Test: 20 Marks
Credit: -4

UNIT-I. INTRODUCTION:
Introduction to Environmental Geotechniques Environmental cycles and their interaction-Soil water environment interaction relating to geotechnical problems-Effect of pollution on soil water behaviourSources, production and classification of wastes-Environmental regulations in India-Case studies of foundation failures by ground contamination

UNIT-II. SITE SELECTION AND METHOD OF DISPOSALS:
Criteria for selection of sites for waste disposal facilities-parameters controlling the selection of wastes disposal sites-current practices for waste disposal, subsurface disposal techniques-Passive contaminant systems-Leachate contamination-applications of geomembrane and other techniques in solid and liquid waste disposal-rigid or flexible membrane liners.

UNIT-III. HYDROLOGY OF CONTAMINANTS:
Transport phenomena in saturated and partially saturated porous media-contaminant migration and contaminant hydrology-Hydrological design for ground water pollution control-Ground water pollution downstream for landfills Bearing capacity of compacted fills-foundation for waste fill ground-pollution of aquifers by mining and liquid wastes-protection of aquifers

UNIT-IV. HAZARDOUS WASTE DISPOSAL:
Hazardous waste control and storage system-Stabilization/Solidification of wastes-Processes and Functions-Monitoring and performance of contaminant facilities-Environmentally safe disposal of solid and liquid waste

UNIT-V. REMEDIAL MEASURES:
Ground modification techniques in waste fill, Remedial measures for contaminated grounds-Remediation technology-Bioremediation.

Recommended Books:
MEV655. OCCUPATIONAL SAFETY AND HEALTH

Teaching Scheme:                      Examination Scheme:
Lectures: 3 Hours/Week                Theory Paper: 80 Marks
Tutorial: 1 Hours/Weeks               Test: 20 Marks
Credit: - 4                           

UNIT I. Introduction,

Occupational Safety and Health Act, Occupational Safety and Health Administration, Right to know Laws.

UNIT II. Indian Acts And Accident

Labour Act, Factories Act, OSHA, Causation, investigation methods and different models.

UNIT III. Ergonomics

Need, Task Analysis, Preventing Ergonomic Hazards, Ergonomics Programme.

UNIT IV. Occupational Hazard and Control

Hazard Analysis, Human Error and Fault Tree Analysis, Emergency Response. Hazards and their control in different manufacturing and processing industries.

UNIT V. Fire Prevention and Protection


UNIT VI. Occupational Health And Health problems in different types of industries

Health and Safety Considerations, Personal Protective Equipment. – construction, textile, steel and food processing, pharmaceutical, occupational Health and Safety considerations in Wastewater Treatment Plants.
Recommended Books:


   International Thomson Publishing Inc.


   GOI, New Delhi.


   Pollution Control Handbook”
MEV771: LABROTARY- III

Teaching Scheme:  
Practical: 02 Hours / Week

Exam Scheme:
Term work: 50 marks
Credit: - 1

ANALYSIS OF A AIR AND NOISE

- Ambient air quality Analysis: Determination of SPM, CO, NOx and SOx.
- Ambient noise quality
- Dust fall measurement by tile
- Dust fall measurement by dust sampler

MEV772: LABROTARY- IV

Teaching Scheme:  
Practical: 02 Hours / Week

Exam Scheme:
Practical Exam: 50 marks
Credit: - 2

Part B: Design of any 4 components of treatment units of the same industry or treatment plant visited
MEV773: SEMINAR- II

Teaching Scheme :
Practical: 02 Hours / Week

Exam Scheme :
Practical Exam: 50 marks
Credit: - 1

Topic of the seminar II shall be decided in such a way that it will enhance the knowledge of the student in a particular topic which is not covered in the syllabus. It is expected that the students should refer the journals, and proceedings of National and International seminar/conferences. Student should follow International Practice of seminar report writing (International Journals). The candidate will deliver a talk on the topic and the assessment will be made on the basis of term work and the talk thereon by internal examiner appointed by the Principal of the Institution. Seminar topics from text and reference books will not be accepted.
SEMISTER – III

MEV731: DISSERTATION PART-I

Teaching Scheme:
Practical: 12 Hours / Week

Exam Scheme:
Term work: 50 marks
Practical: 50 marks
Credit: 12

It will be taken up by the student at the end of the second semester and the duration would be six months. This is aimed at training the students to analyze independently any problem posed to them. The work may be analytical, experimental, design or combination of these. The dissertation report is expected to exhibit clarity of thought and expression, critical appreciation of the existing literature and analytical and/or experimental or design skill. The evaluation of dissertation will be based on continuous internal assessment comprising three seminars, one internal Viva-voce and an external Viva-voce examination.

The dissertation shall consist of a report on any research work done by the candidate or a comprehensive and critical review of any recent development in the subject or detailed report of the project work consisting of experimentation/numerical work, design and or development work that the candidate has executed.

- In part I dissertation it is expected that the student should decide a topic of dissertation which is useful in field or practical life. It is expected that the students should refer the journals, and proceedings of National and International seminar/conferences. Emphasis should be given to the introduction of topic, literature review, objective of the study along with some preliminary work/experimentation carried out on dissertation topic.

- Student should submit part I dissertation report (soft bound) in three copies covering the content discussed above and highlighting the features of the works to be carried out part II of the dissertation. Student should follow standard practice of dissertation writing.

- The candidate will deliver a talk on the topic and the assessment will be made on the basis of term work and the talk thereon by internal examiner appointed by the Principal of the Institution.
SEMESTER - IV

MEV 781: DISSERTATION PART - II

Teaching Scheme:
Practical: 20 Hours / Week

Exam Scheme:
Term work: 100 Marks
Practical: 200 Marks
Credit: 20

The part II of dissertation will be in continuation of part I after completion of work satisfactorily the examinee shall submit the dissertation in soft bound two copies to the head of department. The examinee shall present the pre synopsis of the dissertation work before two internal examiners out of which one will be guide. The suggestion given by these two examiners should be incorporated before submitting the final four copies of the head of the institution. The term work marks should be submitted to the university by the internal guide, examinee should take into account the opinion of other two examiners who were present at time of pre synopsis.

Viva-voce examination shall consist of defense presented by the examinee on his/her work in the presence of other teachers and students and two examiners appointed by the university, one of whom will be the guide and second will be external examiner.