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**Department of Geology**

**College of Science**

**University of Salahaddin**

**Subject: Hydrology**

**Course Book – *Second Year* (Year 2)**

**Lecturer's name: Mariwan Akram H.Saeed(Ph.D.)**

**Academic Year: 2022/2023**

**Course Book**

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| **1. Course name** | **Hydrology** |
| **2. Lecturer in charge** | **Mariwan Akram Hamah Saeed (Ph.D.)** |
| **3. Department/ College** | **Geology Department/ Science College** |
| **4. Contact** | **e-mail:** [**mariwan.hamahsaeed@su.edu.krd**](https://us-mg5.mail.yahoo.com/compose?to=mariwan.hamahsaeed@su.edu.krd)**Tel: (optional): 00964-750-3310070** |
| **5. Time (in hours) per week**  | **For example Theory: 2** **Practical: 2**  |
| **6. Office hours** | **3-4 hours** |
| **7. Course code** | **-** |
| **8. Teacher's academic profile**  |  **I graduated from University of Salahaddin on 1987, and then I got the M.Sc. hydrology and hydrochemistry from the University of Baghdad on 1998. I was engaged to work as an assistant lecturer on 1998 at department of geology – Science College – Salahaddin University. I hold Ph.D. in Hydrogeology on 2003 from Baghdad University. I awarded the lecturer degree in 2009. During my work I carried out some of published researches and scientific reports.** **From 2011 till now I gave many courses in the Department of Geology such as Crystallography, General Geology, Environmental Geology, Geomorphology, Hydrology, Hydrogeology and many courses for M.Sc. students such as Hydrogeology, Computer application, and Hydrology.** |
| **9. Keywords** | **Science- Hydrology –water cycle** |
| **10. Course overview:****The course covers step by step the theoretical principles of surface water of the earth, quantity and quality of water, infiltration and relation with hydrogeology or groundwater. Present text books together with print media or internet articles which deal with current subject are used.** **Hydrology Is the science that studies the occurrence, distribution, movement and Chemical, physical, and biological properties of the surface waters of the earth. It is concerned with the distribution of water on the surface of the earth and its movement over and beneath the surface, and through the atmosphere. This wide-ranging definition suggests that all water comes under the emit of a hydrologist, while in reality it is the study of fresh water that is of primary concern.** **The course will give students a better understanding of water availability, water losses by using Hydrometeorological data, type of water, water uses , relation between meteorological data with water surplus and water deficit , and water managements. The student should be able how to get data, process data and interpret in view of hydrology. The study of hydrology helps us to know*** **The maximum probable flood that may occur at a given site and its frequency; this is required for the safe design of culverts, dams and reservoirs, channels and other flood control structures.**
* **The water yield from a catchment area (watershed) : its occurrence, quantity and frequency, etc; this is necessary for the design of dams, municipal water supply, water power,..etc.**
* **The ground water development for which a knowledge of the hydrology of the area**
* **The maximum intensity of storm and its frequency for the design of a drainage project in the area**
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| **11. Course objective:**1. **Theory (two hours weekly)**

**The course covers step by step the theoretical principles of surface water of the earth, quantity and quality of water, infiltration and relation with hydrogeology or groundwater. Present text books together with print media or internet articles which deal with current subject are used. The course will give students a better understanding of water availability, water losses by using Hydrometeorological data, type of water, water uses , relation between meteorological data with water surplus and water deficit , and water managements. The student should be able how to get data, process data and interpret in view of hydrology.** 1. **Practical (three hours weekly)**

