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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** |
|  | **Number of Pages** |

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| --- | --- | --- |
| **1.** | **Course Title** | Principles of Soil |
| **2.** | **Course Number** | 0604101 |
| **3.** | **Credit Hours (Theory, Practical)** | 3 |
| **Contact Hours (Theory, Practical)** | 3 |
| **4.** | **Prerequisites/ Corequisites** | 0303101, 0333109 |
| **5.** | **Program Title** | Bachelor Land, Water and Environment |
| **6.** | **Program Code** | 4 |
| **7.** | **School/ Center** | Agriculture |
| **8.** | **Department** | Land, Water and Environment |
| **9.** | **Course Level**  | Undergraduate-BSc |
| **10.** | **Year of Study and Semester (s)** | Spring 2023 /2024 |
| **11.** | **Other Department(s) Involved in Teaching the Course** | -------- |
| **12.** | **Main Learning Language** | English |
| **13.** | **Learning Types** | √ Face to face learning ☐Blended ☐Fully online |
| **14.** | **Online Platforms(s)** | ☐Moodle √ Microsoft Teams |
| **15.** | **Issuing Date** | 4/7/2024 |
| **16.** | **Revision Date** | 9/7/2024 |

**17. Course Coordinator:**

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| --- |
| Name: Prof. Jawad Al-Bakri Contact hours: 11:00-12:30 Office number: 052 Phone number:22449Email: jbakri@ju.edu.jo  |

**18. Other Instructors: --------**

|  |
| --- |
| Name: Areej AL Khreisat Contact hours: 12:30-13:30 Monday &WednesdayOffice number: 57 1st floor Phone number:22444Email: a.alkhreisat@ju.edu.jo  |

**19. Course Description:**

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| This introductory course in soil science enables the student to know and understand the main properties and functions of soils as natural bodies, media for plant growth and as components of the larger ecosystem. The students will gain knowledge in soil composition and forming factors; physical, chemical, and biological properties; soil mineralogy; and soil fertility and health. |

**20. Program Intended Learning Outcomes:** Land, Water and Environment BSc Program ILOS

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. Assess 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 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:**

The overall aim of this course is to provide the students with knowledge in soil including the main properties that control soil quality. This is achieved by introducing components and phases of soil and its forming factors, main soil properties and the roles of organic matter and soil colloids. Upon completion of the course, the student will achieve the following ***intended learning outcomes***:

**A. Knowledge and Understanding**

A1- Importance of soil in relation to crop production and environment.

A2- The basic soil physical and chemical properties that control plant growth.

 **B. Intellectual, Analytical and Cognitive Skills:**

B1- Processes of soil formation and their impacts on soil properties.

B2- Concept of soil fertility and plant nutrients availability.

**C. Subject- Specific Skills:**

C1- Main types and structures of primary and secondary clay minerals and their importance

C2- Soil organic matter and nitrogen cycle and transformations.

**D. Transferable Key Skills:**

D1- Soil properties in arid environments including saline, sodic and saline-sodic soils.

D2- Possible practices to improve soil health and fertility for crop production.

|  |  |
| --- | --- |
| Course ILOs | The learning levels to be achieved |
| Remembering | Understanding | Applying | Analysing | evaluating | Creating |
| 1.A1 | √ | √ |  | √ |  |  |
| 2.A2 | √ | √ |  |  | √ | √ |
| 3.B1 | √ |  |  | √ |  |  |
| 4.B2 |  |  |  |  |  | √ |
| 5.C1 |  |  |  | √ | √ |  |
| 6.C2 |  |  |  | √ | √ |  |
| 7.D1 | √ | √ | √ |  |  | √ |
| 8.D2 | √ | √ | √ |  |  |  |

