| Code | Subject Title | Cr. Hrs | Semester |
|---|---|---|---|
| BOT-203 | Botany-IV (Plant Physiology and Ecology) | 3 | IV |

| Year | Discipline |
|---|---|
| 2 | Botany, Zoology, Chemistry-I |

**Syllabus Outline:** The course content include Water Relation, Mineral Nutrition, Photosynthesis, Respiration in relation to growth of Plants, Aims and Application of Ecology.

**Course Outline:**

**a) Plant Physiology:**

1. **Water Relations:** Water Potential, Osmotic Potential, Pressure Potential, Matric Potential; Absorption and Translocation of Water.
2. **Mineral Nutrition:** Soil as a Source of Minerals, Passive and Active Transport of Nutrients, Essential Mineral Elements, Role and Deficiency Symptoms of Macronutrients.
3. **Photosynthesis:** Introduction, Mechanism of Oxygenic and Non-Oxygenic Photosynthesis: Light Reactions (Electron Transport and Photophosphorylation) and Dark Reactions (Calvin Cycle), Differences between C2 and C3 Plants, Factors affecting Photosynthesis.
4. **Respiration:** Definition and Respiratory Substrates, Mechanism of Glycolysis, Krebs Cycle, Electron Transport and Oxidative Phosphorylation, Anaerobic Respiration, Energy Balance in Aerobic and Anaerobic Respiration.
5. **Growth:** Definition; Role of Auxins, Cytokinins, Gibberellins, Abscisic Acid and Ethylene in controlling Growth.
6. **Photoperiodism:** Definition, Historical Background, Classification of Plants based on Photoperiodic Response, Role of Phytochromes, and Hormones and Metabolites in photoperiodism.
7. **Dormancy:** Definition and Causes of Seed and Bud Dormancy; Methods of breaking Seed Dormancy, Physiological processes during Seed Germination.
8. **Plant Movements:** Classification, Phototropism, Nastic Movements, Gravitropism and their Mechanisms

**b) Ecology:**

1. Introduction, aims and applications of Ecology.
2. **Soil:** Physical and Chemical Properties of Soil (Soil Formation, Soil Texture, pH, EC, Soil Organisms, Soil Organic Matter) and their relationship to plants.
3. **Light and Temperature:** Quality of Light, Diurnal and Seasonal Variations, Ecophysiological Responses.
4. **Water:** Field Capacity and Soil Water Holding Capacity, Characteristics of Xerophytes and Hydrophytes, Effects of Precipitation on Distribution of Plants.
5. **Wind:** Wind as an Ecological Factor and its Importance
6. **Population Ecology:** Introduction to Population Ecology.
7. **Community Ecology:**
   - **i.** Ecological Characteristics of Plant Community
   - **ii.** Methods of Sampling Vegetation (Quadrat and Line Intercept)
   - **iii.** Succession.

**iv.** Major Vegetation Types of the Local Area.

**8. Ecosystem Ecology:**

**i.** Definition and Components of Ecosystem.

**ii.** Food Chain and Food Web.

**iii.** Biogeochemical Cycles, Definition, Types with emphasis on Nitrogen and Hydrological Cycles.

**Module Aims:** Specific objectives of this course will be to understand the following topics, viz.; Water Relations, Conduction of Water and Organic Matter; the Role of Mineral Nutrients in Growth and Development, Metabolic Processes of Photosynthesis and Respiration, Hormonal Regulation of Growth and Development; Plant Movements, Environmental (Light, Temperature), Control of Growth and Development.

**Learning Strategies:**

1. Lectures
2. Group Discussion
3. Laboratory work
4. Seminar/ Workshop

**Learning Outcome:** The aim is to give the students increased knowledge of metabolism, physiology and structure of plants together with a better understanding of regulation of growth and development and influence of environment.

**Assessment Strategies:**

1. Lecture Based Examination (Objective and Subjective)
2. Assignments
3. Class discussion
4. Quiz
5. Tests

**BOOKS RECOMMENDED:**


1. **Taiz, L. and Zeiger, E. (2010).** *Plant Physiology.* 5th Edition. Sinauers Publishing, Company. Inc. California.

2. **Illahi, I. (2009).** *Plant Physiology. Biochemical Processes in Plants.* UGC Press.

3. **Witham, F.W, Devlin, A., Blaydes, D.F. and Devline, R.M (1986)** *Exercises in Plant Physiology.* Prindle, Weber and Schmidt, Boston.

4. **Schultz, E. (2005).** *Plant Ecology.* (2nd Ed. ) Springer-Verlag, Berlin.

5. **Smith, R. L. (2002).** *Ecology and Field Biology.* Harper and Row Publishers, New York.

6. **Salisbury, F.B. and Ross, C.B. (2002).** *Plant Physiology.* (7th Ed.), Wordsworth Publishing Co. Belmont CA.

7. **Ricklefs, R.E. (2001).** *The Economy of Nature.* W.H. Freeman and Company .UK.

8. **Hopkins, W.B. (2000).** *Introduction to Plant Physiology*. (2nd Ed.), John Wiley and Sons. New York.

9. **Rick, R.E. (2000).** *Ecology*. (1st Ed.). W.H. Freeman and Company, U.K.

10. **Smith, R. L. (2000).** *Elements of Ecology*. Harper and Row Publishers, New York.

11. **Subrahmanyam, N.S. and Sambamurthy. A.V.S.S. (2000).** *Ecology*. Narosa Publishing House, New Delhi.

12. **Townsend, C.R., Harper, J.L. and Begon, M.E. (2000).** *Essentials of Ecology*. Blackwell Scientific Publications, U.K.

13. **Barbour, M.O., Burke, H.J. and Pitts, D.W. (1999).** *Terrestrial Plant Ecology*. The Benjamin, Cumming Publishing Co. California, USA.

14. **Hussain, F. (1999).** *Field and Laboratory Manual of Plant Ecology*. National Academy of Higher Education, Islamabad.

15. **Krebs, C. J. (1997).** *Ecology and Field Biology*. