



Department of Soil and Water Sciences

College of Agricultural Engineering Sciences

Salahaddin University- Erbil

Course Book – Second Stage / Spring Semester

Lecturer's Theoretical name: Dr. Kazhin Sarbaz Rajab

**Lecturer's Practical name: Mrs. Chra Othman Hamaameen and
Mr. Ahmad Hazim**

Academic Year: 2023-2024

Course Book

1. Course name	Spring Semester 2023-2024
2. Lecturer in charge	Dr. Kazhin Sarbaz Rajab Mrs. Chra Thman and Mr. Ahmed Hazim
3. Department/ College	Soil and Water Sciences, Agriculture
4. Contact	e-mail: kazhin.rajab@su.edu.krd Tel: 07507992635 chra.hamaameen@su.edu.krd 009647504196619
5. Time (in hours) per week	Theory: 2 hours per week Practical: 2 hours per week
6. Office hours	6 hours/week
7. Course code	
8. Teacher's academic profile	Dr. Kazhin Sarbaz Rajab My name is Kazhin Sarbaz Rajab I have B.Sc. in Soil and Water Science at Salahaddin University in 2010 and getting Master degree in Water chemistry at Salahaddin University in 2015. I am Ph. D. in Water chemistry branch.
9. Keywords	Cation exchange capacity, chemical equilibrium , Modern soil chemistry ,Electrical diffuse double layer.
10. Course overview:	<p>Soil chemistry is a branch of edaphology which deals with studding the soil chemical properties and the role of them in limiting soil fertility and nutrient availability for plants.</p> <p>The fundamental concepts in this subject are: explaining the history of soil chemistry, its branches, the relation between soil chemistry and other branches of soil science, the main terms in soil chemistry in additional to the role of soil chemistry in protection of environment from pollution.</p> <p>It is necessary to throw light on the role of soil chemistry in sustainable agriculture and food security.</p> <p>The chemical equilibrium between soil phases plays an important role in limiting nutrient intensity in soil solution.</p>

Clay minerals have great effect on nutrient availability and fixation , the carbonate minerals also plays an important role in limiting macro and micro nutrient status in the soil.

Ion exchange and factors affecting it is one of the main subjects of this course due its role in limiting soil fertility status and protection of ground water from pollution. Since ion activity is a better criterion than ion concentration for this reason it is necessary to throw light on the relation between ion activity and concentration briefly. On the other hand, it is very necessary to learn the students to use instruments, chemicals and other materials in a scientifically in order to avoid the risk of them on the students.

11. Course objective:

Goals of the course or Goals of studying soil chemistry:

The main goals of studying soil chemistry can be summarizing as follow:

1. Studying the chemical properties of the soil, like EC, pH, CEC, concentration of cat ions and anions.....etc.
2. Studying the availability of nutrients for plants or determining the amount of available nutrients for plants.
3. Determining total concentration of nutrients in the soils.
4. Studying micro nutrient status in the soils.
5. Studying mineralogical properties of the soils.
6. Reclamation the soil which not suitable for agriculture purpose.
7. Understanding of soil chemical reactions and how the soil relates chemically with the environment.
8. Studying the applications of thermodynamic in the soil science.
9. Studying the soil pollution.
10. Studying the relation between soil chemistry and other sciences.
11. Studying soil supplying power.
12. To insure and to increase production of food and fibres crops and wood production with the best quality.
13. Increasing the efficiency fertilizer use efficiency.
14. The toxicity of nutrients that harm plant growth can also controlled by soil chemistry.
15. To predict the accumulation and leaching of nutrients in irrigated fields.
16. Quality of cereals and their relation to soil chemistry,
17. The role of soil chemistry in Eco labelling.

