UNIVERSITY OF SARGODHA

DEPARTMENT OF AGRONOMY, COLLEGE OF AGRICULTURE

COURSE OUTLINE Spring 2020

Course Title: **PLANT AND SOIL ANALYSIS**

Course Code: AGRO-404

Credit Hours: 3(2-1)

Instructor: Dr. Muhammad Rafi Qamar

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| DESCRIPTION |

This course improves theoretical and practical knowledge of the students regarding different types and use of balances. In this course, students are trained in preparation of solutions of known concentrations-normal, molar, molal, ppm, etc. Moreover, preparation of stock solutions for drawing standard curves; In this course, soil and plant sampling techniques are studied and preparation of plant and soil samples for analytical work. Different protocols are used for estimation of EC, pH, N, P, K, Na, organic matter.

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| LEARNING OUTCOMES |

The key objectives/outcomes of this course are;

* To train the students about different methods of soil and plant analysis.
* To study the preparation of different stock solution.
* To study the different protocols for estimation of nutrients in the soil and plants.

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| CONTENTS |

**THEORY**

1. Types and use of different balances.
2. Laboratory Facilities, Quality Control and Data Handling
3. Preparation of solutions of known concentrations – normal, molar, molal, p.p.m, etc.
4. Quality Control and Standardization Procedures
5. Data Processing
6. Soil Sampling and Processing
7. Preparation of stock solutions for drawing standard curves
8. Preparation Laboratory Processing
9. Soil Physical Analysis- Moisture Content
10. Soil Physical Analysis- Water Holding Capacity
11. Soil Physical Analysis- Particle Size Distribution
12. Soil Physical Analysis- Hydrometer Method
13. Soil Texture- Pipette Method
14. Soil Structure
15. Dry Aggregate Analysis
16. Wet Aggregate Analysis
17. Soil Bulk Density- disturbed and undisturbed samples
18. Total Pore Space and Porosity
19. Plant Analysis- Moisture Factor
20. Plant Analysis- Nitrogen and Phosphorus
21. Plant Analysis- Macronutrients (Dry Ashing)
22. Plant Analysis- Micronutrient (Wet Digestion)
23. Preparation of soil samples for analytical work
24. Soil Chemical Analysis -Estimation of EC, pH, N, P, K, Na.
25. Soil Chemical Analysis -Estimation of organic matter.

**Practical**

1. Demonstration of analytical methods in the laboratory
2. Recording data
3. Computation work and recommendations.

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| READINGS |

1. Basak, R.K. 2004. Soil Testing and Recommendation. Kalyani Publisher, New Delhi.
2. Hussain, T. and A. Jabbar. 1985. Soil and Plant Analysis. Department of Soil Science, University of Agriculture, Faisalabad.
3. Estefan, G. R. Sommer and J. Ryan. 2013. Methods of Soil, Plant and water Analysis: A manual for the West Asia and North Africa Region. Laboratory Manual. 3rd Ed., ICARDA, Syria.
4. Tandon, H.L.S (Ed.). 2001. Methods of Analysis of Soils, Plants, Waters and Fertilizer. Development and Consultation Organization, New Delhi, India.
5. Westerman, R.L. (Ed.). 1990. Soil Testing and Plant Analysis. 3rd Ed. Soil Sci. Am. Inc., Madison, WI, USA.
6. Jones, J. Benton. 2012. Plant Nutrition and Soil Fertility Manual. 2nd Ed. CRC Press. Taylor & Francis, London. UK.

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| COURSE |
| Week | Topics and Readings | Book with Page No. |
| 1 | Types and use of different balances. Laboratory Facilities, Quality Control and Data Handling | Book # 3. Ch. # 2. Page # 10-19 |
| 2 | Preparation of solutions of known concentrations – normal, molar, molal, ppm, etc.Quality Control and Standardization ProceduresData Processing | Book # 3. Ch. # 2. Page # 10-19 |
| 3 | Soil Sampling and ProcessingPreparation of stock solutions for drawing standard curves | Book # 3. Ch. # 3. Page # 20-24 |
| 4 | Preparation Laboratory Processing Soil Physical Analysis- Moisture Content | Book # 3. Ch. # 4. Page # 26-54 |
| 5 | Soil Physical Analysis- Water Holding Capacity Soil Physical Analysis- Particle Size Distribution | Book # 3. Ch. # 4. Page # 26-54 |
| 6 | Soil Physical Analysis- Hydrometer Method Soil Texture- Pipette Method  | Book # 3. Ch. # 4. Page # 26-54 |
| 7 | Soil StructureDry Aggregate Analysis | Book # 3. Ch. # 4. Page # 26-54 |
| 8 | Wet Aggregate AnalysisSoil Bulk Density- disturbed and undisturbed samples | Book # 3. Ch. # 4. Page # 26-54 |
|  | **Mid Term Examination** |  |
| 9 | Total Pore Space and PorosityPlant Analysis- Moisture Factor | Book # 3. Ch. # 4. Page # 26-54 |
| 10 | Plant Analysis- Nitrogen and Phosphorus | Book # 3. Ch. # 7. Page # 142-160 |
| 11 | Plant Analysis- Macronutrients (Dry Ashing) | Book # 3. Ch. # 7. Page # 142-160 |
| 12 | Plant Analysis- Micronutrient (Wet Digestion) | Book # 3. Ch. # 7. Page # 142-160 |
| 13 | Preparation of soil samples for analytical work | Book # 3. Ch. # 5. Page # 61-135 |
| 14 | Soil Chemical Analysis -Estimation of EC, pH, N, P, K, Na | Book # 3. Ch. # 5. Page # 61-135 |
| 15 | Soil Chemical Analysis -Estimation of EC, pH, N, P, K, Na | Book # 3. Ch. # 5. Page # 61-135 |
| 16 | Soil Chemical Analysis -Estimation of EC, pH, N, P, K, Na | Book # 3. Ch. # 5. Page # 61-135 |
| 17 | Soil Chemical Analysis -Estimation of EC, pH, N, P, K, Na | Book # 3. Ch. # 5. Page # 61-135 |
| 18 | Soil Chemical Analysis -Estimation of organic matter | Book # 3. Ch. # 5. Page # 61-135 |

***Note****: You can reserve one week for sessional or mid-term exam, and if you wish, one week for student presentations of the assigned research project*

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| **RESEARCH PROJECT/ PRACTICAL/LABS** |

*State here the prerequisites of the assigned research project including term paper or lab assignment etc.*

* Soil sampling techniques will be performed in the field
* Stock solution will be prepared in the lab
* Soil and plants analysis will be conducted in the lab

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| **ASSIGNMENT CRITERIA** |

*Write here the distribution of marks. You can choose any or all from the below for the purpose*

Sessional: 02

Project: 02

Presentation: 02

Participation: 02

Mid-term: 12

Final-Exam: 20

Practical: 20