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| EXC-01-02-02A | **Form Number** | **Form:**  **Course Syllabus** |
| 2/3/24/2022/2963  05/12/2022 | **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** |
| 09 | **Number of Pages** |

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| **1** | **Course title** | Principle of Irrigation |
| **2** | **Course number** | 0604103 |
| **3** | **Credit hours** | 3 |
| **Contact hours (theory, practical)** | Theory |
| **4** | **Prerequisites/corequisites** | Calculus 1 |
| **5** | **Program title** | Land, Water and Environment |
| **6** | **Program code** | 4 |
| **7** | **Awarding institution** | The University of Jordan |
| **8** | **School** | School of Agriculture |
| **9** | **Department** | Land, Water and Environment |
| **10** | **Level of course** | First and Second year |
| **11** | **Year of study and semester (s)** | 2022/2023 First |
| **12** | **Final Qualification** | Bachelor in Land, Water and Environment |
| **13** | **Other department (s) involved in teaching the course** | / |
| **14** | **Language of Instruction** | English |
| **15** | **Teaching methodology** | in-person Online |
| **16** | **Electronic platform(s)** | Moodle Microsoft Teams Skype Zoom  Others…e-learning……… |
| **17** | **Date of production/revision** | 23/9/2020 |

**18 Course Coordinator:**

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| Name: Dr. Fayha AlShibli  Office number:  Phone number:22467  Email: f.shibli@ju.edu.jo |

**19 Other instructors:**

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| Name: Hala Abdur Rauf Rawabdeh  Office number: 058  Phone number:22452  Email: hl.rawabdeh@ju.edu.jo |

**20 Course Description:**

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| This course introduces the fundamental knowledge required to carry out basic irrigation activities, such as determining the irrigation depth and interval, and determining the soil water content for undisturbed soil samples. Also it prepares the students for advanced courses in irrigation management and design. At the beginning of the course the students will get acquainted with water resources in Jordan, as well as the purpose and objective of irrigation. The attention will then be shifted to the conversion of measurement units, calculation of soil water content, and crop water requirement. The lectures after the midterm will be allocated to discuss irrigation efficiencies and irrigation systems. |

**21 Course aims and outcomes:**

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| **A- Aims:**   * Understand the importance of irrigation water to agriculture and define its continued supply. * Qualify students to manage irrigation water system in the agricultural production. * Make students aware of the many problems facing the water sector in Jordan including limited water supply and deteriorating water quality and understand their effects on the agricultural sector. * Understand soil moisture concepts and measurement and the cycling of water in the agricultural systems. * Calculate evapotranspiration rates for crops common grown in Jordan during a complete growing season * Use the basic principles of soil-water-plant relationships and agricultural water cycle to schedule irrigation and water management and auditing. * Familiarize the students with different on-farm irrigation systems including their application and design. * Understand the concept and compare surface, sprinkler, and drip systems with attention to efficiency, economics, and application rates.   **B- Intended Learning Outcomes (ILOs):**  Successful completion of the course should lead to the following outcomes:  **A. Knowledge and Understanding:** Student is expected to  **A1.** Understand the purposes, objectives and benefits of irrigation practice  **A2.** Understand the prioritization policies of water resources and allocation of irrigation water in terms of quality and quantity  **A3.** Describe basic soil properties such as porosity, soil bulk density, soil particle density and soil texture  **A4.** Define the soil field capacity and permanent wilting point  **A5.** Describe the water cycle  **A6.** Describe the direct and indirect methods of evapotranspiration measurements  **A7.** Describe the direct and indirect methods of soil water measurements  **A8.** Describe the advantages and disadvantages of the surface, sprinkler and drip irrigation.  **B. Intellectual Analytical and Cognitive Skills:** Student is expected to  **B1.** Explain the basic design concepts for furrow, border and basin irrigation  **B2.** Use guideline tables to select the appropriate furrow length, border and basin size.  **B3.** Explain the appropriate operation of drip and sprinkler irrigation system  **C. Subject- Specific Skills:** Students is expected to  **C1**. Convert between the different units of measurements  **C2.** Determine soil texture from soil textural triangle  **C3.** Determine the volumetric and gravimetric soil water content  **C4.** Determine the readily available water  **C5.** Calculate the daily and monthly evapotranspiration  **C6.** Estimate the crop water requirements  **C7.** Determine the different irrigation efficiencies  **C8.** Determine the leaching fraction  **C9.** Determine the net irrigation requirements  **D. Transferable Key Skills:** Students is expected to  **D1.** Select the appropriate irrigation system based on given circumstances  **D2.** Determine when and how much to irrigate  **D3.** Determine irrigation frequency |