<p>18.-Comparison between different methods of soil chemical analysis for selecting the best one.</p> <p>19.– To study the half-life of organic matter decomposition , half-life of fungicides, pesticides ,metal in the soil.</p> <p>20.Studying the role soil chemistry in fertilization recommendation. Studying the role of microorganisms in solving nutrient availability</p>
<p>12. Student's obligation: The student must have an important role:</p> <ol style="list-style-type: none">1- The students must contribute in the scientific discussions in the class or teaching hall.2- The students must know the importance of quizzes , homework , reports and exams.3- It is necessary to contribute the student in presentation a scientific subject .
<p>13. Forms of teaching: There are different forms of teaching:</p> <ol style="list-style-type: none">1-Datashow and power point.2- White board.3-Lectures.
<p>14. Assessment scheme Breakdown of overall assessment and examination:</p> <ol style="list-style-type: none">1-Monthly exam 16 marks.2-Quizzes 5 marks.3-Present and contributing in scientific discussions 3 marks.4-Seminar 2 marks.
<p>15. Student learning outcome: Explaining and training on determining the main soil chemical properties of sampling and methods of analysis ,then interpretation and discussing them that and in the future they will be applying their information in the practice</p>
<p>16. Course Reading List and References:</p> <ol style="list-style-type: none">1. A.A.S (1981). Chemistry of soil environment. USA.2. Alvarez- Benedi, J. & Munoz- Carpena R. (2005) Soil- Water solute process characterization.3. Benjamin M.M. (2002) Water chemistry. Univ. of Washington.4. Bohn, H.L., L. M. Brian and George A. O. (2001). Soil chemistry. 3rd ed. New York.5. Essington M. E. (2004) Soil and Water chemistry. New York.6. Lindsay, W. L. (1979). Chemical equilibria in soils. USA.7. Parker, D. R., R. L. Chaney and W. A. Norvell (1995). Chemical equilibrium and reaction models. SSSA special publication No. 42.

<p>8. Sparks, D. L. (1995). Environmental soil chemistry. USA. 9. Sposito, G. (2008). The chemistry of soils. New York. 2nd edition. 10. Wolt, J. D. (1994). Soil solution chemistry John Wiley and Sons, IIVC. 11. Zasoki, R. J. and R.G. Buran (2002). Soil and water chemistry. Course notes and Graphical materials, winter quarter 2002. 12. Weiner Eugene R. (2007) Applications of environmental aquatic chemistry. New York 13. Zasoski R. J. and Burau R. G. (2012) Soil and Water chemistry. USA. Magazines: 1- Soil Sci. Soc. J. 2- Journal of Soil Science. 3- Journal of Soviet Soil Science</p>	
17. The Topics:	Lecturer's name
1-Introduction (definition of soil chemistry ,the main soil chemical properties, the relation between soil chemistry and other sciencesetc) : In this week students will learn the definition of soil chemistry ,the main goals of studding it and the relation between soil chemistry and other branches of soil science.....etc.	<p>Dr.Kazhin Sarbaz Rajab Asst.Lect. Chra Othman Mr. Ahmed Hazim</p>
1-Methods of soil sampling for chemical analysis	
2 and 3-The chemical equilibrium between soil phases .Electrical double layer(EDL): This topics the aims are: 1-To explain the dynamic equilibrium between solid phase and liquid phase , liquid phase and gases phaseetc. 2-to explain EDL and its importance in soil chemistry.	
2 and 3-determination of ECe , TDS and Ionic strength.	
4-Soil minerals , clay minerals. The students will learn to distinguish between soil minerals and clay minerals then in additional to learn the properties of basic clay minerals. .	
4-Determination of soil pH using different methods.	
6-The role of clay minerals in agriculture.	

6- Determination of total nitrogen in soil .	<p>Dr.Kazhin Sarbaz Rajab Asst.Lect. Chra Othman Ahmed Hazim.</p>
7- Effect of clay minerals in selecting the best method for irrigation and fertilization .	
7- Determination of Phosphorus in soil.	
8-Ion exchange phenomenon. In this week the students will learn the difference between CEC, ECEC ,AEC and RCEC.	
8- determination of Soil potassium content.	
9-Factors affecting cat ion exchange capacity. In this topic the students will learn to answer this question why the CEC value is differing among soils ?	
9- Determination of Total Carbonate in the soil	
20. Extra notes: Nothing	
1. Peer revier: Approved by Asst. Prof. Dr. Akram Otham Esmail	