MTEE 101 -ENVIRONMENTAL CHEMISTRY & MICROBIOLOGY

UNIT-I

Fundamentals of general chemistry: Elements, symbols, atomic rate, chemical equation, gas laws, Le-chateler's principle, activity, solubility product, ion effect.

Physical chemistry: Thermodynamics vapour pressure, surface tension, osmosis, electrochemistry, conductivity, chemical kinetics, and adsorption.

Equilibrium chemistry: Acids and bases, pH concept, equilibrium problems, titration, buffers, solubility, oxidation and reduction reactions.

UNIT-II

Basics of organic:

Organic chemistry: Aliphatic compound, alcohol, aldehydes and ketones, halogenated carbon compounds, esters, simple carbon compound containing nitrogen, cyclic and aromatic compounds etc. Dyes, carbohydrates, fats, oil, proteins, detergent, pesticides, trace organics.

UNIT-III

Water analysis and atmospheric reaction, standard methods of analysis, basic concepts from quantitative chemistry :

Atmospheric reaction including tropospheric and stratospheric chemical reactions, urban atmosphere, hazardous chemical and their control.

UNIT-IV

Relevance of microbiology to environmental engineering: Micro-organism, classification structure and function, pathway of metabolism proteins, fatty acids, nuclei acids, lipids, amino acids, enzymes.

UNIT-V

Colloidal and Nuclear Chemistry: Colloidal and dispersion, general properties and significance of colloids. Atomic structure, radio activity, nuclear reaction, fission and fusion, traces.

Reference Books:

1. Clair N. Sawyer & Perry L. Mc Carty : Chemistry for Environmental Engg., McGram-Hill, Inc.
2. Manahan, S.E. : Environmental Chemistry, Lewis, Chetsea MI
3. Wertheim, E & H. Jeskey : Introductory Organic Chemistry, McGraw-Hill N.Y.
4. Brock T.D. and M.T. Madigan : Biology of Micro-organism, Prentice Hall, Englewood Cliffs N.J.
5. White A, P. Handler & E. Smith : Principles of Biochemistry, McGraw-Hill. N.Y.
6. Ross, S& I.D. Morrison : Colloidal System & Interface, Wiley – Inter science N.Y.
7. Harvey, B.G. : Introduction to Nuclear Physics & Chemistry, Prentice Hall Engle Wood N.J.

W.e.f. Academic Session 2015-16

MTEE 102-WATER TREATMENT – I

UNIT - I

Process Dynamics. Mechanics of mass transport. Reactor Engineering process design.

UNIT -II

Water Quantity and concepts of beneficial use. water Quality criteria and drinking water standards.

UNIT - III : Sedimentation:

Settling velocity of discrete particle. hindered settling of discrete particles. settling of flocculent suspensions. efficiency of an ideal settling basin. size weight composition and removal. reduction in settling efficiency by currents. short circuiting and basin stability. elements of tank design. general dimensions. Inlet and outlet hydraulics. common tank loadings.

UNIT - IV : Coagulation and flocculation:

Objectives. coagulation mechanisms mixing and stirring devices (Gravitational and mechanical) Flocculator loading and performance. up flow classification.

UNIT - V: Filtration:

Granular water filters. granular filtering materials. grain size and size distribution. grain shape and shape variation. preparation of filter sand hydraulics of filtration. hydraulics of stratified. unstratified and fluidized beds. Removal of impurities. Kinetics of filtration. 'hydraulics of back washing of filter.

References

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

MTEE 103-WASTE WATER TREATMENT - I

UNIT - I
Physical. chemical and Biological Characteristics of sewage.

UNIT -II
Wastewater treatment objectives. Classification and application of wastewater treatment methods Elements of plant analysis.

UNIT -III
Physical units operations: Screening. flow equalization. Mixing. flocculation. sedimentation. Chemical Precipitation.

UNIT - IV : Disposal of Sewage :
(A) Land treatment systems - Fundamental consideration. Irrigation systems - Design objectives. site Selection. Pre-application treatment. loading rates. land requirements. Crop-selection. distribution systems.
Rapid - infiltration systems. over land flow systems. land application of sludge.
(B) Effluent disposal and Reuse: Receiving water standards. Effluent standards.
Disposal bv dilution. Disposal into lakes. Disposal into rivers. Re-oxygenation in rivers. De-oxygenation in rivers. Oxygen sag mode. Disposal into estuaries. Disposal into ocean. Direct and indirect reuse of wastewater.

UNIT-V:
Hydraulic design of sanitary and storm sewers

References:
1. Waste Water Engineering Treatment & Reuse bv - Metcalf & Eddy (Tata Mc-Graw Hill)
2. Water & Wastewater Technology bv - Mark J.Hammer (Prentice - Hall of India)
3. Manual on Sewerage & Sewage Treatment CPHEEO. Min of Urban Dev. New Delhi

MTEE 104 - Climate Change and Clean Development Mechanism (CC & CDM)

Unit I: Basics of Climate Change:

Weather, Climate Variability, Climate change, Greenhouse gases, Natural and enhanced greenhouse effect

Natural and Man Made Sources of Greenhouse gases & Carbon emissions.

Basic Terms of Climate Change, Science of climate change, Global warming and GWP of GHG.

Climate Change (CC) Impacts on *agriculture, water resources, human health, forest* and also on Ecosystem like *Himalayan, coastal zones, Western Ghats.* Indian Network for Climate Change Assessment (INCA) 4x 4 Assessments.

Unit II: International and National Policies And Regulation

Brief History on Environmental Negotiations, Rio Summit, UNCED-1992, Convention on Biodiversity (CBD) and its key elements, Definition and concepts of Sustainable Development, Montreal Protocol on Ozone.

