

Rutgers University–New Brunswick
School of Engineering
Department of Civil and Environmental Engineering

16:180:592 GREEN INFRASTRUCTURE FOR WATER MANAGEMENT Fall 2026 — Course Outline

Instructor: Professor Qizhong (George) Guo
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Office: Weeks Suite 328
Office Hours: By appointment

Class: Monday, 6:00–9:00 pm
Location: RWH-402, Busch Campus
Course Website: <https://canvas.rutgers.edu/>

Course Objectives

This course introduces the principles, planning, analysis, and design of green infrastructure for sustainable water management, with primary emphasis on urban stormwater management. Students will learn to evaluate and integrate green, gray, blue, and intelligent infrastructure; apply appropriate hydrologic, hydraulic, water-quality, environmental, and economic considerations; and assess infrastructure alternatives at site, municipal, regional, and watershed scales.

Topics

1. Stormwater Management — Primary Focus

Green Infrastructure as defined by the 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, including flood control, runoff treatment, and groundwater recharge; combined sewer overflow (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); green, gray, blue, and intelligent infrastructure; integrated Green–Gray–Blue–Intelligent (GGBI) framework.

Rain barrels; rain gardens; green roofs; pervious pavements; bioretention and biofiltration basins; infiltration basins and trenches; constructed wetlands; manufactured treatment devices; detention basins; wet ponds; hydraulic design of drainage systems, piping, pumping, and outfalls; soil erosion and sediment control; cost estimates and benefit–cost 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); greywater reuse; sludge management and beneficial use.

3. Drinking Water

Sustainable and soft-path approaches to water supply and management; water conservation.

4. Energy Generation and Recovery

Anaerobic digestion; hydropower generation from existing water infrastructure, including low-head dams, outfalls, channels, and related facilities.

5. Environmental Impacts and Tools for Sustainability

Environmental impact assessment; integration of new infrastructure with existing ecosystems; dams, canals, pipelines, and treatment plants—balancing infrastructure benefits and environmental impacts; fish ladders and other adaptations to minimize environmental disruption; life-cycle assessment (LCA) and related sustainability-analysis tools addressing carbon emissions, energy use, costs, and other environmental and economic considerations.

Prerequisites

Graduate standing or undergraduate preparation in engineering or applied sciences, or permission of the instructor.

References

Guo, Q. (2026). *Green Infrastructure for Water Management: Course Materials and Lecture Slides*.

<https://qizhong-guo.org/teaching/green-infrastructure/>

New Jersey Department of Environmental Protection (NJDEP) (2026). *New Jersey Administrative Code, N.J.A.C. 7:8, Stormwater Management*.

https://dep.nj.gov/wp-content/uploads/rules/rules/njac7_8.pdf

New Jersey Department of Environmental Protection (NJDEP) (2026). *New Jersey Stormwater Best Management Practices Manual*. Originally published April 2004; revised multiple times; latest update January 2026.

<https://dep.nj.gov/stormwater/stormwater-management/bmp-manual/nj-stormwater-best-management-practices-manual-2026/>

HydroCAD Software Solutions LLC. *HydroCAD Stormwater Modeling*.
<http://www.hydrocad.net/>

Center for Neighborhood Technology. *Green Values™ Stormwater Management Calculator*.
<https://greenvalues.cnt.org/>

Hale, D. (Ed.) (2021). *Site Work & Landscape Costs with RSMeans Data 2022*. R.S. Means Company.

Davis, A. P., Hunt, W. F., & 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. (2020). *Water-Resources Engineering* (4th ed.). Pearson.

The four books listed above are accessible through the Rutgers University Library.

Grading

Homework: **30%**

Exam: **30%**

Presentation: **20%**

Independent Project: **20%**

The presentation and independent project are separate assignments:

- **Presentation:** An individual oral presentation on an instructor-approved topic (e.g., a critical review of a recent research publication, emerging GI technology, or case study).
- **Independent Project:** A semester design or analysis project focusing on a practical water management problem, culminating in a comprehensive written technical report.

University Policies

Students are responsible for reviewing and complying with all applicable University policies. Full information on academic integrity, accommodations and disability services, and other student policies is available at:

Academic Integrity: <https://academicintegrity.rutgers.edu>

Office of Disability Services: <https://ods.rutgers.edu>

The detailed course schedule may be adjusted throughout the semester; topics, assignments, and due dates will be announced in class and posted on Canvas.