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**Department of Soil and Water**

**College of Agricultural Engineering Sciences**

**University of Salahaddin**

**Subject: Irrigation and Drainage**

**Course Book – *3rd year***

**Lecturer's name: Dr. Abd-Elrahman Perdawood Haydar Academic Year: 2022/2023**

**Course Book**

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| **1. Course name** | **Irrigation and Drainage** |
| **2. Lecturer in charge** | **Dr. Abd-Elrahman Perdawood Haydar** |
| **3. Department/ College** | **Soil and Water Sciences** |
| **4. Contact** | **e-mail:** **Tel: (0750 494 23 52)** |
| **5. Time (in hours) per week**  | **Theory: 2 hrs and Practical: 3hrs**  |
| **6. Office hours** | **Sunday from 8-10a.m during the week** |
| **7. Course code** |  |
| **8. Teacher's academic profile**  | **Through Ms. Degree practical subjects at: soil physics, soil conservation, irrigation systems, land leveling, Surveying was upon my responsibility. After Phd. Courses, working as a lecturer at my department and other departments at the subjects of : soil physics, surveying, hydrology, principles of soil science, irrigation and drainage were the main duties, besides cooperating works within the transitory commissions that charged from the department.** |
| **9. Keywords :**  | **Irrigation ,Soil moisture, Available water Field capacity, Evaporation , water balance, Lysimeters, Discharge, weirs, consumptive use ,infiltration, drainage ,open and pipe drains** |
| **10. Course overview:**  Water is the main characters that affect directly upon the productivity of the crops, therefore expressing the role of water in the dissimilar farming processes is our main objectives, for achieving this aim obtaining information about the soil water content, how it can be consider and different methods for determining the soil moisture, its available quantities, effect of physical properties on moving and transporting water ...is the chief purpose. Calculating the discharge of water in the channels and the amount of evaporated water from the water surface, from the bare soil, transpiration and other losses is another issue it should be taken in our considerations in order to enable us for determining the consumptive use for designing and good irrigation planning. As the presence of water is essential in the root activity zone, at the same time the surplus water in the soil is also important and generally affects negatively on the plant growth consequently perversion and delivering from these quantities of water is necessary.  |
| **11. Course objective:**The main objective of this course is to enable the students making good treatment with water and how to use it scientifically and economically in order to obtain high benefits from the quantity of water that is available in the field with a minimum amount of losses, to enable the students to irrigate the fields at the suitable time and with a sufficient amount of water without spending time and water. It is the lecturers aim to make the students treying to conserve water at the seasons of precipitation by means do not let it goes out from his field, but collect it and store it for the need times.  |
| **12. Student's obligation:**  Because the level of the most of the student are not acceptable for these kinds of subjects – which contains mathematics and different equations – therefore their understanding is not at our desired level, consequently the process need more trying and cooperation between the lecturers and the students, in other words the lecture should have fatigues for performing this duty.  |
| **13. Forms of teaching:** After preparing the lectures and printing it, data show and power point is used for expressing the subject, solving and discussing mathematical problems will be done on white board.  |
| **14. Assessment scheme**: Two Examinations will be done at the whole course, presence and the absence of the students recorded by the lecturer and returns to themselves and the menace of the absence articulated at the beginning of the course, because the time-**generally**- do not help the lecturers and the halls are not standardized therefore I see that the verbal quizzes can be performed within the students share at the lectures. For obtaining more information and understanding we haven’t prevention at performing an additional examination to encourage the students on reading and making more discussion about the subject. ‌ |
| **15. Student learning outcome:**The results at the final examination is one of the indicators about the students understanding the matter ,and preparing a good chance for applying their information after graduating from the college is another and the most important aid for progressing their abilities in order to not forget the academic information.  |
| **16. Course Reading List and References‌:****Key References:*** **Michael,A.M., and Ojha,T.P.(2003).Agricultural Engineering .Vol.II.JainBrothers,New Delhi.**
* **Orson,W.I., and Hansen,V.E. (1962).Irrigation Principles and practices.3rdedition.JohnWelly& Sons Inc.**
* **Misra,R.D. and Ahmed,M.(1990).Manual of Irrigation gronomy.MohanPrimlani for Oxford &Publishing ,Darya Ganj New Dalhi**
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| **17. The Topics:** |
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| No week | **The Topics** | **Lecturer Name** |
| **1** | **Definitions, types of irrigation, objectives of irrigation, relation between irrigation and other sciences, water in soil, Methods of measuring soil water content, Why irrigation is necessary, scope and importance of irrigation science, Sources of irrigation water, Benefits of irrigation.** | **Dr.****Abd-Elrahman** |
| **2** | **Available water holding capacity, Available water in the soil, Soil water relations, Soil-water-plant relationship, Soil water potential and soil water content, soil water characteristic curves** | **Dr.****Abd-Elrahman** |
| **3** | **Methods of water measurements in the a stream, Volumetric measurement, Velocity –Area method, Float method, Dilution gauging method, Fixed gauging stations (Weirs& orifices), Resistance equation** | **Dr.****Abd-Elrahman** |
| **4** | **Consumptive use, Terminology, units of C.U, Factors affecting C.U , Estimating of evapotranspiration, Empirical equations** | **Dr.****Abd-Elrahman** |
| **5** | **Field measurements of evapotranspiration: Lysimeters, Water balance, evaporation index** | **Dr.****Abd-Elrahman** |
| **6** | **Principles of flow, types of water flow, Froude number, Infiltration, Processes of infiltration, Infiltration : Objectives , Factors affecting infiltration rate, ,Infiltration nomenclature, Percolation** | **Dr.****Abd-Elrahman** |
| **7** | **Estimating infiltration based on irrigation, Estimating infiltration based on precipitation (SCS Method), Methods of measuring Infiltration, Infiltration measurement for flooded irrigation.** | **Dr.****Abd-Elrahman** |
| **8** | **Soil Type Effects on Infiltration, Single and Double ring Infiltrometer, Rainfall Simulator/Infiltrometer, Infiltration Measurement For Furrow Irrigation, and Infiltration Measurement For Sprinkler Irrigation.** | **Dr.****Abd-Elrahman** |
| **9** | **Drainage*,* Definitions, Aims of drainage.** | **Dr.****Abd-Elrahman** |
| **10** | **Components of a drainage system, Drainage system** | **Dr.****Abd-Elrahman** |
| **11** | **Components of surface drainage system, Random field drainage system, Parallel field drainage system.**  | **Dr.****Abd-Elrahman** |
| **12** | **Subsurface drainage systems,open drains and pipe drains, A singular drainage system, A composite (combined) drainage system.** | **Dr.****Abd-Elrahman** |

