

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

COURSE OUTLINE

Spring 2020

Course Title: **Nutrient Management in Degraded Soils**
Course Code: **SES-310**
Credit Hours: **3(3-0)**
Instructor: **Mr. Ghulam Murtaza**
Email: ghulamurtazaus@gmail.com

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 degraded soil. Plants need a variety of nutrient to live and grow so, the effective management of degraded soils can lead to enhanced agricultural productivity of such degraded soils.

1. **Objectives of the course:** The students will be able to diagnose soil problems and then management of nutrients in different degraded soils.

INTENDED LEARNING OUTCOMES

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

COURSE CONTENTS

1. Degraded soils: Introduction, causes and types
2. Nutrient dynamics in degraded soils
3. Nutritional limitations and potentials of different degraded soils
4. Macro and micro nutrients
5. Causes and process of nutrient deficiency and toxicity
6. Approaches for nutrient management in degraded soils
7. Fertilizer use, integrated , agronomic and genic

READINGS

1. Havlin, J. L, S. L. Tisdale, W. L. Nelson and J. D. Beaton. 2005. Soil Fertility and Fertilizers: An Introduction to Nutrient Management. 7th Ed. Prentice Hall. Upper Saddle River, NJ, USA.
2. Fageria, N. K., V. C. Baligar and C. A. Jones. 1997. Growth and Mineral Nutrition of Field Crops. 2nd Ed. CRC Press, Denver, CO, USA.
3. Tanji, K. K. 1990. Agricultural Salinity Assessment and Management: Manuals and Reports on Engineering Practices No. 71, American Society of Civil Engineers, New York, USA.
4. Pessarakali, M. (ed.). 1999. Handbook of Plant and Crop Stress. Marcel Dekker, Inc., New York, USA.

COURSE SCHEDULE

Week	Topics and Readings	Books
1	Introduction and importance of the course	
	Land degradation: Introduction	Zia-ur-Rehman, M., Murtaza, G., Qayyum, M. F., Rizwan, M., Ali, S., Akmal, F., & Khalid, H. (2016). Degraded soils: origin, types and management. In <i>Soil science: Agricultural and environmental prospectives</i> Springer, Cham.
	Causes of Land Degradation	Akmal, F., & Khalid, H. (2016). Degraded soils: origin, types and management. In <i>Soil science: Agricultural and environmental prospectives</i> Springer, Cham.
2	Types of land degradation: Soil Erosion	Akmal, F., & Khalid, H. (2016). Degraded soils: origin, types and management. In <i>Soil science: Agricultural and environmental prospectives</i> Springer, Cham.
	Types of Erosion	Material will be provided
	Soil acidity and its impact on crop production	Zia-ur-Rehman, M., Murtaza, G., Qayyum, M. F., Rizwan, M., Ali, S., Akmal, F., & Khalid, H. (2016). Degraded soils: origin, types and management. In <i>Soil science: Agricultural and environmental prospectives</i> Springer, Cham.
3	Nutrient dynamics in degraded soils	Material will be provided
	Factors affecting nutrient absorption by plants	Material will be provided
	Effect of aeration, temperature and light on nutrient availability	Material will be provided
4	Nutrient uptake mechanisms: Active and Passive	Material will be provided

	Donnan's equilibrium	Material will be provided
	Redistribution of nutrient in plants	Material will be provided
5	Osmotic deregulation	Material will be provided
	Nutrient imbalance	Zia-ur-Rehman, M., Murtaza, G., Qayyum, M. F., Rizwan, M., Ali, S., Akmal, F., & Khalid, H. (2016). Degraded soils: origin, types and management. In <i>Soil science: Agricultural and environmental prospectives</i> Springer, Cham.
	Structure and permeability problem in degraded soils	Zia-ur-Rehman, M., Murtaza, G., Qayyum, M. F., Rizwan, M., Ali, S., Akmal, F., & Khalid, H. (2016). Degraded soils: origin, types and management. In <i>Soil science: Agricultural and environmental prospectives</i> Springer, Cham.
6	Nutrient limitations & potential	Material will be provided
	Nutrient dynamics: Soil Characteristics Contributing to Nutrient Supply	Material will be provided
	Nutrient dynamics: PH and Nutrient availability	Material will be provided
7	Leibig's law of minimum	Nutrient Management handbook
	Managing nutrients efficiently and effectively	Nutrient Management handbook ch.2
	Nutrient stewardship model	Nutrient Management handbook ch.4
8	Soil properties influencing nutrient availability in degraded soils	Soil Chemistry, Soil Fertility & Nutrient Management pp. 3
	Soil as a source of plant nutrients	Soil Chemistry, Soil Fertility & Nutrient Management pp. 10
	Mechanism of nutrient transport	Soil Chemistry, Soil Fertility & Nutrient Management pp. 26
9	Macro- Nutrient: Nitrogen functions and transformation	Soil Chemistry, Soil Fertility & Nutrient Management pp. 30
	Macro- Nutrient : phosphorus functions and transformation	Soil Chemistry, Soil Fertility & Nutrient Management pp. 40

