- **Important Note: Course syllabus according to ABET guidelines for engineering programs only**
- **Important Note: Please use the following format for the course syllabi (2 pages maximum in Times New roman 12 point font)**

Course number: 04035272

Course: name: Water Treatment Engineering (2)

Prerequisites by course: Water Treatment Engineering (1)

Prerequisites by topic: Student should have a basic knowledge in general chemistry, a knowledge of conventional water supply system and wastewater treatment processes.
Credit hours: 3 Credit hours (theory)
Contact hours: 3 Hours (theory)

Textbook: [*Water and Wastewater Technology*], [Hammer J., and Hammer Jr.], [2012]

References:

1. Lin S.D., "*Water and Wastewater Calculations Manual"*, 2nd ed., McGraw-Hill, USA. DOI: 10.1036/0071476245. *(Available at the teacher office)*
2. Crites, R. and Tchobanoglous, G.,1998, "*Small and decentralized wastewater management systems*", McGraw-Hill, Singapore. *(Available at the Library)*
3. Tchobanoglous, G., Burton, F. L., Stensel, H. D., & Metcalf & Eddy, 2003, "*Wastewater engineering: Treatment and reuse*", McGraw-Hill, USA. *(Available at the Library)*

Course website: https://elearn.iu.edu.jo/course/view.php?id=2626

Schedule and duration: Mon – Wed, 16 weeks, 3 hours a week, 1.5 hours each lecture.

Minimum student material: Lectures, assignments, and a project will be applied to achieve the course objectives. The students have access to the e-learning portal where the presentations, lecture notes and lecture outlines are placed. The lecture outlines include the program of each lecture, reading materials and specific questions related to the lecture.

Minimum college facilities: classroom, textbook, class handouts, some instructor keynotes, whiteboard, marker, eraser, calculator, access to a personal computer, internet and data show projector are available to provide an atmosphere conducive to learning.

Course objectives: The key objective of this course is to introduce students to advanced water including seawater and wastewater treatment techniques. This course provides students with knowledge of design and operational concepts of different water and seawater treatment units including physical, chemical, and biological unit processes.

Course outcomes and relation to ABET student outcomes: (matrix)

ABET student outcomes	Course Student Outcomes
1	an ability to apply knowledge of mathematics, physics, chemistry, and microbiology to solve and analyze engineering problems related to water and wastewater collection, transport, quality and treatment. To use the fundamental principles of mass balance, chemical kinetics and equilibrium to design advanced water or wastewater reactors to achieve a desirable treatment goal.
2, 6	an ability to identify and select suitable desalination technologies to remove a large majority of salts and pollutants present in seawater
2, 6	an ability to design a reverse osmosis treatment system
5	an ability to balance chemical reactions and use balanced reactions to determine the distribution of species at equilibrium
3	an ability to communicate effectively
4	an understanding of process theory for water, seawater and wastewater treatment
7	a knowledge of selected contemporary global water and wastewater issues such as water shortage, wastewater reuse and emerging contaminants

Course topics: Introduction (water and wastewater quantities, water and wastewater qualities, and seawater characteristics). Advanced water and wastewater treatment techniques such as adsorption, ion exchange, membrane processes, reverse osmosis, electrodialysis, tertiary treatment units (ammonia, nitrate, and phosphorus removal), disinfection, reuse and recycle of the treated wastewater. A case study and a project are required.

Computer usage: low

Attendance:

A- *Attendance policies:* the maximum absences allowed is 15% of the lectures.
B- Absences from exams and handing assignments on time:

- First exam and second exam can be retaken based on approval of excused absence by the instructor's discretion.
- Final exam can be retaken based on approval of excused absence by department and the instructor's discretion.
- Not handing assignment on time will incur penalties.

Assessments: First Written Exam (Midterm), Final Written Exam, Quizzes, Homework, Projects, Participation in Lecture.

Grading policy: The evaluation of students will be based on a final exam (50%), midterm exam (30%), term project (10%) Quiz (5%) and two assignments (5%). Student's active participation during the lecture is welcomed and will be rewarded with bonus marks up to 3%.

Instructors: Dr. Abdelmajeed Adam Lagum

Class time and location: Mon -Wed: 9:30 – 11:00, Room 1234

Student Outcomes (SOs)

1	An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2	An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3	An ability to communicate effectively with a range of audiences.
4	An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5	An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6	An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Important note: Student outcomes are outcomes (1) through (7), plus any additional outcomes that may be articulated by the program.