

Course Description Sheet

COURSE TITLE

Water Well Design for Sustainable and Smart Infrastructure

COURSE DURATION

1 Hour(s)

OVERVIEW

This course, Water Well Design for Sustainable and Smart Infrastructure, explores how sound hydrogeologic science merges with modern engineering practice to deliver water wells that operate efficiently, minimize environmental disruption, and embrace smart technologies for the decades ahead.

The following sections take you through the full process—from initial groundwater assessment through drilling, development, and operation—while emphasizing principles of sustainability and resilience.

This course presents the fundamental and advanced concepts in water well design, focusing on both the engineering and environmental stewardship aspects. It is structured to guide you through the complete life cycle of a well: research, design, drilling, development, and long-term management.

At the same time, it introduces the integration of smart infrastructure concepts—the use of data, sensors, and efficient system design to enhance performance and sustainability. By the end, you'll understand not just how to build a well, but how to build one that endures efficiently, minimizes its carbon footprint, and contributes positively to water resource management.

PREREQUISITES

No prior knowledge is required.

BEHAVIORAL OBJECTIVES

After successfully completing this course, you will be able to:

- Explain the key phases of water well design, construction, and operation, including their hydrogeologic and environmental foundations.
- Apply principles of sustainable engineering and smart infrastructure to improve water well efficiency and long-term performance.
- Identify regulatory and professional considerations that influence responsible groundwater development and resource protection.
- Evaluate case-based examples demonstrating the practical benefits of renewable energy integration, automation, and monitoring in well systems.
- Discuss the ethical and professional responsibilities of engineers in promoting sustainable and equitable groundwater use.

COURSE OUTLINE

Chapter	Minutes
Introduction	2
Research, Site Selection, and Preliminary Well Design	22
Drilling, Design, Development and Testing	19
Sustainable and Smart Infrastructure Integration	4
Sustainability Case Applications	7

Operation, Maintenance, and Rehabilitation	4
Professional Ethics and Future Directions	7
Conclusion	3
Course Total	68
+ Knowledge Checks (10% Course Total)	6.8
= Grand Total	74.8

AVAILABILITY

This course is offered online and is available 24 hours a day, 7 days a week, 365 days a year.

TRAINING METHODOLOGY & EVALUATION

This course is self-paced online training. Review exercises reinforce the content, and students are evaluated with a multiple-choice exam. Upon completion, students are prompted to submit a course evaluation.

REFERENCES

1. American Water Works Association (AWWA). (2023). *Water Wells and Sustainable Infrastructure Guidelines*. Denver, CO.
2. Environmental Protection Agency (EPA). (2024). *Groundwater Protection and Sustainability Framework*. Washington, DC.
3. International Water Association (IWA). (2023). *Smart Water Management for Sustainable Infrastructure*.
4. National Ground Water Association (NGWA). (2023). *Manual of Water Well Construction Practices*. Westerville, OH.
5. U.S. Geological Survey (USGS). (2024). *Groundwater Data and Publications*. <https://www.usgs.gov/water>
6. World Health Organization (WHO). (2022). *Guidelines for Drinking-Water Quality (5th ed.)*. Geneva, Switzerland.