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| --- | --- | --- |
| EXC-01-02-02A | **Form Number** | **Form:****Course Syllabus** |
| 2/3/24/2022/296305/12/2022 | **Issue Number and Date** |
|  | **Number and Date of Revision or Modification** |
| 2/3/24/2023 | **Deans Council Approval Decision Number** |
| 23/01/2023 | **The Date of the Deans Council Approval Decision** |
| 06 | **Number of Pages** |

|  |  |  |
| --- | --- | --- |
| **1.** | **Course Title** | Hydrolgoy |
| **2.** | **Course Number** | 604212 |
| **3.** | **Credit Hours (Theory, Practical)** | 3 |
| **Contact Hours (Theory, Practical)** | 3 |
| **4.** | **Prerequisites/ Corequisites** | Calculus 102 |
| **5.** | **Program Title** | Land, Water, and Environment  |
| **6.** | **Program Code** | 141 |
| **7.** | **School/ Center** | University of Jordan |
| **8.** | **Department** | Agriculture |
| **9.** | **Course Level**  | Land, Water, and Environment |
| **10.** | **Year of Study and Semester (s)** | Fourth-year |
| **11.** | **Other Department(s) Involved in Teaching the Course** | 2024/2025 first semester |
| **12.** | **Main Learning Language** | None |
| **13.** | **Learning Types** | English |
| **14.** | **Online Platforms(s)** | ☐Face to face learning ☒Blended ☐Fully online |
| **15.** | **Issuing Date** | ☒Moodle ☒Microsoft Teams ☐Skype ☐Zoom ☐Others………… |
| **16.** | **Revision Date** | 25/9/2024 |

**17 Course Coordinator:**

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| --- |
| Name: Dr. Michel Rahbeh Contact hours: Wednesday, Monday 11:00-12:30 Office number: 054 Phone number: 0775197474 or ext 22442Email: m.rahbeh@ju.edu.jo |

**18. Other Instructors:**

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

**19. Course Description:**

|  |
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| **Topics**: Students will learn to measure the main components of the hydrological cycle and a basic understanding of related physical processes and their interactions. Students will then follow the movement of water from the lower atmosphere to higher altitudes as it condenses and returns to the surface of the earth as precipitation. Quantification of rainfall intensity and average cadastral rainfall will be discussed, followed by a discussion of solar energy balance in the context of evaporation and transpiration. Learning activities also include isolation of the base flow from the hydrograph, derivation of the unit hydrograph, calculations of flow in rivers and synthetic unit hydrograph.**Importance**: Students will enhance their scientific knowledge and practical skills, which in turn will enhance their opportunities in the labor market, as the course includes many applied topics.**Involvement of Experts**: No experts will be involved**Active learning mechanism:** This course does not use the active learning mechanism |

**20. Program Intended Learning Outcomes:** (To be used in designing the matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program)

1. Demonstrate comprehensive understanding of the scientific and theoretical knowledge of land, water and environment.
2. Contribute to agricultural development, as well as food and water security.
3. Demonstrate problem solving skills and well developed linguistic and communication skills while upholding professional ethics
4. Access land characteristics and their suitability for different agricultural uses.
5. Tackle basic problems of water, land and agricultural environment.
6. Analyse and interpret soil and water quality parameters.
7. Use sound scientific principles for the determination of crop water requirement, and design of irrigation systems for the proper management of agricultural water.
8. Determine the optimal use of water and land resources to ensure the sustainability of resources and the environment.
9. Develop​ innovative solution for tackling the adverse effects of water scarcity caused by climate change and desertification​

**21. Course Intended Learning Outcomes:** (Upon completion of the course, the student will be able to achieve the following intended learning outcomes)

**1.** Describe the water cycle

**2.** Explain the interaction between the different components of the hydrological cycle

**3.** Carry out basic calculations such as water volumes, rates and discharges

**4.** Determine infiltration depth and canopy and other abstractions

**5.** Derive a unit hydrograph

**6.** Change the time interval of the unit hydrograph

**7.** Construct a synthetic unit hydrograph

**8.** Determine the air density, saturated and actual vapour pressure

**9.** Determine missing precipitation values

|  |  |
| --- | --- |
| Course ILOs | The learning levels to be achieved |
| Remembering | Understanding | Applying | Analysing | evaluating | Creating |
| 1 |  | **x** |  |  |  |  |
| 2 |  | **x** |  |  |  |  |
| 3 |  |  | **x** |  | **x** |  |
| 4 |  |  |  |  | **x** |  |
| 5 |  |  |  |  |  | x |
| 6 |  |  |  | x |  |  |
| 7 |  |  |  |  | x |  |
| 8 |  |  |  |  | x |  |
| 9 |  |  |  |  | x |  |

