Course Syllabus

1	**Course title**	**Hydrological Modeling**	
2	**Course number**	**0335762**	
3	**Credit hours**	3 hrs. (Theory)	3 hrs. (Theory)
	Contact hours (theory, practical)	3 hrs. (Theory / week)	
4	**Prerequisites/corequisites**	-	
5	**Program title**	M.Sc. In Geology	
6	**Program code**	0305 2	
7	**Awarding institution**	The University of Jordan	
8	**School**	Science	
9	**Department**	Geology	
10	**Course level**	M.Sc.	
11	**Year of study and semester (s)**		
12	**Other department (s) involved in teaching the course**	M.Sc. In Environmental Science and Managment	
13	**Main teaching language**	English	
14	**Delivery method**	☐Face to face learning ☐Blended ☐Fully online	
15	**Online platforms(s)**	☐Moodle ☐Microsoft Teams ☐Skype ☐Zoom ☐Others……	
16	**Issuing/Revision Date**	07-03-2024	

17 Course Coordinator:

Name: Mustafa Al Kuisi	Contact hours: Every day (8Am-4pm
Office number: Geo307	Phone number:0796906169
Email: mkuisi@ju.edu.jo	

مركز الاعتماد وضمان الجودة
ACCREDITATION & QUALITY ASSURANCE CENTER

18 Other instructors:

Name:
Office number:
Phone number:
Email:
Contact hours:
Name:
Office number:
Phone number:
Email:
Contact hours:

19 Course Description:

This is a course on hydrological modelling at Master's level. It is designed to emphasize hydrological concepts while providing useful skills for using well-known hydrological models in simulating hydrological processes. This course develops a quantitative approach to understanding, estimation, and prediction of different components of the hydrologic cycle. Modeling of the following processes will be discussed in this course: interception, snowmelt, evapotranspiration, infiltration, overland runoff, streamflow, sediment erosion and deposition, and transport of contaminants in streams. The course discusses in detail multiple model representations of hydrologic processes, and limitations and uncertainty associated with each. After successful completion of this course, students will possess an in-depth understanding of how and where a given model can be used, and will be prepared to address water quantity (e.g. floods, droughts, climate change impacts etc.). Models that are briefly discussed in the course include HEC-HMS and WMS

20 Course aims and outcomes:

A- Aims:

This course addresses the development of computational models of watershed hydrology in support of water resources management and scientific investigation. The full model development and application cycle is considered: pre-processing, understanding, and generating input forcing data; system discretization and algorithms for simulating hydrologic processes; parameter estimation; and interpreting model output in the context of often significant system uncertainty. The course will include practical applications of models to different watersheds in Jordan.

B- Students Learning Outcomes (SLOs):

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

- Understand the internal functioning of lumped and semi-distributed models of surface water hydrology
- Choose modelling approaches appropriate to the region being investigated, for supporting specific model goals, including water resource management decisions or scientific hypotheses
- Be able to intelligently apply concepts from the course to inform, build, and interpret hydrological models of watersheds.
- Be able to apply a number of standard and advanced software tools to manipulate and analyze hydrologic data, calibrate and evaluate models, and assess model uncertainty

SLOs / SLOs of the course	SLO (1)	SLO (2)	SLO (3)	SLO (4)	SLO (5)	SLO (6)	SLO (7)	SLO (8)	SLO (9)
1 Understand the internal functioning of lumped and semi-distributed models of surface water hydrology	**X**	**X**					**X**		
2 Choose modelling approaches appropriate to the region being investigated, for supporting specific model goals, including water resource management decisions or scientific hypotheses	**X**	**X**					**X**		
3 Be able to intelligently apply concepts from the course to inform, build, and interpret hydrological models of watersheds	**X**	**X**					**X**		
4 Be able to apply a number of standard and advanced software tools to manipulate and analyze hydrologic data, calibrate and evaluate models, and assess model uncertainty	**X**	**X**					**X**		

