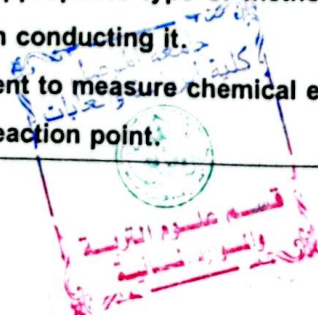


## Course Description Form

1. Course Name:
Soil chemistry
2. Course Code:
SOCH350
3. Semester / Year:
First Autumn semester/2024-2023
4. Description Preparation Date:
2024/9/1
5. Available Attendance Forms:
My presence + electronic
6. Number of Credit Hours (Total) / Number of Units (Total)
2 theoretical +3 piratical /3.5 units
7. Course administrator's name (mention all, if more than one name)
Name: . Abdalkader Absh Sbak Email: dr.abdalkaderabshsbak@uomosul.edu.iq Name:Ahmed Sameer Ghanim Email: ahmedaltaay1986@uomosul.edu.iq
8. Course Objectives
<ul style="list-style-type: none"> <li>• The learner should be able to understand and comprehend what is related to the chemical proper of soil.</li> <li>• Choosing the appropriateness of the factors affecting the knowledge and study of the most import chemical reactions that occur in the soil solution.</li> <li>• Differentiating between the natural systems of interactions that occur between the different solid liquid phases of the soil.</li> <li>• Understand the basics of detecting the type of metals that control dissolution and precipitation.</li> <li>• Enabling the student to become familiar with the most important laboratory methods for estimat the chemical elements in the soil and their condition, the materials and work methods for estimat each element, and the devices by which the estimation is carried out.</li> <li>• Familiarity with the information the student needs and what is available to him to master his work</li> <li>• The student's awareness of the factors affecting chemical reactions</li> <li>• Determine the appropriate type of methods suitable for chemical analysis and what must be ta into account when conducting it.</li> <li>• Enable the student to measure chemical elements quantitatively and volumetrically when reaching end of the clear reaction point.</li> </ul>



## 9. Teaching and Learning Strategies

<b>Strategy</b> Theoretical: - Interactive lecture - Brainstorming - Dialogue and discussion - Assigning tasks and reporting - Presentations of models of soil samples with different chemical properties - He is assigned to prepare a report entitled from his own diligence and prepare it for discussion with the students	<b>practical:</b> - Assigning group work to reveal skills <b>Leadership</b> - Assigning tasks and reporting for each experiment
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## 10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2Theoretical	A1: The student learns about the internal types of composition of the Earth's crust. B1: The student encounters the types of igneous rocks (igneous, volcanic, and metamorphic).	About the chemical composition of the Earth's crust	Interactive lecture, brainstorming, dialogue and discussion, self-learning	Midterm Exam 1, Final Exam
	3Practical	C10: The student collects various soil samples. C11: Grinds and sieves soil samples. C12: Prepares soil sample for analysis.	The student plans to collect a comprehensive sample of the entire field for the purpose of preparing it for chemical analysis.	Interactive lecture, brainstorming, dialogue and discussion, field training, self-learning	Short practical tests
2	2Theoretical	A2: The student identifies the close relationship between the three soil phases. A3: The student describes the volumetric relationship between soil components	The student understands the relationship of soil chemistry with other sciences.	Interactive lecture, brainstorming, dialogue and discussion, self-learning	Midterm Exam 1, Final Exam
	3Practical	A13: Recognizes basic units C13: Convert units to other	Basic and universal units	Interactive lecture, brainstorming,	direct drawing



