



Course Specification

(Bachelor)

Course Title: Hydrology

Course Code: APEP3606

Program: Diploma - Technology of Environmental Protection

Department: Biology

College: Faculty of Sciences

Institution: Umm Al-Qura University

Version: 2

Last Revision Date: 12 / 2024

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A. General information about the course:

1. Course Identification

1. Credit hours: (2 theoretical + 1 practical)

(2 theoretical + 1 Practical)

2. Course type

A. ☐ University ☐ College ☒ Department ☐ Track ☐ Others
B. ☒ Required ☐ Elective

3. Level/year at which this course is offered: (.....)

4. Course General Description:

Students will learn the principles and practices of hydrology, focusing on the movement, distribution, and quality of water on Earth. Infrastructure like dams, reservoirs, and drainage systems are designed using hydrology. Precipitation, evaporation, infiltration, runoff, and groundwater flow are covered in the course. Hydrological modeling and forecasting water-related events will also be explored. The course covers water environmental ecology, marine pollution, and human impacts on marine environments. The course explores marine biology applications in marine resource development, water, and marine environmental protection. Water Quality Standards, WHO Guidelines for drinking water quality, and bioremediation of water will be understood. It will also cover microbiological quality of drinking water, chemical quality of drinking water, distribution networks, and biofilms.

5. Pre-requirements for this course (if any):

principles of Ecology

6. Co-requisites for this course (if any):

7. Course Main Objective(s):

This course is intended to:

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	30	80%
2	E-learning		20%
3	Hybrid <ul style="list-style-type: none"> Traditional classroom E-learning 		
4	Distance learning		



3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	30 h
2.	Laboratory/Studio	14 h
3.	Field	
4.	Tutorial	
5.	Others (specify)	
Total		

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Describe the basic principles used in the water Environmental, source of water quality of water on Earth	K1	<ul style="list-style-type: none"> Interactive lectures Group discussions Tutorials. Brain storming. Discussion. 	-Written exams including: <ul style="list-style-type: none"> - Short answers - MCQs - EMQs - SAQs - LAQs ▪ Assignment ▪ Open-book exam ▪ Quizzes
1.2	❖ Upon successful completion of this course, the student will be able to: designed using hydrology. Precipitation, evaporation, infiltration, runoff, and groundwater flow are covered in the course	K1		
1.3	❖ Upon successful completion of this course, the student will be able to: -water Environmental. - bio diversity of marin Environmental.	K2		
1.4	❖ Upon successful completion of this	K2 & K3		



Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	<p>course, the student will be able to:</p> <ul style="list-style-type: none"> • Outline the standard criteria of drinking water. • Describe the different biological and chemical treatments that should be carried out for drinking water. • Define biofilms in Drinking Water. • Summarize the Risks and hazardous resulting in biofilms. <p>Memorize the microbiological tests that should be done for drinking water.</p>			
2.0	Skills			
2.1	<p>Cognitive skills</p> <p>Having successfully completed the course students should be able to:</p> <p>Describe the basic principles used in the water Environmental, source of water, cycle of water and quality of water on Earth.</p>	S2	<p>- Lectures: To cover theoretical concepts and principles.</p> <p>- Case Studies: To explore real-world hydrological challenges and solutions.</p> <p>- Hands-on Laboratory Work: Practical sessions for measuring hydrological parameters (e.g., precipitation, runoff, groundwater).</p>	<ul style="list-style-type: none"> ▪ Written exams including: <ul style="list-style-type: none"> - Short answers - MCQs - EMQs - SAQs - LAQs ▪ Assignment ▪ Open-book exam ▪ Quizzes ▪ OSPE
2.2	<p>Understanding the role of marine biologists in professional fields including research and development, quality assurance and public health and especially in organisations connected with environmental</p>	S3		



Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	management and conservation.		-Field Visits: To observe hydrological systems in practice (e.g., watershed monitoring, river gauging stations). -Software Tools: Introduction to hydrological modeling and GIS applications for data analysis.	
2.3	<ul style="list-style-type: none">❖ Having successfully completed the course students should be able to:• Diagram the purification steps for drinking water• Explain how the biofilm formed in water	S3 & S4		
2.4	<ul style="list-style-type: none">• Differentiate between raw water and drinking water• Estimate microbiological and biochemical tests that determine the validity of water for human consumption and drinking.	S5		
2.5	Development of critical analytical, numerical and IT skills, both general and subject-specific.	S1		
2.6	Effective communication, both written and oral, at all levels.	S4 & S6		
3.0	Values, autonomy, and responsibility			
3.1	Appraise the value of critical judgment through constructive criticism among colleagues.	V2	<ul style="list-style-type: none">- Tutorials- Practical work- Small group- Discussion	<ul style="list-style-type: none">- Lab demonstration- Assignments- OSPE
3.2	Demonstrate personal integrity, reliability, honesty, trustworthiness, teamwork, and ethical	V1 & V3 & V4		



Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	behavior toward others in the community.			
...				

C. Course Content

No	List of Topics	Contact Hours
1.	-Introduction to Hydrology: <ul style="list-style-type: none"> • Definition of hydrology and its relevance to environmental science and engineering. • The hydrological cycle: precipitation, evapotranspiration, infiltration, runoff, groundwater movement, and storage. • Major components of the global water budget. • Hydrological terms and concepts: watershed, catchment area, basin, etc. 	2
2,3.	Precipitation: <ul style="list-style-type: none"> • Types and forms of precipitation (rain, snow, sleet, hail). • Precipitation measurement: rain gauges, tipping buckets, and radar systems. • Distribution of precipitation and factors influencing precipitation patterns. • Intensity, duration, and frequency of rainfall events. 	4
4.	Evaporation and Transpiration: <ul style="list-style-type: none"> • The processes of evaporation and transpiration (evapotranspiration). • Methods of estimating evapotranspiration. • Factors affecting evaporation rates (temperature, wind, humidity). • Role of vegetation and land use in the water cycle. 	2
5.	Floods, Droughts, and Water Resources: <ul style="list-style-type: none"> • Hydrology of floods: flood frequency analysis, return period, and flood risk assessment. • Drought characteristics and hydrological monitoring techniques. • Water resources • Climate change impacts on hydrological cycles and water resources 	2
6.	<ul style="list-style-type: none"> • Hydrology in designing water management systems (e.g., dams, reservoirs, stormwater systems). • Environmental protection: managing water quality, preventing soil erosion, and sustaining aquatic ecosystems. 	2
7.	Midterm-Exam	2
8,9.	<ul style="list-style-type: none"> • Marine Ecology and Geology • Marine Biodiversity - Seaweeds and Plants • Aquaculture and Marine Environmental Monitoring 	4
10.	<ul style="list-style-type: none"> • Water quality and pollution of natural water sources 	2
11.	<ul style="list-style-type: none"> • Treatment Objectives. 	2



	<ul style="list-style-type: none"> Marine Microbiology and Bioremediation 	
12.	<ul style="list-style-type: none"> Water quality The importance of assessing the quality of drinking water Factors that affect drinking water Water Quality Standards. Drinking Water Quality Standards WHO Guidelines for Drinking Water Quality; Estimation of Water Demand. 	2
13.	<ul style="list-style-type: none"> Microbiological assessments of drinking water: Water sampling, Total count, presumptive test, Confirmatory Test, Completed Test, IMVIC tests: (Indol Production test, Methyl Red test, Voges – Proskauer test, Citrate utilization test), Eckman test. 	2
14.	<ul style="list-style-type: none"> Marine Environmental Biotechnology Marine Natural Products (Economies) 	2
15.	<p>Case Studies and Current Issues:</p> <ul style="list-style-type: none"> Review of global hydrological issues, such as water scarcity, pollution, and flood management. Case studies on significant hydrological events like major floods, droughts, or water conservation projects. Application of hydrological principles in managing water resources for sustainable development. 	2
Total		