	Macro- Nutrient : potassium functions and transformation	Soil Chemistry, Soil Fertility & Nutrient Management pp. 49
10	Macro- Nutrient : Calcium functions and transformation	Soil Chemistry, Soil Fertility & Nutrient Management ch; 2 pp. 53
	Macro Nutrient : Magnesium functions and transformation	Soil Chemistry, Soil Fertility & Nutrient Management pp;55
	Macro- Nutrients : Sulfur functions and transformation	Soil Chemistry, Soil Fertility & Nutrient Management pp.57
11	Micro-Nutrients: Fe, Mn and Zn functions and forms	Soil Chemistry, Soil Fertility & Nutrient Management pp.60
	Micro-Nutrients: Cu, B, Mo, functions and forms	Soil Chemistry, Soil Fertility & Nutrient Management pp.66
	Micro-Nutrients: Ni and Cl functions and forms in soil	Soil Chemistry, Soil Fertility & Nutrient Management pp.71
12	Deficiency & Toxicity symptoms of N, P and K Macro- nutrient	Soil Chemistry, Soil Fertility & Nutrient Management pp.77
	Deficiency & Toxicity symptoms of Ca, Mg and S Macro- nutrient	Soil Chemistry, Soil Fertility & Nutrient Management pp.78
	Deficiency & Toxicity symptoms of Micro-nutrients	Soil Chemistry, Soil Fertility & Nutrient Management pp.79
13	Causes and processes of deficiency and toxicity symptoms	Nutrient Management Handbook, Ch, 9: Plant Nutrient Functions and Deficiency and toxicity Symptoms.
	Diagnosing mobile nutrients	Nutrient Management Handbook, Ch, 9: Plant Nutrient Functions and Deficiency and toxicity Symptoms.
	Diagnosing immobile nutrients	Nutrient Management Handbook, Ch, 9: Plant Nutrient Functions and Deficiency and toxicity Symptoms.
14	Approaches for nutrient management: Leaching and irrigation water management	Zia-ur-Rehman, M., Murtaza, G., Qayyum, M. F., Rizwan, M., Ali, S., Akmal, F., & Khalid, H. (2016). Degraded soils: origin, types and management. In <i>Soil science</i> :

		<i>Agricultural and environmental perspectives</i> Springer, Cham.
	Approaches for nutrient management: Mulching, drainage improvement	Zia-ur-Rehman, M., Murtaza, G., Qayyum, M. F., Rizwan, M., Ali, S., Akmal, F., & Khalid, H. (2016). Degraded soils: origin, types and management. In <i>Soil science: Agricultural and environmental perspectives</i> Springer, Cham.
	Approaches for nutrient management: use of amendments and organic materials	Zia-ur-Rehman, M., Murtaza, G., Qayyum, M. F., Rizwan, M., Ali, S., Akmal, F., & Khalid, H. (2016). Degraded soils: origin, types and management. In <i>Soil science: Agricultural and environmental perspectives</i> Springer, Cham.
15	Introduction to fertilizers and various terminologies	Material will be provided
	Types of fertilizers	Material will be provided
	Forms of fertilizers	Material will be provided
16	Integrated use of fertilizers	Jat, M. L., Satyanarayana, T., Majumdar, K., Parihar, C. M., Jat, S. L., Tetarwal, J. P., & Jat, R. K. (2013). Fertiliser best management practices for maize systems. <i>Journal of Agricultural and Resource Economics (JARE)</i> , 36(4), 80-94.
	Agronomic use of fertilizers	Montemurro, F., & Diacono, M. (2016). Towards a better understanding of agronomic efficiency of nitrogen: assessment and improvement strategies.
	Genic use of fertilizers	Kabir, G. (2014). Genetic approaches of increasing nutrient use efficiency especially nitrogen in cereal crops A review. <i>Journal of Bio-Science</i> , 22, 111-125.

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

ASSESSMENT CRITERIA

Sessional:	12 (project, presentation, participation)
Project:	06
Presentation:	03
Participation:	03
Mid Exam:	18
Final Exam:	30