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)
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8. Course Objectives
• The learner should be able to understand and comprehend what is related to the chemical proper of soil. • Choosing the appropriateness of the factors affecting the knowledge and study of the most impor chemical reactions that occur in the soil solution. • Differentiating between the natural systems of interactions that occur between the different solid liquid phases of the soil. • Understand the basics of detecting the type of metals that control dissolution and precipitation. • Enabling the student to become familiar with the most important laboratory methods for estima the chemical elements in the soil and their condition, the materials and work methods for estima each element, and the devices by which the estimation is carried out. • Familiarity with the information the student needs and what is available to him to master his work • The student's awareness of the factors affecting chemical reactions • Determine the appropriate type of methods suitable for chemical analysis and what must be ta into account when conducting it. • Enable the student to measure chemical elements quantitatively and volumetrically when reaching end of the clear reaction point.

9. Teaching and Learning Strategies

Strategy	
Theortical: - 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	practical: - Assigning group work to reveal skills Leadership - Assigning tasks and reporting for each experiment

10. Course Structure

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

		units according to international and basic ur A14: Demonstrates conversion of old units to new units.		dialogue and discussion, field training, practica exercises, self-learning	
3	2Theoretical	A4: The student identifies the most important eleme that make up the compou in the Earth's crust. B2: The student links the minerals formed to the ty of weathering.	Metal part chemistry	Interactive lectur 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 dissolv salts in the soil	Interactive lectur brainstorming, dialogue and discussion, field training, practica exercises, self-learning	Field evaluation
4	2Theoretical	A5: The student identifies the most important sourc of organic matter. C2: The student discovers the general composition c organic matter. B3: The student evalu the stages of organic ma decomposition.	1- Sources of organic matter 2- General composition organic matter	Interactive lectur brainstorming, dialogue and discussion, self-learning	Midterm Exam 1, Final Exam, Repor
	3Practical	B11: Extract cation excha capacity by saturating wi sodium acetate. C16: Measure cation exchange capacity using a flame photometer.	Cation exchange capaci	Interactive lectur brainstorming, dialogue and discussion, field training, practica exercises, self-learning	Short Practice Tes Direct Drawing
5	2Theoretical	A5: The student identifies the physical and chemical properties of humus thro soil color. B4: The student evalu the relationship betw humic compounds and t solubility in acidic and b media.	1- Physical and chemica properties of humus 2- Basic groups of humi compounds	Interactive lectur brainstorming, dialogue and discussion, self-learning	Midterm Exam 1, Final Exam, Repor
	3Practical	C17: Ammonium oxalate used to determine activat calcium carbonate. C18: Analyze the remaini oxalate by titration with potassium permanganate	Active calcium carbona	Interactive lectur brainstorming, dialogue and discussion, field training, practica exercises, self-learning	Field evaluation
6	2Theoretical	A6: The student identifies the nature of the chemica composition of the soil solution from the ionic species. C3: The student understa the nature of the chemica equilibrium of the soil	1- The chemical composition of the soil solution 2- The nature of the chemical equilibrium of the soil solution	Interactive lectur brainstorming, dialogue and discussion, self-learning	short test, final tes

