

Program	B.Sc. (Hons) Agriculture (Major: Soil Science)	Course Code	SS-302	Credit Hours	3(2-1)
Course Title	SALT-AFFECTED SOILS AND WATER QUALITY				
Course Introduction					
This course covers the extent of salt-affected soils, sources and types of salinity, water quality, and management. Students will learn to diagnose types of salinity, apply suitable reclamation techniques, and recommend sustainable management practices for crop production.					
Learning Outcomes					
Upon completion of the course, students will:					
<ol style="list-style-type: none"> 1. Understand the classification, properties, and extent of salt-affected soils. 2. Comprehend salination and sodication processes and their equations. 3. Characterize salt-affected soils using various systems. 4. Analyze the chemistry of soil solution. 5. Understand root zone salinity and its impact on crops. 6. Develop strategies for reclamation and management of salt-affected soils. 7. Assess irrigation water quality and its classification. 8. Evaluate groundwater characteristics and resources. 9. Predict salinity buildup and its consequences. 10. Manage waterlogged soils effectively. 11. Explore bio-saline agriculture and its potential. 					
Course Content (Theory)					
Week	Unit	Topics	Assignments/Readings		
1	Unit 1	Salt-affected soils: Classification, properties, and extent	Review of salt-affected soils.		
2		Types and sources of salinity	Assignment on identifying salinity sources.		
3	Unit 2	Salination and sodication: Gapon and pHc equations	Practical problems on salination equations.		

4		Factors affecting salination and sodication	
5	Unit 3	Systems of characterization of salt-affected soils	Case studies on soil characterization.
6		Soil sampling and analysis techniques	
7	Unit 4	Chemistry of soil solution	Exercises on soil solution chemistry.
8		Impact of soil solution on plant growth	
9	Unit 5	Root zone salinity and its management	Review on root zone salinity.
10		Techniques to mitigate root zone salinity	
11	Unit 6	Reclamation and management of salt-affected soils	Practical problems on reclamation techniques.
12		Sustainable management practices for salt-affected soils	
13	Unit 7	Irrigation water: Criteria and classification	Review of irrigation water quality.
14		Impact of irrigation water on soil salinity	
15	Unit 8	Groundwater: Characteristics and resources	Case studies on groundwater resources.
16		Salinity buildup and prediction	Final summary report on salinity management.
Course Content (Practical)			

Week	Practical Activity	Description
1	Field visits and sampling	Field visits to salt-affected soils and irrigation water sites for sampling.
2	Saturated soil extract analysis	Analysis of saturated soil extract and SAR calculation.
3	ESP prediction	Prediction of exchangeable sodium percentage (ESP).
4	Irrigation water analysis	Classification and interpretation of irrigation water quality.
5	Gypsum requirement	Calculation of gypsum requirement for soil and brackish irrigation water.
6	Soil reclamation techniques	Demonstration of ex-situ soil reclamation techniques.
7	Lab safety and procedures	Training on lab safety measures and procedures.
8	Data interpretation	Interpretation and reporting of analytical results.
9	Field experiment setup	Establishing a field experiment to study salinity effects on crops.
10	Monitoring soil salinity	Periodic monitoring of soil salinity levels in the field experiment.
11	Plant tissue sampling	Collecting and analyzing plant tissue samples for nutrient content.
12	Evaluating crop response	Assessing the impact of salinity on crop growth and yield.
13	Bio-saline agriculture techniques	Practical demonstration of bio-saline agriculture methods.
14	Salinity mapping	Creating salinity maps using field data and GIS tools.
15	Water management strategies	Implementing and evaluating various water management strategies to mitigate salinity.
16	Final practical exam and report submission	Comprehensive practical exam covering all techniques learned and submission of a detailed report.

Textbooks and Reading Material

Textbooks and Reading Material			
<ol style="list-style-type: none"> 1. Bohn, H.L., B.L. McNeal and G.A.O. Connor. 2001. <i>Soil Chemistry</i>. 3rd Ed. John Wiley & Sons Inc., NY, USA. 2. Essington, M.E. 2004. <i>Soil and Water Chemistry: An Integrated Approach</i>. CRC Press, Boca Raton, FL, USA. 3. Ghafoor, A., M. Qadir and G. Murtaza. 2004. <i>Salt-Affected Soils: Principles of Management</i>. Allied Book Center, Lahore, Pakistan. 4. <i>Handbook 60</i> 5. <i>IWASRI Manual</i> 6. Molden, D. (ed.). 2007. <i>Water for Food, Water for Life: A Comprehensive Assessment of Water Management in Agriculture</i>. Earthscan, Colombo, IWMI, Sri Lanka. 7. Tanji, K.K. and N.G. Kiehl. 2002. <i>Agricultural Drainage Water Management in Arid and Semi-arid Areas</i>. FAO Agri. Drainage Paper 61. Rome, Italy. 			
Teaching Learning Strategies			
<ol style="list-style-type: none"> 1. Multimedia 2. White Board 3. Group discussion 4. Quiz/Assignments 5. Demonstration/Activity 			
Assignments: Types and Number with Calendar			
<ol style="list-style-type: none"> 1. Review on salt-affected soils. 2. Practical problems on salination and sodication equations. 3. Case studies on soil characterization. 4. Exercises on soil solution chemistry. 5. Review on root zone salinity. 6. Practical problems on reclamation techniques. 7. Review of irrigation water quality. 8. Case studies on groundwater resources. 9. Final summary report on salinity management. 			
Assessment			
Sr. No.	Elements	Weightage	Details
1	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.

2	Formative Assessment	25%	Continuous assessment includes: Classroom participation, assignments, presentations, quizzes, etc.
3	Final Assessment	40%	Written Examination at the end of the semester. It is mostly in the form of a test, but may include term papers, research proposals, and reports.