

Rutgers University-New Brunswick
School of Engineering
Dept. of Civil and Environmental Engineering
Fall 2024, Monday 6:00 pm - 9:00 pm
RWH-402, Busch Campus

Instructor: Dr. Q. Guo
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Office hrs: By appointment

16:180:592 GREEN INFRASTRUCTURE FOR WATER MANAGEMENT (Course Outline)

Topics:

1. Stormwater (the focus of this course):

Green Infrastructure as defined by U.S. Environmental Protection Agency; Hydrology and water quality; Urbanization and climate change; Watershed, regional, and municipal planning; Existing and new development areas; New Jersey stormwater management requirements (flood control, runoff treatment, groundwater recharge); CSO reduction; Urban flood management; Stormwater Best Management Practices (BMPs); Structural and non-structural measures; Nature-based solutions; Low Impact Development (LID); Green infrastructure (GI), blue infrastructure (BI), and gray infrastructure; Rain barrels, rain gardens, green roofs, pervious pavements, bioretention & biofiltration basins, infiltration basins & trenches, constructed wetlands, manufactured treatment devices, detention basins, and wet ponds; Hydraulics, drainage, piping, pumping, outfall; Soil erosion and sediment control; Cost estimates, benefits analysis; Design procedures and examples.

2. Wastewater

Water environment assessment, protection, and restoration; Modeling and analysis of receiving water quality; Total Maximum Daily Loads (TMDLs); Grey water reuse; Sludge management and beneficial use.

3. Drinking Water

Sustainable (soft) paths to water future, Water conservation.

4. Energy Generation and Recovery

Anaerobic digestion, Hydropower generation from existing water infrastructure (low head dams, outfalls, channels, etc.).

5. Environmental Impacts and Tools for Sustainability

Environmental impact assessment, Integrating new infrastructure with existing ecosystems, Dams, canals, pipelines, treatment plants - the balance between benefits and impact on the environment, Fish ladders and other adaptations to minimize disruption to the environment, Life cycle analysis tools during the design process (equivalent carbon emissions, energy usage, costs, etc.)

Prerequisites

The students should already have undergraduate degrees in engineering or applied sciences.

References

New Jersey Department of Environmental Protection (2024). New Jersey Stormwater Best Management Practices Manual, April 2004, revised multiple times, last updated in March 2024.

<https://dep.nj.gov/stormwater/bmp-manual/>

Center for Neighborhood Technology, The National Green Values™ Calculator.

<https://greenvalues.cnt.org/>

Davis, A. P., Hunt, W. F., and Traver, R. G. (2022). Green Stormwater Infrastructure: Fundamentals and Design, Wiley

Cahill, T. H. (2012). Low Impact Development and Sustainable Stormwater Management, Wiley

Chin, D. A. (2021). Water-Resources Engineering, 4th Edition, Pearson

Grading:

Homework: 30%, Exam: 30%, Presentation: 20%, Independent Project: 20%