UNFCCC, Brief History of CC, Negotiations and Decision of Conference of Parties (COP) Kyoto Protocol & Mechanism: CDM/JI/ET, IPCC.

Ratification to UNFCCC, Assessment Reports of Intergovernmental Panel on Climate Change (IPCC) *like AR-5*

Institutional Mechanism on Climate Change(CC); MoEFCC, India's efforts on CC, PM Council of CC, National Action Plan on Climate Change(NAPCC), National Missions: Its objectives and Status, NATCOM, GHG Inventorization, Low Carbon Economy, Intended National Determined Contribution (INDC), State Action Plan on Climate Change(SAPCC).

Unit III: Clean Development Mechanism

Basics of CDM/CDM Glossary, CDM project cycle, PIN, PDD, DNA of India, National Approval Potential of Carbon markets, CDM Related bodies, E+ & E- Policies, PoA

Baseline Standardization and Demonstration of Additionality, Methodologies & Tools for Validation, Monitoring and Verification, Large, Small and Micro Scale Projects.

Other Voluntary Carbon markets: Chicago Climate Exchange, Gold Standard (GS), Verified Carbon Standard (VCS), NAMA,

Unit 4: CC & CDM Project Development Opportunity

Case Studies on Renewable Energy, Solid Waste Management, Energy Efficiency, Forestry.

Identification/Possibilities of CDM projects in MP.

Unit 5: Climate Change Adaptation & Mitigation

Basics of Adaptation and Mitigation; Adaptation strategies & options, REDD+.

Concept of Vulnerability, Exposure, Sensitivity, Adaptive Capacity with regards to Sustainable Development Indicators.

Environmentally sound technologies for *transport, infrastructure, industry, waste management, energy efficiency, Renewable and alternative energy, Green building and other carbon sequestration technologies.*

MTEE- 105 SOLID WASTE MANAGEMENT

UNIT –I: Introduction and Basic data: Concept and dimension of third pollution survey and discussion of Generation and Characterization of solid waste (Physical, Biological and Chemical); Integrated Solid waste Management; Waste Reduction at the source, community collection methods, Critical appraisal, Rate Variation, Management options for Solid Waste.

UNIT-II: Collection and conveyance systems: Volume reduction during and prior collection Transformations and disposal Techniques, Size reduction and classification collection management systems routing and Scheduling, Special collection problems or reuse and recycling for waste alleviation, problems of sorting and separation.

UNIT-III: Disposal methods: Unit operations in composting practices, Vermin-Composting, Health problems and bio-degradation, soil microbes and their influence in waste disposal, public relation and marketing problems, unit operation of sanitary land fill site selection and land use planning, design of landfills Movement and control of landfill leachate & gases.

Technical and economic aspects and incinerator operations, components and unit operation for waste incinerator operation problems, high temperature .

UNIT-IV: Solid Waste System: solid waste management collection and conveyance system drying and incineration systems, dewatering and conditioning systems, refuse derived fuels, land filling, Discussion of solid waste acts, resources and recovery act of other countries rate of solid waste in total environment protection necessity of public education and persuasion managed solutions to collection and disposal problems

UNIV-V: **Waste to energy options:** combustion (unprocessed and processed fuel), gasification, anaerobic digestion, pyrolysis.

References:-

1) Solid Waste Management Collection :A.D. Bhide and B.B. Sudershan
2) Solid Waste Engineering Principles, Tecobanoglous G.
3) Handbook of Solid Management, Frank Kreith, Mcgraw Hill,Inc USA
4) Solid waste Management- A practical approach by Manoj Datta
5) Energy form solid waste by Jackson
6) Refuse recycling and recovery by John R. Holmes
7) Handbook of Solid Waste Management Frank Kreith, Mcgraw Hill, Inc USA
8) Hand Book Environmental Engineering Vo12, Lawrence K.Wang and Worman C. Pereira, The Human Press Clifton, New Jersey (1980)
9) Hand Book Environmental Engineering Vo1, I Liptak
10) Environmental Engineering by Peavy, Rowe Tchobanogolous
11) Manual on Solid Waste Management CPHEEO,GOI
12) Waste Management and Resource Recovery by Rhyner, Schwartz & Kohrell
13) Ramachandra T.V , 2006. Management of Municipal Solid Waste , Commonwealth of Learning, Canada and Indian Institute of Science, Bangalore.

MTEE 106- ADV. ENVIRONMENTAL LAB – I

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

1. To determine the total suspended solids & dissolved solid in the water sample.
2. To determine the turbidity in wastewater sample by Nephlometer.
3. Determination of pH, temperature and conductivity of given sample by electrode method.
4. Determination of the strength of unknown strong acid by titrating it against weak base by conductometric method.
5. To determine the dissolved oxygen content of the given sample by Winkler method.
6. To determine the biochemical oxygen demand of the given wastewater sample.
7. To determine the chemical oxygen demand of the given wastewater sample.
8. To determine the fluoride content in the given water sample.
9. Find out chloride content in a given sample of water.
10. Find out iron content in a given sample of water.
11. Determine "percentage Available Chlorine" in a given sample of "bleaching: Power."
12. Find out M.P.N. in a given sample of water by :
    (A)Multiple Tube Technique
    (B) Membrane Filter Technique
13. To Study the Water/Waste Water Analyzing kit.

MTEE 107- FIELD TESTING LAB – I

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

(Suggested Exercise)

List of Experiments:

1. Determine the "Optimum Dose of Coagulant" (Alum) by "Jar Test".
2. To obtain "Filter Sand" from a given sample of "Stock Sand".
3. Find out the clay content in a given sample of filter sand.
4. Find out the ignition loss in a given sample of the filter sand. etc..