		units according to international and basic units A14: Demonstrates conversion of old units to new units.		dialogue and discussion, field training, practical exercises, self-learning	
3	2Theoretical	A4: The student identifies the most important elements that make up the compounds in the Earth's crust. B2: The student links the minerals formed to the type of weathering.	Metal part chemistry	Interactive lecture, brainstorming, dialogue and discussion, self-learning	Midterm Exam 1, Final Exam
	3Practical	C14: Measures soil pH. C15: Measures total dissolved salts in the soil.	Methods for estimating soil pH and total dissolved salts in the soil	Interactive lecture, brainstorming, dialogue and discussion, field training, practical exercises, self-learning	Field evaluation
4	2Theoretical	A5: The student identifies the most important sources of organic matter. C2: The student discovers the general composition of organic matter. B3: The student evaluates the stages of organic matter decomposition.	1- Sources of organic matter 2- General composition of organic matter	Interactive lecture, brainstorming, dialogue and discussion, self-learning	Midterm Exam 1, Final Exam, Report
	3Practical	B11: Extract cation exchange capacity by saturating with sodium acetate. C16: Measure cation exchange capacity using a flame photometer.	Cation exchange capacity	Interactive lecture, brainstorming, dialogue and discussion, field training, practical exercises, self-learning	Short Practice Test, Direct Drawing
5	2Theoretical	A5: The student identifies the physical and chemical properties of humus through soil color. B4: The student evaluates the relationship between humic compounds and their solubility in acidic and basic media.	1- Physical and chemical properties of humus 2- Basic groups of humic compounds	Interactive lecture, brainstorming, dialogue and discussion, self-learning	Midterm Exam 1, Final Exam, Report
	3Practical	C17: Ammonium oxalate used to determine active calcium carbonate. C18: Analyze the remaining oxalate by titration with potassium permanganate	Active calcium carbonate	Interactive lecture, brainstorming, dialogue and discussion, field training, practical exercises, self-learning	Field evaluation
6	2Theoretical	A6: The student identifies the nature of the chemical composition of the soil solution from the ionic species. C3: The student understands the nature of the chemical equilibrium of the soil	1- The chemical composition of the soil solution 2- The nature of the chemical equilibrium of the soil solution	Interactive lecture, brainstorming, dialogue and discussion, self-learning	short test, final test

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		solution.			
	3Practical	C19: Estimates gypsum in soil using acetone. C20: Draws the relationship between the electrical conductivity of the soil extract and the gypsum concentration.	Gypsum in soil	Interactive lecture, brainstorming, dialogue and discussion, field training, practical exercises, self-learning	Live drawing and homework
7	2Theoretical	C4: The student explains the process of gaining or losing a proton. C5: The student explains the process of gaining or losing an electron.	1- Acid-base neutralization reactions 2- Oxidation-reduction reactions	Interactive lecture, brainstorming, dialogue and discussion, self-learning	Midterm Exam 2, Final Exam
	3Practical	C21: Calculate the regulatory capacity in soil from pH readings. A15: Draw the relationship between the electrical conductivity of a soil extract and the gypsum concentration.	Regulatory capacity in soil	Interactive lecture, brainstorming, dialogue and discussion, field training, practical exercises, field project, self-learning	Field project
8	2Theoretical	A7: The student explains phenomena that occur between the liquid and solid phases of soil. B5: The student applies some equations to explain the interaction on clay surface.	1- The double electrical layer 2- The equations describing the double electrical layer	Interactive lecture, brainstorming, dialogue and discussion, self-learning	Midterm Exam 2, Final Exam
	3Practical	C22: Calculates soil pH from pH readings. A16: Draws the relationship between soil pH and the concentration of added acid or base.	Soil Buffer	Interactive lecture, brainstorming, dialogue and discussion, field training, practical exercises, self-learning	Live drawing and homework
9	2Theoretical	A8: The student describes the ion exchange process using the mass action law. B6: The student evaluates the ion exchange process based on the type of cation and the size of the ion.	1- Properties of ion exchange 2- Factors affecting exchange reactions	Interactive lecture, brainstorming, dialogue and discussion, self-learning	Midterm Exam, Final Exam
	3Practical	C23: The student makes a soil extract. C24: The student measures the dissolved sodium element in the extract using a flame photometer. A17: Draws the relationship between the reading obtained from the device and the element concentration from the standard solution.	Calculation of exchangeable ions in soil	Interactive lecture, brainstorming, dialogue and discussion, field training, practical exercises, self-learning	Live drawing homework
10	2Theoretical	B7: The student applies the Freundlich-Langmuir equation to describe the adsorption and release	1- Physicochemical equations (Freundlich, Langmuir) 2- Chemical equations	Interactive lecture, brainstorming, dialogue and discussion, self-	Term 2 Exam