21. Topic Outline and Schedule:

Week	Lecture	Topic	Student Learning Outcome	Learning Methods (Face to Face/Blended/ Fully Online)	Platform	Synchronous / Asynchronous Lecturing	Evaluation Methods	Resources
1	1	Introduction to Hydrological Modeling	Understand the internal functioning of lumped and semi-distributed models of surface water hydrology					Text Book And YouTube Channels
2	2	Hydrologic Principles						Text Book And YouTube Channels
3	3	Hydrological Cycle, Hydrologic budget						Text Book And YouTube Channels
4	4	Data Required for Hydrological Analysis and Modeling						Text Book And YouTube Channels
5	5	Precipitation: Formation - Types - Atmospheric Moisture - Measurement – Variability,	Be able to intelligently apply concepts from the course to inform, build, and interpret hydrological models of watersheds					Text Book And YouTube Channels
6	6	Moving Average, Frequency Analysis Probability concepts - Return period - Graphical presentation of data, Probable Maximum Precipitation (PMP)						Text Book And YouTube Channels
7	7	Interception and Depression Storage, Infiltration, Evaporation and Evapotranspiration						Text Book And YouTube Channels

Week	Lecture	Topic	Student Learning Outcome	Learning Methods (Face to Face/Blended/ Fully Online)	Platform	Synchronous / Asynchronous Lecturing	Evaluation Methods	Resources
8	8	Introduction to WMS	Choose modelling approaches appropriate to the region being investigated, for supporting specific model goals, including water resource management decisions or scientific hypotheses					Text Book
9	9	Watershed concepts, The Stream Network, Drainage Density, Rainfall-runoff - Streamflow - Unit hydrograph -Synthetic Unit hydrograph						And YouTube Channels
10	10	Runoff in Hydrologic Models						Text Book
11	11	Flood Prediction, Flood Routing, Hydrologic and hydraulic routing, SCS curve numbers						And YouTube Channels
12	12	Surface Runoff Model Formulation						Text Book
13	13	Introduction to hydrologic models - watershed modeling - HEC-HMS, stands for Soil and Water Assessment Tool (SWAT)	Be able to apply a number of standard and advanced software tools to manipulate and analyze hydrologic data, calibrate and evaluate models, and assess model uncertainty					And YouTube Channels
14	14	Geographically Integrated Hydrologic Modeling Systems						Text Book
15	15	Water Resources Modeling and GIS, Case Studies in Hydrology						Text Book And YouTube Channels

22 Evaluation Methods:

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

Evaluation Activity	Mark	Topic(s)	SLOs	Period (Week)	Platform
Midterm Exam	30	Week 1-10	1, 2, 7	After 10 Weeks	Personal
Project	30		7	After 14 Weeks	Presentation
Final Exam	40	Week 1-15	2, 7	As Scheduled	Personal

Grading policy:

Letter	Percentage
A	>88
A-	81-87
B+	76-80
B	71-75
B-	66-70
C+	61-65
C	0-60

23 Course Requirements

(e.g: students should have a computer, internet connection, webcam, account on a specific software/platform…etc):

The students will use their laptops.

A License code of the s SWM V.11.0 package will provided for the students.

24 Course Policies:

A- Attendance policies:

1. Absences from class will be recorded. The allowable absences for the student are ***3 numbers***.
2. Late homework assignments will not be graded unless a valid and substantiated written excuse is provided.

مركز الاعتماد وضمان الجودة

3. Hour exams and the final exam will be made up only if a valid and substantiated written excuse is provided.
4. Attendance and participation on the field trips are mandatory, and field trips cannot be "made up".
5. Quizzes will not be made up. You will receive a grade of zero unless a valid and substantiated written excuse is provided

25 References:

A- Required book(s), assigned reading and audio-visuals:

Robinson M. and Ward R.C. (2017) Hydrology, Principles and processes. IWA Publishing.

B- Recommended books, materials, and media:

Dingman S.L. (2015) Physical Hydrology, Waveland Press, Inc. Third edition.

Hingray B., Picouet C. and Musy (2015) HYDROLOGY A Science for Engineers. CRC Press is an imprint of Taylor & Francis Group

26 Additional information:

Name of Course Coordinator: -Prof. Dr. Mustafa Al Kuisi -Signature: *-Mustafa Al Kuisi Date*: 07-03-2024
Head of Curriculum Committee/Department: ---------- Signature: ----------
Head of Department: ---------- Signature: ----------
Head of Curriculum Committee/Faculty: ---------- Signature: ----------
Dean: ---------- Signature: ----------