

**UNIVERSITY OF SARGODHA**  
**DEPARTMENT OF SOIL & ENVIRONMENTAL SCIENCES, COLLEGE OF AGRICULTURE**

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**COURSE OUTLINE**

**Spring 2020**

Course Title: **Salt-Affected Soils and Water Quality**  
Course Code: **SES-302**  
Credit Hours: **3(2-1)**  
Instructor: **Mr. Ghulam Murtaza**  
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**DESCRIPTION AND OBJECTIVES**

**Aims of the course:** The aim of this course is basically to develop understanding of the students about the use and management of soil affected soils. Plants need a variety of nutrient to live and grow so, the effective management of salt affected soils can lead to enhanced agricultural productivity.

**Objectives of the course:** The students will be able to diagnose and manage salt affected soils as well as they will be able to use irrigation water wisely.

**INTENDED LEARNING OUTCOMES**

After the successful completion of this course students will be able to manage different salt affected soils in order to sustain their agricultural productivity.

**COURSE CONTENTS**

1. Salt affected soils, classification, properties and extent
2. Salination and Sodication: Gapon and pHc equations
3. Systems of characterization of salt affected soils
4. Chemistry of soil solution
5. Root zone salinity
6. Reclamation and management of salt affected soils
7. Irrigation water: Criteria and classification
8. Groundwater: Characteristics and resources
9. Salinity Buildup and prediction
10. Waterlogged soils: Causes, impact and management
11. Bio-saline Agriculture

**Practical:**

1. Field visit and sampling of salt affected soils and irrigation water
2. Saturated soil extract analysis, SAR calculation and ESP prediction
3. Irrigation Analysis, Classification and interpretation
4. Gypsum requirement of soil and brackish irrigation water
5. Demonstration of ex-situ soil reclamation techniques

**READINGS**

1. Bohn, H. L., B. L. McNeal and G. A. O. Connor. 2001. Soil Chemistry. 3<sup>rd</sup> Ed. John Wiley & Sons Inc., NY, USA

2. Essington, M. E. 2004 Soil and Water Chemistry: An Integrated Approach. CRC Press, Boca Raton, FL, USA.
3. Ghafoor, A. M. Qadir and G. Murtaza .2004. Salt-Affected Soils: Principles of Management. Allied Book Center, Lahore, Pakistan
4. Handbook 60
5. IWASRI manual
6. Molden, D. (ed.). 2007. Water for Food, Water for Life: A Comprehensive Assessment of Water Management in Agriculture. Earthscan Colombo. IWMI, Sri Lanka.
7. Tanji, K. K. and N. G. Kielm. 2002. Agricultural Drainage Water

<b>COURSE SCHEDULE</b>		
<b>Week</b>	<b>Topics and Readings</b>	<b>Books</b>
1	Introduction and importance of the course	-
	Genesis of salt affected soils	Material will be provided
	Introduction to soil sampling	Material will be provided
2	Global perspective of salt-affected soils	Material will be provided
	Classification of salt affected soils	Material will be provided
	Sampling of salt-affected soils	Material will be provided
3	Processes of salt-affected soils: salinization	Material will be provided
	Processes of salt-affected soils: sodication	Material will be provided
	Determination of anions from salt affected soil sample	Material will be provided
4	Introduction to exchange equations	Material will be provided
	Gapon equation derivation	Material will be provided
	Determination of anions from salt affected soil sample	Material will be provided
5	Systems of characterization of salt-affected soils	Material will be provided
	Factors leading to the genesis of salt-affected soils	Material will be provided
	Determination of cations from salt affected soil sample	Material will be provided
6	Chemistry of soil solution	Material will be provided

	Root zone salinity	Material will be provided
	Determination of cations from salt affected soil sample	Material will be provided
7	Prerequisite for reclamation of salt-affected soils	Material will be provided
	Physical methods of reclamation of salt-affected soils	Material will be provided
	Determination of cations from salt affected soil sample	Material will be provided
8	Chemical methods of reclamation of salt-affected soils	Material will be provided
	Chemical reactions of amendments	Material will be provided
	GR of saline sodic soils	Material will be provided
9	Biological method of reclamation of salt-affected soils	Material will be provided
	Electro-reclamation and synergistic approach	Material will be provided
	Introduction to water sampling	Material will be provided
10	Specific ion effect	Material will be provided
	Management of salt-affected soils	Material will be provided
	Analysis of water	Material will be provided
11	Irrigation and ground water characteristics	Material will be provided
	Criteria for irrigation and ground water	Material will be provided
	Determination of anions from irrigation water	Material will be provided
12	Specific ion effect of irrigation water	Material will be provided
	Management of ground and irrigation water	Material will be provided
	Determination of anions from irrigation water	Material will be provided
13	Salinity buildup and prediction	Material will be provided
	Soil salinity detection and monitoring	Material will be provided

	Determination of cations from irrigation water	Material will be provided
14	Waterlogged soils: categories and control measures	Material will be provided
	Introduction to SCARP project	Material will be provided
	Determination of cations from irrigation water	Material will be provided
15	Effectiveness of SCARP	Material will be provided
	Biosaline Agriculture	Material will be provided
	Determination of cations from irrigation water	Through Internet
16	Components of biosaline Agriculture	Material will be provided
	Prerequisite for biosaline Agriculture	Material will be provided
	Gypsum requirement of water	Material will be provided

### **RESEARCH PROJECT/PRACTICAL/LABS/ASSIGNMENTS**

Assignments will be assigned to the students during the semester and students will be evaluated for these assignments through presentations.

### **ASSESSMENT CRITERIA**

Sessional:	08 (project, presentation, participation)
Project:	04
Presentation:	02
Participation:	02
Mid Exam:	12
Final Exam:	20
Practical Exam:	20