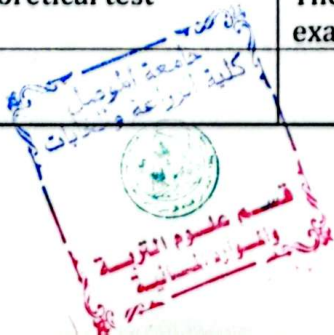


		processes. B8: The student applies Kerr-Wanslow-Capon equations to describe exchange processes between positive ions of the same different valences.	(Kerr, Fanslow, Capon)	learning	
	3Practical	C25: The student makes a soil extract. C26: The student measures the dissolved potassium in the extract using a flame photometer. A18: Draws the relationship between the reading obtained from the device and the element concentration from the standard solution.	Calculation of exchangeable ions in soil	Interactive lecture, brainstorming, dialogue and discussion, field training, practical exercises, self-learning	Live drawing homework
11	2Theoretical	A9: The student describes the process of dissolving CO <sub>2</sub> gas in water. B9: The student evaluates the role of carbonic acid in the solubility of metals.	1- CO <sub>2</sub> -H <sub>2</sub> O system 2- CaCO <sub>3</sub> -CO <sub>2</sub> -H <sub>2</sub> O system	Interactive lecture, brainstorming, dialogue and discussion, self-learning	Final exam
	3Practical	C27: Measures calcium in soil extract by titration with EDTA C28: Measures calcium and magnesium in soil extract by titration with EDTA using the EBT indicator	Calculation of exchangeable ions in soil	Interactive lecture, brainstorming, dialogue and discussion, field training, practical exercises, self-learning	Live drawing homework
12	2Theoretical	C6: The student explains the nature of phosphoric acid ionization. A10: The student uses chemical equations to describe the reactions of phosphorus in soil.	1- The nature of phosphoric acid ionization 2- Phosphorus reaction in soil	Interactive lecture, brainstorming, dialogue and discussion, self-learning	Final exam
	3Practical	C29: Measures the dissolved chloride in the soil extract by titration with silver nitrate	Calculation of exchangeable ions in soil	Interactive lecture, brainstorming, dialogue and discussion, field training, practical exercises, self-learning	Live drawing homework
13	2Theoretical	A11: The student draws solubility diagrams to identify the mineral controlling solubility. C7: The student draws solubility diagrams to identify the mineral controlling solubility.	1- Solubility diagrams for carbonate minerals 2- Solubility diagrams for phosphorus minerals	Interactive lecture, brainstorming, dialogue and discussion, self-learning	Final exam
	3Practical	C30: Extract humic compounds in soil by neutralizing them with a sodium bicarbonate solution C31: Extract humic	Humic compounds in soil	Interactive lecture, brainstorming, dialogue and discussion, field training, practical	Live drawing and homework

		compounds in soil by neutralizing them with a sodium hydroxide solution C32: Calculate the percentage of organic carbon in soil using wet oxidation		exercises, self-learning	
14	2Theoretical	C8: The student explains the importance of soil pH. A12: The student identifies the most important sources of acidity in soil.	1- The importance of studying soil pH 2- Sources of acidity in soil	Interactive lecture, brainstorming, dialogue and discussion, self-learning	Short exams, assignments, discussions
	3Practical	C33: Calculate the ionic strength of monovalent compounds C34: Calculate the ionic strength of divalent compounds C35: Calculate the ionic strength of trivalent compounds	Ionic strength in soil	Interactive lecture, brainstorming, dialogue and discussion, field training, practical exercises, self-learning	Short practical tests
15	2Theoretical	C9: The student identifies the type and sources of salinity. B10: The student evaluates the salt composition of soil based on knowledge of the dominant ions.	1- Sources of salinity in soil 2- The salt composition of saline soils	Interactive lecture, brainstorming, dialogue and discussion, self-learning	short test, final test
	3Practical	C36: Calculate the activity coefficient for monovalent compounds C37: Calculate the activity coefficient for divalent compounds C38: Calculate the activity coefficient for trivalent compounds	Soil activity and effectiveness coefficient	Interactive lecture, brainstorming, dialogue and discussion, field training, practical exercises, field project, self-learning	Field project

### 11. Course Evaluation

	Calendar methods	Calendar date (week)	degree	Relative weight %
1	Final theoretical report + practical experience reports	My theory is 15 weeks My work is 15 weeks	7theoretical + 6 practical	13%
2	Short test (1) Quiz	week (3)	4 theoretical + 2 practical	6%
3	Midterm Exam (theoretical and practical)	week (9)	10theoretical + 5 practical	15%
4	Short test (2) Quiz	week (12)	4 theoretical + 2 practical	6%
5	Final practical test	Practical exams week	20	%20
6	Final theoretical test	The week of theoretical exams	40	%40
	TOTAL		100	100 %





Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

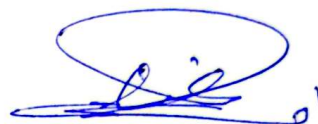
## 12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Book: Soil Chemistry, written by Kazem Mashhout, 1986
Main references (sources)	
Recommended books and references (scientific journals, reports...)	Spsito,G.(2008).The Chemistry of soil. Oxford University Press.
Electronic References, Websites	



dr.Abd Alkader Absh Sbak

Theoretical subject teacher



Ahmed Samir Ghanem

Practical subject teacher



dr.Abd Alkader Absh Sbak

Chairman of Scientific Committee



dr.Khalid Anwar Khalid

Head of the Department