**22. The matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program:**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Program ILOsCourse ILOs | ILO (1) | ILO (2) | ILO (3) | ILO (4) | ILO (5) | ILO (6) | ILO (7) | ILO (8) | ILO (9) |
| 1 | x |  |  |  |  |  |  |  |  |
| 2 | x |  |  |  |  |  |  |  |  |
| 3 |  |  |  |  |  |  |  |  |  |
| 4 |  |  |  | x |  |  |  | x |  |
| 5 |  |  | x |  |  |  |  | x |  |
| 6 |  |  | x |  |  |  |  | x | x |
| 7 |  |  | x |  |  |  |  | x | x |
| 8 |  |  |  |  |  |  |  |  | x |
| 9 |  |  |  |  |  |  |  |  | x |

**23. Topic Outline and Schedule:**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Week** | **Lecture** | **Topic** | **ILO/s Linked to the Topic** | **Learning Types****(Face to Face/ Blended/ Fully Online)** | **Platform Used** | **Synchronous / Asynchronous Lecturing** | **Evaluation Methods** | **Learning Resources** |
| 1 | 1.1 |  Definition of hydrology | 1 |  Face to Face | classroom |  |  |  1 |
| 1.2 | Hydrological cycle | 2 |  Face to Face | classroom |  |  |  1 |
| 1.3 |  Water balance equations | 3 |  Face to Face | classroom |  |  |  1 |
| 2 | 2.1 | Atmospheric water:Vapor pressure   | 8 |  Face to Face | classroom |  |  HW | 1 |
| 2.2 | 8 |  Face to Face | classroom |  |  HW | 1 |
| 2.3 | 8 |  Face to Face | classroom |  | HW | 1 |
| 3 | 3.1 | Atmospheric water:Water vapor  | 8 |  Face to Face | classroom |  |  HW | 1 |
| 3.2 | 8 |  Face to Face | classroom |  |  Quiz | 1 |
| 3.3 | 8 |  Face to Face | classroom |  |  HW | 1 |
| 4 | 4.1 | Atmospheric water:Precipitable water  | 8 |  Face to Face | classroom |  |  HW | 1 |
| 4.2 | 8 |  Face to Face | classroom |  |  HW | 1 |
| 4.3 | 8 |  Face to Face | classroom |  |  HW | 1 |
| 5 | 5.1 |   Precipitation :* Types
* Formation
* Measurements
 | 2 |  Face to Face | classroom |  |  HW | 1 |
| 5.2 | 2 |  Face to Face | classroom |  |  HW | 1 |
| 5.3 | 3 |  Face to Face | classroom |  |  HW | 1 |
| 6 | 6.1 |  Precipitation :* Areal averages
* Missing values
 | 3 |  Face to Face | classroom |  |  HW | 1 |
| 6.2 | 3 |  Face to Face | classroom |  |  HW | 1 |
| 6.3 | 9 |  Face to Face | classroom |  |  Quiz | 1 |
| 7 | 7.1 | The process of infiltration  | 4 |  Face to Face | classroom |  |  HW | 1 |
| 7.2 |  storm abstractions  | 4 |  Face to Face | classroom |  |  HW | 1 |
| 7.3 | φ-index  | 4 |  Face to Face | classroom |  |  HW | 1 |
| 8 | 8.1 | 4 |  Face to Face | classroom |  |  HW | 1 |
| 8.2 | 4 |  Face to Face | classroom |  |  Quiz | 1 |
| 8.3 |  Midterm Exam |  |  Face to Face | classroom |  |  HW | 1 |
| 9 | 9.1 |    Soil Conservation Services (SCS) method  | 5 |  Face to Face | classroom |  |  HW | 1 |
| 9.2 | 5 |  Face to Face | classroom |  |  HW | 1 |
| 9.3 | 5 |  Face to Face | classroom |  |  HW | 1 |
| 10 | 10.1 | 5 |  Face to Face | classroom |  |  HW | 1 |
| 10.2 | 5 |  Face to Face | classroom |  |  HW | 1 |
| 10.3 | 5 |  Face to Face | classroom |  |  Quiz | 1 |
| 11 | 11.1 |  Sources of streamflow | 1 |  Face to Face | classroom |  |  HW | 1 |
| 11.2 |  Runoff generation | 2 |  Face to Face | classroom |  |  HW | 1 |
| 11.3 |  Streamflow hydrograph | 5 |  Face to Face | classroom |  |  HW | 1 |
| 12 | 12.1 | Base flow separation | 5 |  Face to Face | classroom |  |  HW | 1 |
| 12.2 |  Derivation of the unit hydrograph | 5 |  Face to Face | classroom |  | HW  | 1 |
| 12.3 | 5 |  Face to Face | classroom |  |  HW | 1 |
| 13 | 13.1 | Runoff determination using the Unit hydrograph | 5 |  Face to Face | classroom |  |  HW | 1 |
| 13.2 | 5 |  Face to Face | classroom |  |  HW | 1 |
| 13.3 | 5 |  Face to Face | classroom |  |  Quiz | 1 |
| 14 | 14.1 |  Construction and use of the synthetic unit hydrograph | 7 |  Face to Face | classroom |  |  HW | 1 |
| 14.2 | 7 |  Face to Face | classroom |  |  HW | 1 |
| 14.3 | 7 |  Face to Face | classroom |  |  HW | 1 |
| 15 | 15.1 |  S -hydrograph   | 6 |  Face to Face | classroom |  |  HW | 1 |
| 15.2 | 6 |  Face to Face | classroom |  |  HW | 1 |
| 15.3 | 6 |  Face to Face | classroom |  |  HW | 1 |

