

DEPARTMENT OF WATER RESOURCES & ENVIRONMENTAL ENGINEERING

Bologna Process Course Description Guide — Level 1 (First Year)

DEGREE PROGRAM
B.Sc. Technical Engineering

ACADEMIC YEAR
Level 1 (Semesters 1 & 2)

TOTAL ECTS CREDITS
60 ECTS

SEMESTER 1 COURSE SPECIFICATIONS

WREE111 Soil Physics

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

Course Description: Covers physical properties of soils including mass-volume relationships, soil texture, structure, water potential, retention curves, saturated and unsaturated hydraulic conductivity, and soil thermal/air regimes vital for water engineering.

Weeks	Core Topics Covered	Learning Outcomes
Weeks 1–4	Soil composition, phase relationships, bulk density, porosity, void ratio.	Calculate physical soil parameters & Phase diagrams.
Weeks 5–9	Soil water potential, retention curves, capillary action, infiltration.	Analyze water movement & storage in soil profiles.
Weeks 10–15	Darcy's Law, hydraulic conductivity, soil aeration and temperature.	Measure saturated hydraulic conductivity in lab.

WREE112 Environmental Chemistry

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

Course Description: Principles of aquatic, atmospheric, and soil chemistry. Emphasizes chemical equilibrium, stoichiometry, acid-base reactions, solubility product, oxidation-reduction, and chemical processes in water treatment.

Weeks	Core Topics Covered	Learning Outcomes
Weeks 1–5	Stoichiometry, chemical equilibrium, aqueous solutions, pH and alkalinity.	Evaluate buffering capacity and chemical dosage.
Weeks 6–10	Precipitation, coagulation chemistry, complexation, redox reactions.	Understand chemical coagulation in water plants.
Weeks 11–15	Water hardness, softening techniques, organic pollutants, lab titrations.	Conduct standard water quality chemical assays.

WREE113 Engineering Mechanics - Statics

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

Course Description: Basic concepts of force vectors, force system resultants, equilibrium of rigid bodies, structural analysis of trusses and frames, centroids, center of gravity, and moments of inertia.

WREE114 Mathematics I

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

Course Description: Functions, limits, continuity, differential calculus, applications of derivative (rates of change, optimization, curve sketching), definite and indefinite integrals, and basic transcendental functions.

WREE115 Environmental Microbiology

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

Course Description: Fundamentals of micro-organisms (bacteria, algae, fungi, viruses), cell structure, microbial kinetics, metabolic pathways, role in biogeochemical cycles, pathogen control, and biological wastewater indicators.

Weeks	Core Topics Covered	Learning Outcomes
Weeks 1–5	Microbial taxonomy, cell anatomy, culture media, bacterial growth kinetics.	Perform microbial staining & culturing techniques.
Weeks 6–10	Metabolism, aerobic/anaerobic respiration, nitrogen & sulfur cycles.	Explain biological degradation of organic matter.
Weeks 11–15	Waterborne pathogens, indicator organisms (E. coli, coliforms), membrane filtration.	Execute standard bacteriological water testing.

SEMESTER 2 COURSE SPECIFICATIONS

WREE121 Engineering Mechanics - Dynamics

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

Course Description: Kinematics and kinetics of particles and rigid bodies. Rectilinear and curvilinear motion, Newton's second law, work-energy principle, impulse-momentum, and rotational motion.

Weeks	Core Topics Covered	Learning Outcomes
Weeks 1–6	Particle kinematics, position, velocity, acceleration vectors, Newton's laws.	Solve motion problems in Cartesian & polar systems.
Weeks 7–11	Work-energy principle, conservative forces, potential energy, power.	Calculate energy transformations in mechanical systems.
Weeks 12–15	Impulse, momentum, impact collisions, rigid body dynamics.	Model dynamic response of hydraulic structures.

WREE122 Engineering Drawing & CAD

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

Course Description: Fundamentals of engineering drawing, geometric constructions, orthographic projections, isometric views, sectional views, dimensioning, and introduction to Computer-Aided Design (AutoCAD) drafting.

WREE123 Environmental Geology

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

Course Description: Earth structure, mineralogy, rock types, weathering, surface and groundwater geology, structural geology, geological hazards (landslides, earthquakes), and site investigation for engineering works.

WREE124 Mathematics II

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

Course Description: Integration techniques, applications of definite integrals (areas, volumes, arc length), polar coordinates, vector algebra, partial derivatives, and first-order ordinary differential equations.

Weeks	Core Topics Covered	Learning Outcomes
Weeks 1–5	Integration techniques (by parts, partial fractions, trigonometric substitution).	Solve complex definite and indefinite integrals.
Weeks 6–10	Applications of integration, surface areas, volumes of revolution, centroid.	Apply integration to geometric engineering problems.
Weeks 11–15	Vectors, partial differentiation, 1st order differential equations (separable, linear).	Model physical systems using differential equations.

WREE125 Computer Principles & Programming

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

Course Description: Fundamentals of computer architecture, operating systems, spreadsheets for engineering calculations (Excel), and introductory algorithmic programming (Python/C++) for mathematical problem-solving.

GEN101 / GEN102 General University Requirements

6 ECTS Total | Arabic, English Language, Human Rights

Course Description: Core institutional modules aimed at developing professional communication, technical writing in English, linguistic competence in Arabic, and understanding democratic rights and ethics.