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**Department of: Geology**

**College of: Science**

**University of: Salahaddin**

**Subject: Hydrogeology**

**Course Book : Year 4**

**Lecturer's name: Afrah Kafi Mohammed**

 **Al- Nabawi(MSc)**

**Academic Year: 2020/2021**

**Course Book**

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| **1. Course name** |  **Hydrogeology** |
| **2. Lecturer in charge** | **Afrah Kafi Mohammed Al- Nabawi** |
| **3. Department/ College** | **Department of Geology/ College of Science** |
| **4. Contact** | **e-mail:afrah.alnabawi@su.edu.krd** **Tel: (07504702210)** |
| **5. Time (in hours) per week**  | **Practical:8**  |
| **6. Office hours** | **10-12 hr** |
| **7. Course code** |  |
| **8. Teacher's academic profile**  | I graduated from University of Salahaddin on 1985-1986,I employed in the geology department on 1987, then I got the M.Sc. in Hydrogeology from the same university on 2002 .since that time I gave many courses in the Department of Geology such as Practical Hydrology and Hydrogeology ,Practical Geomorphology ,practical Engineering Geology and practical Optical Mineralogy. |
| **9. Keywords** | **Science, Hydrogeology** |
| **10. Course overview:**  This course focuses on the important of surface and ground water. The course is composed of two parts Hydrology and Hydrogeology. In Hydrology part a wide study of surface water is done from view of occurrence, movement of water, relation with climate elements, determining of stream discharge, infiltration and chemistry of surface water. While in Hydrogeology part a wide study of groundwater is done from view of occurrence, movement of groundwater, relation with geology materials, determining of groundwater discharge, determining of aquifer characterises and study chemistry of groundwater. |
| **11. Course objective:** In this course, the students will be able to understand the important of Water, where Water is the elixir of life, without it life is possible. People use surface water in places where there is a source of it such as rivers, streams, lakes and so. Groundwater is very important especially where there is no surface water; people depend on surface and ground water for several purposes such as drinking industrial, agriculture and irrigation.Students will be interested From where the water coms and the processes effect the water by studying the water cycle .The most important processes are precipitation, evaporation and evapotranspiration, infiltration and percolation. Also student will understand the important of quantity and quality of water by studying water balance and hydrochemistry , this study let the student to be responsible to save water and leave it clean. This course is very important for all geology students in there practical life after they graduate most places need a Hydrologist such as Dam directory, Groundwater directory and water resources companies in public and private sectors and other directories.   |
| **12. Student's obligation** The student’s obligation during the course is attendance in the class or lab for about three hours for studying the practical part of the course. Every lab there are many exercise to solve after a brief explaining for the theoretical part and then students must write a report with a discussion of what they did in the lab. There are marks on the attendance of the students and on the work of the students and on there reports.   |
| **13. Forms of teaching**In this course different forms of teaching are used such as power point presentations, blackboard and whiteboard also are used. Figures that related to the lectures also are used to help student to understand the objects. Furthermore, students will be asked to prepare a report in each lab and there will be classroom discussions at the end of the presentations. I suggest to get best results of this course, students must read the theoretical lectures and teacher's notes before they attend the lab, and always try participate in classroom discussions as much as possible.  |
| **14. Assessment scheme**The students are required to do tow exams in this course, one after six or seven labs of practical hydrology and the second after six or seven labs of practical Hydrogeology. Average of the both exams has 15marks. The attendance, classroom activities, and reports count 2-3 marks from the 15 marks. There will be a final practical exam on 20 marks.  ‌ |
| **15. Student learning outcome:**In this course student learn the important of Water and how to respect this resource that god gave us and how to protect it from reducing and pollution. Water is the elixir of life, without it life is possible, people depend on surface and ground water for several purposes such as drinking industrial, agriculture and irrigation, so it is necessary for student to understand the important of quantity and quality of water and to be responsible to save water and leave it clean.There are many directories and water resources companies in public and private sectors where geology students can attend after they graduate such as Dam directory, Groundwater directory and water resources directory, so this branch is very important for the practical life after graduation where most places need a Hydrologist.   |
| **16. Course Reading List and References‌:**▪ Key references:Groundwater, surface water, Hydrology, Hydrogeology▪ Useful references:Fetter, C.W. ,1994. Applied Hydrogeology, Prentice Hall Inc., Englewood Cliffs, N.J.691 p.Kruseman ,G. P. and de Ridder , N. A.,1994 . Analysis and evaluation of pumping test data. International Institute for Land Reclamation and Imporovement, Wageningen, Netherlands, 377p.Serrano, S. E., 1997. Hydrology for engineers, geologists and environmental professionals Hydro. Sci. Inc. USA, 452p.Todd, D.K., 2005. Groundwater Hydrology (3rd edition). John Wiley and Sons, New York, USA, 650p.World Health Organization (WHO), 2008. Guidelines for drinking-water quality. 3rd ed., Vol.1, Recommendations, Geneva, 668 p.▪ Magazines and review (internet): Iraqi Journal of Earth Science Journal of hydrology |
| **17. The Topics:** | **Lecturer's name** |
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| **18. Practical Topics (If there is any)** |  |
| Week 1: Relation between water level in streams and ground water level in three types of streams: Influent, Effluent and Equifluent streams by constructing ground water level maps and drawing cross sections for the streams.Week 2: Exercises to study the three types of Aquifers: confined, Unconfined and Perched aquifer by drawing stratigraphic cross section for subsurface data of wells.Week 3: Preparing a water table map by using data of deep wells in an area and drawing a cross section showing the relation between the water table and aquifers.Week 4: Preparing a water table map by using three point problem and determining the aquifer characteristics such as discharge, transsmisivity, hydraulic conductivity.Week 5: Exercises to determine the aquifer characteristics (discharge, transsmisivity, hydraulic conductivity). Week 6: Exercises to practice how to determine aquifer characteristics.Week 7: Exercises to prepare a flow net by using equipotential lines and flow lines and determining aquifer discharge by using flow net.Week8: Well Hydraulics-Pumping tests .Theis method is used to determine the aquifer characteristics such as transsmissivity, hydraulic conductivity and storage coefficient for an aquifer by using data of time and drawdown from an observation well and a pumping well.Week9: Well Hydraulics-Pumping tests by using Jacob and Chow methods for determine the aquifer characteristics such as transsmissivity , hydraulic conductivity and storage coefficient for an aquifer by using data of time and drawdown from an observation well and a pumping well . Week10: Monthly Examination. Week11: Well test. For this situation two methods are used to determine the aquifer characteristics such as transsmissivity, hydraulic conductivity and storage coefficient for an aquifer by using data of time and drawdown from a pumping well, these methods are: straight line method for Jacob, and recovery method.Week12: Presentation of chemical analysis results for groundwater by using several diagrams.Week 13: Determining the Accuracy and Precision for chemical analysis of water samples. | Lecturer's nameAfrah Kafi Al-Nabawiex: ( 3 hrs\* 4groups) |
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| **20. Extra notes:**None |
| **21. Peer review پێداچوونه‌وه‌ی هاوه‌ڵ** Dr. Awaz K. Rasoul .‌‌  |