**24. Evaluation Methods:**

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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Evaluation Activity** | **Mark** | **Topic(s)** | **ILO/s Linked to the Evaluation activity** | **Period (Week)** | **Platform** |
| Quizzes |  10 |  As indicated in the topic outline | 1 to 9 |  As indicated in the topic outline |  Face to face |
|  Home works |  10 |  As indicated in the topic outline | 1 to 9 |  As indicated in the topic outline |  Moodle or teams |
|  Midterm |  30 | Topics up to the end of the seventh | 1,2,3,7,8 |  Week 8 |  Face to face |
| Final exam | 50 | All topics | 1 to 9 | Exam week | Face to face |

**25. Course Requirements:**

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| students should have access to the internet and desktop computer either at home or on campus. Each student should also have a personal calculator |

**26. Course Policies:**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| A- Attendance policies: Regular and timely attendance is expected from all students. University regulations concerning class attendance will applyB- Absences from exams and submitting assignments on time: The students are expected to submit home works in due time, a late submission will result in a 20% deduction of the homework grade and will not be accepted once the key answers are provided. Exams absentees are allowed to write makeup exams only if an acceptable and documented excuse is provided; for example, a medical report. Makeup exams are usually more difficult than regular examsC- Health and safety procedures: Follow directions and notifications in case of emergency D- Honesty policy regarding cheating, plagiarism, and misbehavior: Zero tolerance for cheating, plagiarism, and misbehavior. Use of cell phone is prohibitedE- Grading policy: the following is a suggested grading scale:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| From (%) | To (%) | Scale | Letter Grade | Result |
| 86 | 100 | 4 | A | Excellent |
| 83 | 85 | 3.75 | A- | Excellent |
| 80 | 82 | 3.5 | B+ | Very Good |
| 74 | 79 | 3.0 | B | Very Good |
| 71 | 73 | 2.75 | B- | Very Good |
| 68 | 70 | 2.5 | C+ | Good |
| 62 | 67 | 2.0 | C | Good |
| 59 | 61 | 1.75 | C- | Good |
| 56 | 58 | 1.25 | D+ | Accepted |
| 50 | 55 | 1.00 | D | Accepted |
| 47 | 49 | 0.75 | D- | Fail |
| 0  | 46 | 0 | F | Fail |

F- Available university services that support achievement in the course: For more details on University regulations please visit: http://www.ju.edu.jo/rules/index.htm |

**27. References:**

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| A- Required book(s), assigned reading and audio-visuals:Chow, V. T., Maidment, D. R. and Mays, L. W. 1988. *Applied hydrology*. McGraw-Hill B- Recommended books, materials, and media:Part 630 Hydrology National Engineering Handbook, USDA, 2010 |

**28. Additional information:**

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| **Tips for Success** * Results from previous semesters showed that successful students are those who attended the classes regularly.
* Solve all your homework yourself, it’s worth the effort. Consider the following popular saying**: "**I hear and I forget. I see and I remember. ***I do and I understand***."
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| Name of the Instructor or the Course Coordinator:………………………………………………… | Signature: …………...……………… | Date: ……..………… |
| Name of the Head of Quality Assurance Committee/ Department…………………………………………………. | Signature: …………...……………… | Date: ……..………… |
| Name of the Head of Department…………………………………………………. | Signature: …………...……………… | Date: ……..………… |
| Name of the Head of Quality Assurance Committee/ School or Center…………………………………………………. | Signature: …………...……………… | Date: ……..………… |
| Name of the Dean or the Director…………………………………………………. | Signature: …………...……………… | Date: ……..………… |