

2nd Semester

25PCEM03 ADVANCED WATER AND WASTE WATER TREATMENT (3-1-0)

Module I: (10 HOURS)

Introduction

Wastewater Sources and flow rates, Characteristics, Standards of Disposal, Treatment Objective and Strategies, Sanitary sewer design, Head works and Preliminary design, Layouts of Primary, Secondary and Advanced Treatment Units. Quantity estimation

Design of Preliminary and Primary Treatment Operations: Screens, Grit Chambers, Skimming Tank, Primary and Secondary Sedimentation Tanks.

Module II: (15 HOURS)

Biological Treatment Processes: Types, Kinetics of Plug Flow and Completely Mixed Systems for aerobic and anaerobic systems.

Attached Growth Processes: Trickling Filters (Standard Rate, High Rate), Biofilters, Practices, Features and Design, Operational Difficulties and Remedial Measures, Rotating Biological Contactors.

Module III: (15 HOURS)

Suspended Growth Processes: Activated Sludge Process, Modifications and Design Equations, Process Design Criteria, Oxygen and Nutrient Requirements – Classification and Design of Oxidation Ponds, Lagoons, Root Zone Treatment Systems, Membrane bio reactors, fluidized bed reactors, Hybrid Systems.

Sludge Treatment and Disposal: Sludge Thickening, Aerobic and Anaerobic Sludge Digestion Processes, Design of Digester Tank, Sludge Dewatering, Ultimate Disposal, Other Methods of Sludge Treatment.

Learning Resources:

Text books:

1. Wastewater Engineering – Collection, Treatment, Disposal and Reuse, Metcalf and Eddy, 5th Ed., McGraw Hill Pub. Co., 2014
2. Water and Wastewater Engineering: Design Principles and Practice Mackenzie L. Davis, McGraw Hill, 2010.

Reference Books:

1. Biological Process Designs for Wastewater Treatment, Benefield L.D. and Randall C.D., Prentice Hall Pub. Co., 1980
2. Fundamentals of Biological Wastewater Treatment, UdoWiesmann, In Su Choi and Eva-Maria Dombrowski, , 1st Ed., Wiley, 2007
3. Wastewater Engineering: Treatment, Disposal, and Reuse, Tchobanoglous, G., et al., Fifth Edition, Metcalf & Eddy, Inc., McGraw-Hill Publishers, New York, 2013.
4. Water Treatment Principles and Design, Crittenden, J.C., et al., 2nd Ed., Montgomery, Inc., John Wiley and Sons, New York, 2005.
5. Unit Operations and Processes in Environmental Engineering, Reynolds, T.D., Richards, P.A., PWS Publishing Company, Boston, 1996

Online Resources:

1. <https://nptel.ac.in/courses/105/105/105105178/>
2. <https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-85-water-and-wastewater-treatment-engineering-spring-2006/lecture-notes/>
3. https://onlinecourses.nptel.ac.in/noc21_ce25/preview