**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) |
| A1- Importance of soil in relation to crop production and environment. | √ | √ |  |  |  |  |  |  |  |
| A2- The basic soil physical and chemical properties that control plant growth.  |  |  |  | √ | √ | √ |  |  |  |
| B1- Processes of soil formation and their impacts on soil properties. | √ |  |  | √ |  |  |  |  |  |
| B2- Concept of soil fertility and plant nutrients availability.  |  |  | √ |  |  | √ |  |  |  |
| C1- Main types and structures of primary and secondary clay minerals and their importance |  |  |  | √ |  |  |  |  |  |
| C2- Soil organic matter and nitrogen cycle and transformations. |  | √ | √ |  |  |  |  |  |  |
| D1- Soil properties in arid environments including saline, sodic and saline-sodic soils. | √ |  |  |  |  |  |  |  |  |
| D2- Possible practices to improve soil health and fertility for crop production. | √ |  |  |  |  |  |  |  |  |

**23. Topic Outline and Schedule:**

| **Week**  | **Lecture (1.5 hr)** | **Topic (Number and contents)** | **ILO of the course** | **Learning Methods** **(Platform)** | **Synch. / Asynch. Lecturing** | **Evaluation Methods\*** | **Resources** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 1 | **1-Soil and soil science:*** Scientific definitions of soil.
* Importance of soil to plant (Mechanical support to plant, supply of water, oxygen, nutrients)
 | A1 | Face to Face | -- | Quiz 1 | R1-Ch1R2-Ch 1R4 |
| 1 | 2 | **Soil development:** Soil forming factors of parent material, climate, biotic factors, time and topography | B1D1 | Face to Face | -- | Quiz 1 | R1-Ch2R2-Ch 1 |
| 2 | 34 | **Soil development:** Soil composition and phases.**Soil functions:** Soil as a medium for plant growth, plant nutrients and soil supply | A1, B2 | Blended (Teams) | S/A | Quiz 1 | R1-Ch1R2-Ch 1 |
| 3 | 5, 6 | **2- Rock weathering and soil formation.*** Weathering processes (physical, chemical, biological) and types of soil parent material.
 | A2, B1 | Face to Face | -- | HW 1 | R1-Ch2R2-Ch2 |
| 4 | 7,8 | **3- Soil classification (in brief):** * Formation of soils (Pedon, soil profile, major soil horizon, soil regolith and bedrock).
* Soil orders in USDA system.
 | A2, B1A1 | Face to Face | -- | HW 1 | R1-Ch3R4 |
| 5 | 9,10 | **4- Soil Physical Properties.*** Soil texture (soil particles and their classification)
* Soil textural classes and soil textural triangle.
 | A2 | Face to Face | -- | HW2 |  |
| 6 | 11,12 | * Soil texture determination
* Soil texture importance: surface area and soil properties affected by texture.
 | A2, D2 | Face to Face | S/A | HW2 |  |
| 7 | 13 | **First Hour exam** |  | **At UOJ** |  |  |  |
| 78 | 1415 | **4- Soil Physical Properties.*** Soil structure (soil aggregates, soil cementing agents, classification and importance of soil structure).
* Soil consistence: definition and expression.
 | A2 D2 | Face to Face | -- | HW3 | R1-Ch4R2-Ch3R4 |
| 89 | 1617 | * Soil density (bulk and particle densities and their implications, soil porosity).
* Soil color: Munsell chart and expression of color, implications of soil color.
 | A2A2 | Face to Face | -- | HW3 | R1-Ch4R2-Ch3R4 |
| 910101111 | 1819202122 | **5- Soil Mineralogy.*** Chemical and mineralogical composition of the earth’s crust.
* Weathering processes in brief (review, see week 3).
* Types of rocks, primary and secondary minerals.
* Soil secondary clay minerals: main composition of Kaolinite (1:1).
* Soil secondary clay minerals: main composition of Smectite and other clay minerals (2:1).
* Charge on clay minerals: sources of permanent charge, pH dependent charge.
* Ion exchange: Cation exchange capacity (CEC), Anion exchange, CEC, base saturation.
 | A2B1 C1C1C1C1D1 | Face to FaceFace to Face | --S/A | Quiz 2 | R1-Ch8R2-Ch10R1-Ch8R2-Ch10 |
| 12 | 23 | **Second Hour exam** |  | **At UOJ** |  |  |  |
| 1213 | 2425 | **6- Soil Chemistry.*** Soil pH: Determination of soil pH, Source of alkalinity (Carbonate hydrolysis and Mineral
* weathering), Sources of Acidity (Aluminum, role of strong acids), significance of soil pH (Nutrient availability, effect on soil organisms, toxicity), Management of soil pH.
* Soil salinity and alkalinity: saline, sodic and saline-sodic soils.
 | A2B2 D1 |  |  | HW4 | R1-Ch9R2-Ch11R1-C10R4 |
| 1314 | 2627 | **7- Soil Ecology.*** Biogeochemical Cycles and their roles in ecosystems and food production.
* Carbon cycle and soil food web.
* Producers, Consumers and Decomposers.
* Soil food web: Trophic levels and general features of Decomposers.
* Beneficial and harmful organisms to plants, Soil Animals (Earthworms and nematodes)
 | C2D2 | Face to Face | --S/A | Quiz 3 | R1-Ch11R2 - Ch8R3R1-Ch13 |
| 1415 | 2829 | **8- Soil Organic Matter.*** Soil organic matter: sources, decomposers,
* Soil organic matter influence on physical and chemical properties of soil.
* C/N ratio and organic matter decomposition, humus formation.
* Nitrogen cycle and paths of nitrogen in soil and ecosystem.
 | C2 D2 | Face to Face | -- | Quiz 4 | R1-Ch12R3-Ch3R4 |
| 1516 | 3031 |  **9- Soil fertility and plant nutrients.*** Soil fertility and characteristics of fertile soils
* Plant nutrients and Chemical forms of uptake.
* Fixation and immobility of nutrients in soils.
* Nutrient mobility in plants and deficiency symptoms of macro and micro nutrients.
 | B2C2D2 | Face to Face | -- | HW 5 | R1-Ch15 R2-Ch12R2-Ch13R1-Ch16R4 |
| 16 | 32 | **Final Hour Exam** |  | **At UOJ** |  |  |  |