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quiz 1 (Theory)	3	5%
2.	Midterm examination (Theory)	6	15%
3.	Midterm examination (practical)	7	10%
4.	Group project	9-10	10%
5.	Final examination (practical)	15	20%
6.	Final examination (Theory)	16	40%
	TOTAL	100%	

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources





Essential References	<p>(1)- Mara, D. and Horan, N. (2003) The Handbook of Water and Wastewater Microbiology. Academic Press, San Diego, CA, USA.</p> <p>(2)- book- hydrology, Sahar Ayman Katout</p> <p>©</p> <p>Source: https://www.agro-lib.site/2022/01/blog-post_526.html</p>
Supportive References	<p>1. Edberg, S. C., Rice, E. W., Karlin, R. J. and Allen, M. J. (2000) Escherichia coli: the best biological drinking water indicator for public health protection. Journal of Applied Microbiology, 88: 106S-116S.</p> <p>2. Godfree, A., Kay, D. and Wyer, M. D. (1997) Faecal streptococci as indicators of faecal contamination in water. Journal of Applied Microbiology, 83: 110S-119S.</p> <p>-Viessman, W., & Lewis, G. L. (2003).</p> <ul style="list-style-type: none"> • <i>Introduction to Hydrology</i> (5th ed.). • Pearson Prentice Hall. <p>-Chow, V. T., Maidment, D. R., & Mays, L. W. (1988).</p> <ul style="list-style-type: none"> • <i>Applied Hydrology</i>. • McGraw-Hill. <p>- Kundzewicz, Z. W., & Robson, A. J. (2000).</p> <ul style="list-style-type: none"> • <i>Hydrological Extremes: Understanding, Predicting, Mitigating</i>. • Cambridge University Press. <p>- Ward, A. D., & Trimble, S. W. (2004).</p> <ul style="list-style-type: none"> • <i>Environmental Hydrology</i> (2nd ed.). • CRC Press. <p>- Houghton, R. A., & Short, T. M. (2011).</p> <ul style="list-style-type: none"> • <i>Hydrology: An Introduction to Hydrological Science</i>. • Routledge.
Electronic Materials	HYDROCAD, HEC-HMS, ArcGIS for hydrological analysis.
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
<p>facilities</p> <p>(Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)</p>	<ul style="list-style-type: none"> - Lecture room = 30 students - Laboratory for practical = 15 students





Items	Resources
Technology equipment (projector, smart board, software)	<ul style="list-style-type: none"> - Computers - Internet access - Smart Board (preferred) - Projector
Other equipment (depending on the nature of the specialty)	<ul style="list-style-type: none"> - Display screen - White board - SDS electrophoresis tanks and its contents - DNA electrophoresis tanks and its contents - PCR Thermocycler - UV rays for DNA visualization

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	<ul style="list-style-type: none"> ➤ Class discussion. ➤ Written feedback by individuals. ➤ Satisfaction survey at the end of each semester.
Effectiveness of Students assessment	Course instructor Peer reviewer Program director	<ul style="list-style-type: none"> ➤ Course development according to the analysis of student feedback. ➤ Monitoring students' performance throughout the semester using formative assessment. ➤ Analyzing students' progress. ➤ Using statistics to analyze students' achievement at the end of each semester and implement data comparison. ➤ Department council discussion. ➤ Peer evaluation of the instructor.
Quality of learning resources	Course instructor	<ul style="list-style-type: none"> ➤ Attending staff development workshops and programs. ➤ Continuous education. ➤ Implementing student feedback. ➤ Variations of teaching strategies including tutorials, PBL and more emphasizing on the practical sessions
The extent to which CLOs have been achieved		
Other		

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

Assessment Methods (Direct, Indirect)





G. Specification Approval

COUNCIL /COMMITTEE	Umm Al-Qura University Council
REFERENCE NO.	851141114462/190635
DATE	22/11/1446

