

Course Title: Introduction to Environmental Engineering

Course Code: ENVE 101

Credit Hours: 2

Course Description:

This course provides an overview of the state-of-the-art information on the discipline of environmental engineering and its scope. The students will develop a general knowledge and understanding of the quantification, estimation and other key concepts of pollution control, waste management, life cycle assessment and environmental assessment. They will also be equipped with the knowledge of incorporating environmental considerations in design of projects and products.

Course Contents:

Unit 1: Introduction

Profession, Engineering, Engineering decisions, Environmental engineering

Unit 2: Units of Measurement

Values, Units and Dimensions, Size and scale of measurement, Flow (discharge) rate, Retention time, Approximations in engineering calculations, Procedure for calculations with approximations

Unit 3: Ecosystem and System Approach in Solving Problems

Ecosystem, Key terminologies, Why does an engineer need knowledge of Biology?, Water cycle, Carbon cycle, Nitrogen cycle, Phosphorous cycle, Environmental system

Unit 4: Mass Transfer

Basic concepts of mass and energy transfer, Mass balance, Conservative and non-conservative substance, Steady state condition

Unit 5: Basics of Pollution Control and Waste Treatment

Water purification process, Kinetics of bacterial growth, Basics of biological treatment, Basics of physical treatment, Basics of chemical treatment

Unit 6: Environmental Quality Parameters

Physical parameters, Chemical parameters, Biological parameters, Refractory organics

Unit 7: Environmental Management System

Product life cycle assessment, Quantitative risk assessment, Environmental Impact assessment, Quality management system, Cleaner production

Unit 8: Green Engineering and Built Environment

Fundamental concepts, Low impact development, Context sensitive design, Waste design, urban planning, smart growth and planned communities

References:

1. P. Aarne Vesilind, Susan M. Morgan, *Introduction to Environmental Engineering*, Thompson Brooks / Cole
2. James R. Mihelcic and Julie B. Zimmerman, *Environmental Engineering: Fundamentals, Sustainability and Design*, John Wiley and Sons
3. Richard O. Mines and Laura W. Lackey, *Introduction to Environmental Engineering*, Prentice Hall
4. Henrik Wenzel, Michael Z. Hauschild and L. Alting, *Environmental Assessment of Products: Volume 1: Methodology, Tools and Case Studies in Product Development*, Springer
5. Michael Z. Hauschild and Henrik Wenzel, *Environmental Assessment of Products - Volume 2: Scientific Background*, Springer
6. Soli Archeivala and Shyam R. Asolekar, *Wastewater Treatment for Pollution Control and Reuse*, Tata McGraw- Hill Education Private Limited
7. Metcalf and Eddy, *Wastewater Engineering : Collection and pumping of Wastewater*, Tata McGraw-Hill Publishing
8. Michael D. LaGrega, Phillip L. Buckingham, Jeffrey C. Evans, *Hazardous Waste Management*, Waveland Pr Inc
9. Chongrak Polprasert, *Organic Waste Recycling: Technology and Management*, IWA Publishing
10. Satoshi Takizawa, *Groundwater Management in Asian Cities: Technology and Policy for Sustainability*, Springer
11. Samir Khanal, *Anaerobic Biotechnology for Bioenergy Production: Principles and Applications*, Wiley-Blackwell