		solution.			
	3Practical	C19: Estimates gypsum in soil using acetone. C20: Draws the relationsh between the electrical conductivity of the soil extract and the gypsum concentration.	Gypsum in soil	Interactive lectur brainstorming, dialogue and discussion, field training, practica exercises, self-learning	Live drawing and homework
7	2Theoretical	C4: The student explains process of gaining or losi proton. C5: The student explains process of gaining or lo an electron.	1- Acid-base neutraliza reactions 2- Oxidation-reduction reactions	Interactive lectur brainstorming, dialogue and discussion, self-learning	Midterm Exam 2, Final Exam
	3Practical	C21: Calculate the regulat capacity in soil from pH readings. A15: Draw the relationsh between the electrical conductivity of a soil extr and the gypsum concentration.	Regulatory capacity in s	Interactive lectur brainstorming, dialogue and discussion, field training, practica exercises, field project, self-learn	Field project
8	2Theoretical	A7: The student explains phenomena that occur between the liquid and so phases of soil. B5: The student applies some equations to explain the interaction on clay surfac	1- The double electrical layer 2- The equations describing the double electrical layer	Interactive lectur brainstorming, dialogue and discussion, self-learning	Midterm Exam 2, Final Exam
	3Practical	C22: Calculates soil pH fr pH readings. A16: Draws the relationsh between soil pH and the concentration of added ac or base.	Soil Buffer	Interactive lectur brainstorming, dialogue and discussion, field training, practica 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 evalu the ion exchange pro based on the type of cha and the size of the ion.	1- Properties of ion exchange 2- Factors affecting exchange reactions	Interactive lectur brainstorming, dialogue and discussion, self-learning	Midterm Exam Final Exam
	3Practical	C23: The student makes a soil extract. C24: The student measur the dissolved sodium element in the extract usi a flame photometer. A17: Draws the relationsh between the reading obtained from the device and the element concentration from the standard solution.	Calculation of exchangeable ions in so	Interactive lectur brainstorming, dialogue and discussion, field training, practica exercises, self-learning	Live drawing homework
10	2Theoretical	B7: The student applies t Freundlich-Langmuir equation to describe the adsorption and release	1- Physicochemical equations (Freundlich, Langmuir) 2- Chemical equations	Interactive lectur brainstorming, dialogue and discussion, self-	Term 2 Exam

		processes. B8: The student applies Kerr-Wanslow-Capon equations to desc exchange processes betw positive ions of the same different valences.	(Kerr, Fanslow, Capon)	learning	
	3Practical	C25: The student makes a soil extract. C26: The student measur the dissolved potassium i the extract using a flame photometer. A18: Draws the relationsh between the reading obtained from the device and the element concentration from the standard solution.	Calculation of exchangeable ions in so	Interactive lectur brainstorming, dialogue and discussion, field training, practica exercises, self-learning	Live drawing homework
11	2Theoretical	A9: The student describes the process of dissolving CO2 gas in water. B9: The student evaluates the role carbonic acid in the solubility of metals.	1- CO2-H2O system 2- CaCO3-CO2-H2O syst	Interactive lectur brainstorming, dialogue and discussion, self-learning	Final exam
	3Practical	C27: Measures calcium in soil extract by titration w EDTA C28: Measures calcium ar magnesium in soil extract titration with EDTA using the EBT indicator	Calculation of exchangeable ions in so	Interactive lectur brainstorming, dialogue and discussion, field training, practica exercises, self-learning	Live drawing homework
12	2Theoretical	C6: The student explains 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 ionizat 2- Phosphorus reaction soil	Interactive lectur brainstorming, dialogue and discussion, self-learning	Final exam
	3Practical	C29: Measures the dissolv chloride in the soil extrac titration with silver nitrat	Calculation of exchangeable ions in so	Interactive lectur brainstorming, dialogue and discussion, field training, practica 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 f carbonate minerals 2- Solubility diagrams phosphorus minerals	Interactive lectur brainstorming, dialogue and discussion, self-learning	Final exam
	3Practical	C30: Extract humic compounds in soil by neutralizing them with a sodium bicarbonate solut C31: Extract humic	Humic compounds in so	Interactive lectur brainstorming, dialogue and discussion, field training, practica	Live drawing and homework

		compounds in soil by neutralizing them with a sodium hydroxide solutio C32: Calculate the percentage of organic car in soil using wet oxidatio		exercises, self-learning	
14	2Theoretical	C8: The student explains (importance of soil pH. A12: The student identi the most important sou of acidity in soil.	1- The importance of studying soil pH 2- Sources of acidity in	Interactive lectur 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 lectur brainstorming, dialogue and discussion, field training, practica exercises, self-learning	Short practical tes
15	2Theoretical	C9: The student identifies the type and sources of salinity. B10: The student evalu the salt composition of soil based on knowledg the dominant ions.	1- Sources of salinity in soil 2- The salt composition saline soils	Interactive lectur brainstorming, dialogue and discussion, self-learning	short test, final tes
	3Practical	C36: Calculate the activity coefficient for monovalen compounds C37: Calculate the activity coefficient for divalent compounds C38: Calculate the activity coefficient for trivalent compounds	Soil activity and effectiveness coefficien	Interactive lectur brainstorming, dialogue and discussion, field training, practica exercises, field project, self-learn	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	

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