**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, homework | 10 | All topics | All | During semester | At University |
| First-term exam | 20 | All topics | A,B,D | 7 | At University |
| Second-term Exam | 20 | Beginning to soil water | A2,B1,C,D1  | 12 | At University |
| Final Exam | 50 | All topics | All | 16 | At University |

**25. Course Requirements:**

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| Students should have internet access and an account on Microsoft team’s platform.  |

**26. Course Policies:**

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| A- Attendance policies:B- Absences from exams and submitting assignments on time:C- Health and safety procedures:D- Honesty policy regarding cheating, plagiarism, misbehavior:E- Grading policy:F- Available university services that support achievement in the course: |

**27. References:**

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| **A- Required books:**R1 Brady, N C and Weil, R R, 2008. The Nature and Properties of Soils. 15th ed. Global Edition, Pearson-Prentice Hall, Upper Saddle River, NJ. 1105 pp. R2 Foth, H.D. 1990. Fundamental of soil science 8th edition. John Willey & Sons, New York.**B- Recommended materials and media:**R3 Food and Agriculture Organization of UN ( <https://www.fao.org/soils-portal/data-hub/en/>) R4 Natural Resources Conservation Service (<https://www.fao.org/soils-portal/resources/en/>)  |

**28. Additional information:**

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| 1- Attendance is obligatory.2- Any disturbance to class lectures will result in expulsion of the student and considering him absent from the lecture. Repetition of this behavior will subject the student for further actions according to UOJ regulations. |

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| Name of the Instructor or the Course Coordinator:**Prof. Jawad Al-Bakri** **Areej AL Khreisat Areej** | Signature:  | Date: 7/7/20247/7/2024 |
| 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: ……..………… |