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| **18. Examinations:*****Q1/* Fill the following blanks:**1. **Quantity of water does not give a true ...................................................**

**2-Soil wetness reflects the ease or difficulty of extraction of ...............................................**1. **The amount and timing of rainfall determines the adequacy of ....................................**
2. **Irrigation is concerns with............................................................................**
3. **Successful irrigation allows improve .....................................................................**
4. **Available water is defined as the .......................................................................**
5. **Temporary wilting point may occur in ...........................................................**
6. **Irrigation efficiency is the ratio between the ....................................................**
7. **Soil water potential (matric potential) is normally measured.......................**
8. **Float method of discharge measurement gives a good estimate......................................**

**Q2/ Say True (T) or False (F), the false answer expunges the right one.**1. A plant extracts water easier from a silty soils than from a clay soils at the same moisture content.
2. Gravimetric water content can be converted to volumetric by multiplying the first one by soil bulk density.
3. The scope of irrigation extends from the source to the farm and on the drainage channel.
4. Rainmaking can be performed by nucleation process using Barium iodide.
5. Three float tests should be conducted at least to take an average velocity of the stream.
6. Robert Manning is an English Engineer , in 1889 presented his formula
7. Potential evapotranspiration would occur if there was an adequate soil-moisture supply at all time)
8. Velocity of water of a varied flow changes from section to another, by means dv/dL= 0.
9. Soil texture and vegetation have major influence on infiltration rate.
10. Drainage is the removal of excess water and dissolved salts from the surface of the land.

**Q3/ Calculate the available water per one hectare in a soil with a homogeneous profile according to the following data:**Field capacity (F.C) = 17%, Wilting point (W.P) =7%, Soil bulk density (ρb )=1.3g/cm3, Main root zone (Zr); ds=0.4m, ρw=1.0g/cm3 |
| **20. Extra notes:**Obtainable different irrigation systems at Grdarasha field and instruments in labours enable the students to apply their information that had been given by lecturers, and consequently their education levels will be higher and they can perform more at the future.  |