**We use to make the three practical hours follow the theoretical two hours by at least one week in order to give the student the enough time to apply his latest knowledge in processing data or interpreting data. This is done by solving convenient problems that are related to the theoretical knowledge.** |
| **12. Student's obligation****The student’s obligation during the course is attendance in the class for two hours for studying the theoretical part of the course the he applied it in the laboratory (about three hours). There are many tests before the beginning of the labs.**  |
| **13. Forms of teaching****Different forms of teaching will be used to reach the objectives of the course: power point presentations for the head titles, definitions and summary of conclusions, classification of materials and any other illustrations. Besides of that worksheets in the form of problems (mostly got from field data) will be designed to let the chance for practicing on several aspects of the course in the practical classroom. There will be classroom discussions and the lecture will give enough background to translate, solve, analyze, and evaluate problems sets, and different issues discussed throughout the course.****To get the best of the course, it is suggested that the student attend classes as much as possible, read and understand the required lectures immediately after getting them regularly as all of them are foundations for the course. Lecture’s notes on the power point are for supporting and are not enough for you; you should read the text book as well and participate discussions.** |
| **14. Assessment scheme****The students are required to do an exam after each five lectures. The exam has 50 marks (lab 35, theory 15). There will be a final theoretical exam on 50 marks so the final grade will be upon the following criteria:** * **Laboratory for 2 courses: 35**
* **Theory exam and classroom participation and assignments: 15**
* **Final exam: 50**
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| **15. Student learning outcome:****In the last years many dam design and construction companies come to Kurdistan Region for construction the dams, weirs, and ponds in a wide areas along the region, so several geologist are followed these companies and others are work with the geological survey, hydrological survey and environments. Some of the students after graduation they employed in water resources companies in public and private sectors.**  |
| **16. Course Reading List and References‌:*** **Fundamentals of Hydrology. Tim Davie, 2008**
* **Hydrology in Practice. Elizabeth M. Shaw, 2005**
* **Hydrology for Engineers , Geologists, 1997, Sergio E. Serrano.**
* **In addition to many other references**
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| **17. The Topics:** | **Lecturer's name** |
| 1. **Introduction to water science**
2. **Hydrological cycle, climate, precipitation, type of rainfall, catchment area, and Instruments for measurement of rainfall(Rain Gauges)**
3. **Computation of Average Rainfall over a Basin: Arithmetic average method, Weighing mean method or Thiessen polygon method, and Isohyetal method, Comparison between the three methods**
4. **Infiltration, infiltration capacity, Factors affecting and controlling infiltration, Modelling Infiltration, Measuring infiltration, Infiltration Measurement Instruments**
5. **Hydrometeorological Water Balance, Water availability Elements(Precipitation and Relative humidity), Water losses Elements(Temperature, Wind speed, Sun Shine, and Evaporation), Predict Station, Evaporation from class (A) pan, Evapotranspiration.**
6. **Water budget method or Water balance, Thornthwaite Method, Blaney-Criddle Method, Kharrufa Method, Turce method, Dalton method, pasquill method, Penman method, and Water Surplus and Water Deficit**
7. **Stream Discharge, Manning Equation, Discharge Measurements, Velocity-Area method (Mid-section method, and Mean Section Method) , Dilution Gauging Method, Weir formulas**
8. **The Hydrograph, Factors affecting flood hydrograph (Natural geographic factors and Climatic factors)**
9. **Relationship Between GW & SW, Gaining and Losing streams , Types of Aquifers**
10. **Water Quality Collection of water samples, Methods of Analysis, Accuracy and Precision**
11. **Physical properties of water, Chemical properties of water, Trace elements , The effective environmental factors for chemistry of water, Hydrochemical formula and water type, Hypothetical Salt Combinaion, Hydrochemical Indicators , and Water Classification**
12. **Water Utalizations (Uses) , Drinking water, livestock uses, agricultural, irrigations, industrials, and portray uses**
13. **Timee of concentration of water in catchment area, peak discharge, gauge stations, relation between shape of catchments with tyme of concentrations and peak discharges.**
14. **Discussions, seminars, reports, and presentations**
15. **Examination**
16. **examination**
 | **Dr.Mariwan A.H.Saeed****ex:(2 hrs)** |
| **18. Practical Topics (If there is any)** |  |
| 1. **Exercises on point measurement of precipitation by using histograms (bar-graphs) and continuous curves.**
2. **Determining the effective depth precipitation for a basin by using the arithmetic mean, Isohyetal and Thiessen methods.**
3. **Determining the potential evapotranspiration for monthly data of temperature and sunshine by using Thornthwait, BlanyCridle and Kharofa method. Then determining the water surplus and water deficit.**
4. **Exercises to determine infiltration rates and infiltration capacity by using Davis equation with illustrating the relation between infiltration rates and time on normal graph paper.**
5. **Determining the total discharge for a cross sectional area of a steam by using data of velocity and depth for several stations and by using Mean and Mid section methods.**
6. **Exercises to separate base flow for a stream discharge hydrograph by using Straight line method, Fixed base length method.**
7. **Presentation of chemical analysis results for groundwater by using several diagrams.**
8. **Determining the Accuracy and Precision for chemical analysis of water samples.**
9. **Review for all labs.**
10. **Monthly Examination.**
 | **Dr.Mariwan A.H.Saeed****M.Sc Afrah Kafi Mohamad****ex:(2 hrs - 4groups)** |
| **19. Examinations:*****1. Compositional:*** **a. Define the follow.** **Hydrology, Stream discharge, convective rainfall** **b: Give the reason for the following:** **a. peak discharge change with climate change.**  **b. high rain fall in windward side.** **c. chemistry of water changed with time and relief .*****2.*True or false type of exams:****Answer by True or False, correct what is written in (bold) if it is not correct**1. **Hydrology:** Is the earth science that studies the occurrence, distribution, movement and Chemical, physical, and biological properties of the waters of the earth.
2. **Drizzle is** a freezing raindrops, a combination of snow and rain.
3. **Convective precipitation:** this is the precipitation that is caused by the expansion of air on ascent along or near a frontal surface. Kurdistan region rainfall is mostly of this type.
4. **Evapotranspiration is** the water loss from plants.

**3*.* Complete the following sentences with a proper words or statements.**1. **………………………………………………….. is defined as the area of land from which water flows towards a river and then in that river to the sea.**
2. **The percentage of ………..……….. in the world is 96.54%.**
3. **An …………………………. is a line joining places where the rainfall amounts are equal on a rainfall map of a basin.**
4. **……………………………….: Is the ratio of actual Is the ratio of actual vapour pressure to saturated vapour pressure. is expressed in percentage.**
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| **20. Extra notes:****None** |
| **21. Peer review****Dr. Masoud Husain.‌‌**  |