

## Water Resources and Environmental Engineering Roadmap (12 Weeks)

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### Week 1: Introduction to Water Resources Engineering

- Overview of water resources and hydrology.
  - Importance and challenges.
  - Water cycle and watershed basics.
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### Week 2: Surface and Groundwater Hydrology

- Precipitation, infiltration, runoff.
  - Hydrograph analysis.
  - Groundwater flow and aquifers.
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### Week 3: Fluid Mechanics for Water Engineering

- Properties of fluids.
  - Flow types: laminar, turbulent.
  - Continuity, momentum, energy equations.
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### Week 4: Open Channel Flow

- Types of channels.
  - Flow classification: uniform, non-uniform.
  - Manning's equation and flow profiles.
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### Week 5: Hydraulic Structures

- Dams, spillways, canals.
  - Design considerations.
  - Flood control structures.
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### Week 6: Water Supply Engineering

- Water demand and quality standards.

- Treatment processes: coagulation, sedimentation, filtration.
  - Distribution systems.
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#### Week 7: Wastewater Engineering

- Characteristics of wastewater.
  - Primary, secondary, tertiary treatment.
  - Sewage disposal methods.
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#### Week 8: Environmental Pollution and Control

- Types of pollution: water, air, soil.
  - Environmental laws and regulations.
  - Pollution monitoring techniques.
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#### Week 9: Watershed and Flood Management

- Watershed modeling.
  - Flood forecasting and management.
  - Soil conservation techniques.
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#### Week 10: Groundwater Management

- Recharge methods.
  - Contamination and remediation.
  - Sustainable groundwater use.
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#### Week 11: Environmental Impact Assessment (EIA)

- EIA process and methodologies.
  - Environmental management plans.
  - Case studies.
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#### Week 12: Project / Case Study

- Design of a water treatment plant or stormwater management system.
  - Environmental impact report.
  - Field data collection and analysis.
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#### Tools and Software:

- HEC-RAS, SWMM, EPANET
- GIS software (ArcGIS, QGIS)
- MATLAB and Excel for modeling