UNIVERSITY OF SARGODHA

DEPARTMENT OF AGRONOMY, UNIVERSITY COLLEGE OF AGRICULTURE

COURSE OUTLINE Winter 2020-2021

Course Title: Agro Ecology

Course Code: AGRO-309

Credit Hours: 3(3-0)

Instructor: Dr Muhammad Ehsan Safdar

Email: mehsan.safdar@uos.edu.pk

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| **DESCRIPTION** |

Agro ecology encompasses many diverse interests and emerging problems, including the need to address growing pest and weed control problems, protect farmworker health, reduce pressure on supporting natural resources, ameliorate environmental impacts of agricultural operations and promote sustainable agricultural production.

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| **LEARNING OUTCOMES** |

1. Study of agricultural organisms, populations, communities, and their interactions at a systems level, in order to determine how ecological principles operate in an agricultural context.
2. Comparison of ecological and evolutionary processes in agricultural and natural ecosystems, and use of these comparisons to understand the major similarities and differences between agricultural and natural ecosystems.
3. Combining ecological principles with agronomic practice to manage agricultural systems for sustainable production, improved resource conservation, and minimized environmental impact.

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| **CONTENTS** |

1. Ecosystem; definition and components.
2. Ecological pyramids; process within the ecosystem;
3. Primary production processes; measuring primary production;
4. Estimation of primary production in ecosystems;
5. Biogeochemical cycling process; cycling of CO2, nitrogen, water, phosphorus and sulphur;
6. Factors within the ecosystem;
7. Agro ecosystem; biotic structure, primary producers, consumers, decomposers; Primary productivity;
8. Energy flow; Competition, crop yields and variability in relation to the ecological optima;
9. Responses of crop plants to biotic and abiotic factors.

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| **READINGS** |

1. Hussain, S.S. (2003). Pakistan Manual of Plant Ecology. National Book Foundation, Islamabad.

2. Kapur, P. and R.G. Sudha. (2000). Experimental Plant Ecology. CBS Publishers and Distributors, New Delhi.

3. Brown C.S. and T. Toadwine (eds.) (2007). Nature’s Edge- Boundary Explorations in ecological theory and practice. State University of New York Press, Albany, USA.

4. Shukla, R.S. and P.S. Chandel. (2006). A Textbook of Plant Ecology. S. Chand & Co. Ltd. New Delhi, India.

5. Townsend, C.R., M.E. Begon and J.L. Harper. (2000). Essentials of Ecology. Blackwell Scientific Publications, UK.

6. Weathers, K. C., Strayer, D.L., & Likens, G.E. (Eds.). (2012). Fundamentals of Ecosystem Science. Academic Press.

7. Begon, M., Townsend, C.R., & Harper, J.L. (2006). Ecology: From Individuals to Ecosystems 4th Edition. Blackwell Publishing.

8. Ågren, G.I., & Andersson, F.O. (2011). Terrestrial Ecosystem Ecology: Principles and Applications. Cambridge University Press.

9. Osborne, P.L. (2000). Tropical Ecosystems and Ecological Concepts. Cambridge University Press.

10. Martin, K., & Sauerborn, J. (2013). Agroecology. Amsterdam, The Netherlands: Springer.

11. Schulze Ernst-Detlef, Beck E., Müller-Hohenstein K. (2002). Plant Ecology. Springer-Verlag Berlin Heidelberg New York.

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| **COURSE** |

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| **Week** | **Topics and Readings** | **Book with Page No.** |
| 1 | Introduction of the course. | Book 5, Pages 3-22 |
| Dictation & discussion about the course contents. |
| Ecosystem concepts  |
| 2 | Ecosystem structure: site factors, soil and vegetation | Book 8, Pages 40-56 |
| Soil physics and chemistry  |
| Ecosystem layering and terrestrial biomes |
| 3 | Food Chains and Energy flow  | Book 9, pages 159-162 |
| Trophic levels |
| Pyramids of number, biomass and energy |
| 4 | Processes within the ecosystem: Flow of energy and material | Book 10, pages 73-77. |
| Energy Flows Through Food Webs |
| Material Transport Through Water and Wind |
| 5 | Biogeochemical cycling process: The process of decomposition | Book 5, pages 369-379   |
| Flux of matter through ecosystem.  |
| Nutrient budget in terrestrial and aquatic ecosystems  |
| 6 | Global biogeochemical cycles Hydrological cycle  | Book 5, pages 380-383  |
| Phosphorus, nitrogen and carbon cycles |
| Human impact on biogeochemical cycles |
| 7 | Factors within the ecosystem: Light | Book 11, Pages 23-114  |
| Temperature |
| Oxygen deficiency |
| 8 | Factors within the ecosystem: Water deficiency, salt stress  | Book 11, Pages 117-215 |
| Heavy metals and Aluminum |
| Xenobiotica |
| **9** | **MID TERM EXAM (December 14-18, 2020)** |
| 10 | Agro-Ecosystem: Ecosystem, Agro-Ecosystem,  | Book 10, pages 1-32 |
| Agro-Ecology history and concepts |
| Origin and development of Agriculture |
| 11 | Classification of agro-ecosystems | Book 10, pages 35-56 |
| Patterns and processes in agro-ecosystems: biotic interactions  |
| Communities |
| 12 | Patterns and processes in agro-ecosystems: Biodiversity | Book 10, pages 59-77 |
| Succession |
| Flow of energy and materials  |
| 13 | Patterns and processes in agro-ecosystems: Ecosystem services | Book 10, pages 77-101 |
| Global material cycles: water and C,  |
| Oxygen, N and P  |
| 14 | Primary production  | Book 6, pages 27-36 |
| Components of primary production  |
| Measuring primary production  |
| 15 | Flux of energy through ecosystem  | Book 7, Pages 499-511 |
| Intraspecific competition | Book 7, Pages 132-139 |
| Interspecific competition  | Book 7, Pages 227-231 |
| 16 | Ecological niches:  | Book 7, Pages 31-50 |
| Temperature  |
| Salinity  |
| 17 | Responses of crop plants to abiotic factors. Radiation and Energy | Book 10, Pages 103-133 |
| Water  |
| Soil |
| 18 | Responses of crop plants to biotic factors. Weed Management  | Book 10, pages 187-241 |
| Pest management  |
| Management of phytopathogens |
| **19** | **Final Exam (February 8-12, 2020)** |  |

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

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| **ASSIGNMENT CRITERIA** |

Sessional: 25%, Project: 25%, Presentation: 25%, Participation: 25%