**22. Topic Outline and Schedule:**

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| |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Week** | **Lecture** | **Topic** | **Teaching Methods\*/platform** | **Evaluation Methods\*\*** | **References** | | 1 | 1.1 | **Introduction:** Systems of units(Basic, derived units);  Definition and importance of irrigation; Water resources in Jordan | Class rooms | Exams | Hnsen,1980  (Chapter 1,2)  James, 1988  (Chapter 1,2) | | 1.2 | | 1.3 | **Soil physical properties:** Texture and structure  Bulk density, particle density and specific gravity and  Porosity; Soil water content(mass basis, volumetric basis and water depth) | Class rooms | Exams | Hansen,1980  (Chapter 3,4)  James,1988 (Chapter 1) | | 2 | 2.1 | | 2.2 | **Soil moisture forms:**  Saturation, Field capacity, Permanent wilting point, Available water, saxton equation | | 2.3 | | 3 | 3.1 | **Movement of water in soils** | | 3.2 | | 3.3 | **Soil moisture measurement:**  Direct method (by feel, gravimetric method); Indirect method (tensiometer, gypsum blocks, TDR, capacitance and neutron probe) | | 4 | 4.1 | **Water cycle**  **Water consumptive use by crop:**  Reference Evapotranspiration (ETo); Crop Evapotranspiration (ETc);  Crop coefficient (Kc); | Class rooms | Exams | James,1988 (Chapter 1) | | 4.2 | | 4.3 | | 5 | 5.1 | Determination ETo  (direct and indirect methods) ;  Estimating Evapotranspiration | | 5.2 | | 5.3 | | 6 | 6.1 | **Water scheduling**  How much water to apply. rrigation strategies | Class rooms | Exams | FAO land and water bulletin 4, 1997  [FAO Irrigation and Drainage Paper No. 56](https://www.google.jo/url?sa=t&rct=j&q=&esrc=s&source=web&cd=4&cad=rja&uact=8&ved=0CCwQFjADahUKEwjhio__5-nHAhVHPBQKHRPZAwI&url=http%3A%2F%2Fwww.kimberly.uidaho.edu%2Fwater%2Ffao56%2Ffao56.pdf&usg=AFQjCNGq9M8m_CCzRM7FmojZvNZeTIgDAw&bvm=bv.102022582,d.bGg) | | 6.2 | | 6.3 | | 7 | 7.1 | When to irrigate? Irrigation frequency | | 7.2 | | 7.3 | | 8 | 8.1 | **Irrigation efficiencies and losses**  Application efficiency; Conveyance efficiency; | Class rooms | Exams | Hansen,1980  (Chapter 8)  James,1988 (Chapter 2) | | 8.2 | | 8.3 | | 9 | 9.1 | Storage efficiency; Distribution uniformity | | 9.2 | | 9.3 | | 10 | 10.1 | **Irrigation methods**  Surface; | Class rooms | Exams | FAO websites, training manual no 1, 4 and 5 by Brouwer et al.  Hansen,1980  (Chapter 9,10)  James,1988 (Chapters 5, 6 ,7) | | 10.2 | | 10.3 | | 11 | 11.1 | | 11.2 | Sprinkler | | 11.3 | | 12 | 12.1 | | 12.2 | Drip | | 12.3 | | 13 | 13.1 | **Water Quality**  Salinity of irrigation water; Soil salinity tolerated by the crop, | Class rooms | Exams | Hansen,1980  (Chapter 6)  James,1988 (Chapter 3) | | 13.2 | Leaching requirements, irrigation with recycled water/ | | 13.3 | Guidelines and risks | | 14 | 14.1 | Review | | | | | 14.2 | | 14.3 | | 15 |  | Final exams | | | | |

* Teaching methods include: Synchronous lecturing/meeting; Asynchronous lecturing/meeting
* Evaluation methods include: Homework, Quiz, Exam, pre-lab quiz…etc

**23 Evaluation Methods:**

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| Opportunities to demonstrate achievement of the ILOs are provided through the following assessment methods and requirements:   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Evaluation Activity** | **Mark** | **Topic(s)** | **Period (Week)** | **Platform** | | Homework, assignments or project-based assessment | 20 | All related topics are allowed | Week 5 | Paper-based homework, presentations, representative models, or justifications of methods | | Midterm | 30 | 1, 2, 3, 4, 5 | Week 7 | Paper-based exam | | Final | 50 | 6, 7, 8, 9, 10, 11, 12, 13 | Week 15 | Paper-based exam | |

**24. Course Policies:**

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| * Regular and timely attendance are expected from all students. University regulations concerning class attendance will apply * Exams absentees can 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 exams * For more details on university regulations please visit: <http://www.ju.edu.jo/rules/index.htm> * If you have any issues get in contact with me right away. If somebody is going to miss a lecture (big deal), let me know ahead of time. * UoJ code of conduct and academic Integrity, Cheating, and Plagiarism are not acceptable / the consequences as mandated by the UoJ * Attendance is mandatory with no disturbance (*phones*). * Entering the classroom on time |

**25. Required equipment: (**Facilities, Tools, Labs, Training….)

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| 1. To train undergraduate students and motivate them to enroll in postgraduate studies in agricultural meteorology, it was decided to propose courses for teaching at the undergraduate level where agricultural and other allied programs were offered. These include a course on climate change and its impact on society in response to the increased attention to climate change. 2. Field trip to weather forecasting center introducing synoptic maps, satellite images, and computer modelling in weather forecasting. |

**26. References:**

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| 1. **Required book(s), assigned reading and audio-visuals:**  * Hansen, V., Israelsen, O. and Stringham, G.,1980, irrigation principles and practices, 4th edition, John Wiley and Sons. * James, L., 1988, Principles of farm irrigation system design, 2nd edition, John Wiley and Sons.   **B- Recommended books, materials and media:**   * ***Irrigation Water Management: Training Manual No. 1 - Introduction to Irrigation***, by C. Brouwer, A. Goffeau, M. Heibloem, <http://www.fao.org/docrep/R4082E/R4082E00.htm#Contents> * ***Irrigation Water Management: Irrigation Scheduling***, Training manual no. 4, by C. Brouwer, K. Prins and M. Heibloem.   <http://www.fao.org/docrep/T7202E/t7202e00.htm#Contents>   * ***Irrigation Water Management: Irrigation Methods***, Training manual no 5, by C. Brouwer, K. Prins, M. Kay and M. Heibloem. <http://www.fao.org/docrep/S8684E/s8684e00.htm#Contents> |

**27 Additional information:**

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| Name of the Instructor or the Course Coordinator:  …………Dr Fayha Al-Shibli…………… | 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:  ……..………… |