

The University of Jordan
Accreditation & Quality Assurance Center

COURSE Syllabus
Geology of Dams and
Water Reservoirs
0305491

1	Course title	Geology of Dams and Water Reservoirs
2	Course number	0305491
3	Credit hours (theory, practical)	3 hours theory;
	Contact hours (theory, practical)	3 hours theory,
4	Prerequisites/corequisites	General Geology 0305101, Structural Geology 0305341, first year math, physics, and chemistry
5	Program title	Environmental and Applied Geology
6	Program code	
7	Awarding institution	The University of Jordan
8	Faculty	Faculty of Science
9	Department	Geology
10	Level of course	undergraduate
11	Year of study and semester (s)	2016-2017 Fall
12	Final Qualification	
13	Other department (s) involved in teaching the course	
14	Language of Instruction	English
15	Date of production/revision	September 2017

Academic standards

Geology of Dams is a science/engineering discipline. Our understanding of this subject is developed by adopting the scientific method whereby data is collected by investigation or observation and used to formulate and test hypotheses. It depends on scientists being objective and sharing all their data, methods and ideas with their peers, by publishing their findings. This allows other scientists to further analyse and build on this body of knowledge by which we learn about Dam Geology. Professional scientists must always acknowledge their sources. **Plagiarism** is the presentation of thought or work of another person as though it is one's own without proper acknowledgment. The University's regulations make it clear that plagiarising is a breach of student discipline and may incur a range of penalties.

16. Course Coordinator: Dr. Fathi Shaqour

Office numbers, office hours, phone numbers, and email addresses should be listed.

Sunday, Tuesday, and Thursday 11:00-12:00

f.shaqour@ju.edu.jo

00962798100473

17. Values/Attitudes

- Appreciate the importance of this subject to Geology students in their practical life.
- Conduct of professional standards.

18. Course Description:

Overview of the geologic features: topography, maps, and engineering properties of soils and rocks; site investigation and dam site selection criteria; types of dams; types of construction materials for dams; slope stability of dams; hydrology of dams and reservoirs. Mechanics of Earth materials and how they respond to forces and stresses, drilling and grouting; mechanics of rock, soils, and fluids, and how these relate to dam construction; uses of dams; pollution problems in dams and reservoirs.

Dams are usually built for one or more of the following reasons:

- To provide a supply of water for towns, cities and mining sites
- To contain and store waste (tailings) from mines
- To provide a supply of water for the irrigation of crops
- To help control or mitigate floods

19. Course aims and outcomes:**A- Aims:**

Main aims of the course are the following:

1. Understand the criteria for dam site selection,
2. Evaluate compaction theory, construction methods, equipment and QA/QC specifications in dam works.
3. Use of spreadsheets and audiovisual software & equipment;
4. Log a trial pit, borehole and draw the geological cross section, sample soil and execute laboratory tests and process the data.
5. Identify failure modes in earthen dams and formulate solutions to prevent failure e.g. determining safe slopes for the earthen dam, quantity of flow and FOS against piping, boiling
6. Evaluate construction materials for dams
7. Discuss the dangers associated with dam structures during and after construction in light of past failures.
8. Conduct field tests to evaluate soils and rock in the dam site
9. Engineering classification of rock
10. Tunneling in rocks
11. Know the principles of foundation treatment such as grouting
12. Discuss the importance of geology in dam construction
13. Expose students to important tests and practices in the dam industry

B- Intended Learning Outcomes (ILOs):

Upon successful completion of this course students will be able to:

- 1- Demonstrate an understanding of the terms, concepts and principles of dams and reservoirs,
- 2- Develop professional skills in site investigation related to dams,
- 3- Develop understanding of rock types suitable for dam construction.
- 4- Calculate hydrologic parameters necessary for dams.
- 5- Perform permeability tests and evaluate the hydrologic parameters in the dam site
- 6- Review rock and soil field investigation.
- 7- Compute water budget
- 8- Understand various soil compaction techniques necessary for construction of the dam clay core.
- 9- The different components of concrete gravity dams and their layouts
- 10- Design steps for of concrete gravity dam sections
- 11- The expected loadings for gravity dams
- 12- Stability analysis of gravity dam sections
- 13- Construction processes for gravity dams
- 14- Foundation preparation for gravity dams

20. Outline and Schedule:

Week	Topic
1	1- Introduction: discuss the syllabus, why study the course, General information 2- The basics of geology of dams, their relationship with other disciplines especially civil engineering, terminology.
2	3- How dams work: - Definitions - Purpose of dams - Dam parts
3	4- Strength and stability of dams: - Bearing capacity - Foundations
4	5- Stability of dams (continue) - Pressure of water in the reservoir - Uplift pressures
5	6- Types of Dams; - Concrete dams: gravity dams, arch dams, buttress dams
6	7- Types of dams (continue): - Fill (embankment) dams: Earth dams, Earth and rock fill dams, Concrete faced rock fill dams
7	8- Mid Term Exam
8	9- Uses of dams: - Specific uses for drinking water, irrigation, power generation - Multi-purpose uses
9	10- How dams are built: - Dam site - Spillway - Rock fill quarry
10	11- How dams are built (continue): - Soil cover and overburden - Clay and gravel burrow areas - Road works within the site and outside - Diversion tunnel
11	12- Geology of the dam site: - Rock types and geological structures - Sources of construction materials
12	13- presentations
13	14- Dam failures:
14	15- Dams and the environment: - Environmental impact assessment - Precautionary esthetics
15	16- Alternatives to dams 17- Case studies

21. Teaching Methods and Assignments:

Development of ILOs is promoted through the following teaching and learning methods:

This course emphasizes the quantitative problem solving to gain a better understanding of geological materials and processes. Therefore, the student will be trained on that through independent and guided solution of problem sets that cover the various and most important aspects covered in the lecture.

22. Evaluation Methods and Course Requirements:

First Test/quizzes	20%		Assess a student's understanding, knowledge and competency of theoretical concepts and practical aspects of the course material. Requirement: Set a written exam on the entire content of the course Assessment Criteria: Correct answers, demonstration of understanding of concepts and principles
Mid-term Test	30%	Week 11	
Final Exam	60%	(Exam period)	
Total	100%		

Opportunities to demonstrate achievement of the ILOs are provided through the following assessment methods and requirements:

Discussion in the class, quizzes, quantitative problem solving and two midterm and a final exam

23. Course Policies:

A- Attendance policies: The rules of the University apply

B- Absences from exams and handing in assignments on time:

Assignments must be handed in on time.

C- Health and safety procedures:

D- Honesty policy regarding cheating, plagiarism, misbehavior:

The regulations of the University of Jordan are applicable

E- Grading policy: The final grade is based on the overall performance of the student to be deduced from

Interest in class through interaction; participation in quizzes, problem set solving and exams:

Below is a tentative grading scale

A: 90-100

A-: 85-89

B+: 80-84

B: 75-79

B-: 70-74

C+: 65-69

C: 60-64

C-: 55-59

D+: 50-54

D: 49-45

D-: 40-44

F: 0-39

F- Available university services that support achievement in the course:

24. Required equipment:

Laptop; data show and white board and whiteboard marker

25. References:

Geotechnical Engineering of Dams, 2nd Edition
By Robin Fell and others

26. Additional information:

Dams and Reservoirs virtual library
International Journal on Hydropower and Dams Special

Name of Course Coordinator: -----Signature: ----- Date: ----- Head

of curriculum committee/Department: ----- Signature: -----

Head of Department: ----- Signature: -----

Head of curriculum committee/Faculty: ----- Signature: -----

Dean: -----Signature: -----

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Head of Department
Assistant Dean for Quality Assurance
Course File