

DEPARTMENT OF WATER RESOURCES & ENVIRONMENTAL ENGINEERING

Bologna Process Course Description Guide — Level 2 (Second Year)

DEGREE PROGRAM
B.Sc. Technical Engineering

ACADEMIC YEAR
Level 2 (Semesters 3 & 4)

TOTAL ECTS CREDITS
60 ECTS

SEMESTER 3 COURSE SPECIFICATIONS

WREE231 Fluid Mechanics

7 ECTS | 5 hrs/wk (3 Lect / 2 Lab)

Course Description: Fluid properties, hydrostatics, pressure distribution, buoyancy, fluid kinematics, momentum and energy equations (Bernoulli), dimensional analysis, pipe flow friction losses, and viscous fluid dynamics.

Weeks	Core Topics Covered	Learning Outcomes
Weeks 1–5	Fluid statics, pressure measurement, hydrostatic forces on submerged surfaces.	Calculate forces on dams, gates, and submerged structures.
Weeks 6–10	Bernoulli equation, continuity equation, energy line & hydraulic grade line.	Apply energy principles to pipe systems & flow meters.
Weeks 11–15	Laminar/turbulent flow, Darcy-Weisbach, Moody diagram, minor losses.	Compute head losses in complex piping systems.

WREE232 Engineering Surveying

6 ECTS | 4 hrs/wk (2 Lect / 2 Field)

Course Description: Principles of leveling, distance measurement, angle measurement, traverse surveying, topographic mapping, contouring, profile leveling, volume calculations, and Total Station equipment applications.

Weeks	Core Topics Covered	Learning Outcomes
Weeks 1–5	Differential leveling, profile and cross-section leveling, earthwork volumes.	Conduct field leveling and plot longitudinal profiles.
Weeks 6–10	Theodolite operation, horizontal/vertical angles, closed traverse computations.	Perform field traverse adjustments & boundary calculations.
Weeks 11–15	Topographic surveying, Total Station setup, GPS fundamentals in surveying.	Generate topographic maps for hydraulic projects.

WREE233 Water Supply Networks

6 ECTS | 4 hrs/wk (2 Lect / 2 Design)

Course Description: Water demand forecasting, source selection, intake structures, hydraulic design of distribution pipe networks, Hardy Cross method, elevated storage tanks, and booster pumping stations.

WREE234 Building Construction & Materials

5 ECTS | 3 hrs/wk (2 Lect / 1 Lab)

Course Description: Properties of engineering materials (cement, aggregates, concrete, steel, bricks), soil site investigations, foundation types, masonry work, waterproofing, and structural construction techniques.

WREE235 Solid Waste Engineering

6 ECTS | 4 hrs/wk (3 Lect / 1 Field)

Course Description: Integrated solid waste management, waste generation rates, composition, collection routing, transfer stations, recycling, composting, waste-to-energy, and sanitary landfill design (liner & leachate systems).

Weeks	Core Topics Covered	Learning Outcomes
Weeks 1–5	Sources, characterization, generation rates, waste minimization, recycling.	Determine municipal solid waste physical properties.
Weeks 6–10	Collection optimization, transfer station design, composting, incineration.	Optimize collection routes and transfer facilities.
Weeks 11–15	Sanitary landfill siting, clay/geomembrane liners, leachate/gas management.	Design safe containment for municipal solid waste.

SEMESTER 4 COURSE SPECIFICATIONS

WREE241 Engineering Hydrology

6 ECTS | 4 hrs/wk (3 Lect / 1 Tut)

Course Description: The hydrologic cycle, precipitation measurement and analysis, evapotranspiration, infiltration indices, streamflow measurement, unit hydrograph theory, peak runoff estimation, and flood routing.

Weeks	Core Topics Covered	Learning Outcomes
Weeks 1–5	Hydrologic cycle, rain gauges, spatial precipitation (Thiessen/Isohyetal).	Estimate catchment average rainfall & abstractions.
Weeks 6–10	Infiltration (Horton/Green-Ampt), runoff generation, hydrograph analysis.	Derive Synthetic Unit Hydrographs for watersheds.
Weeks 11–15	Rational method, SCS curve number, reservoir flood routing methods.	Calculate peak discharge for hydraulic structure design.

WREE242 Strength of Materials

6 ECTS | 4 hrs/wk (3 Lect / 1 Tut)

Course Description: Mechanical properties of materials, axial stress/strain, thermal stresses, torsion of circular shafts, shear force and bending moment diagrams, flexural and shear stresses in beams, beam deflection, and column buckling.

Weeks	Core Topics Covered	Learning Outcomes
Weeks 1–5	Stress-strain relationships, Hooke's Law, poison ratio, statically indeterminate axial members.	Analyze stress distributions in structural elements.
Weeks 6–10	Shear force & bending moment diagrams (SFD/BMD), flexural stress equation.	Draw shear and bending moment diagrams for beams.
Weeks 11–15	Deflection of beams (double integration method), combined loading, Euler column theory.	Calculate structural deflections and critical buckling loads.

WREE243 Soil Mechanics

6 ECTS | 4 hrs/wk (3 Lect / 1 Lab)

Course Description: Index properties, Atterberg limits, USCS/AASHTO classification, permeability, seepage, flow nets, effective stress principle, compaction, consolidation theory, and shear strength (Direct Shear, Triaxial).

WREE244 Water Quality Engineering

6 ECTS | 4 hrs/wk (2 Lect / 2 Lab)

Course Description: Water quality standards, physical/chemical/biological metrics, DO sag curve in rivers (Streeter-Phelps equation), eutrophication in lakes, water quality modeling, and self-purification mechanisms.

WREE245 Drainage Engineering

6 ECTS | 4 hrs/wk (3 Lect / 1 Field)

Course Description: Agricultural land drainage, soil salinity, leaching requirements, sub-surface pipe drainage design (Hooghoudt/Ernst equations), surface drainage channels, and drainage pumps.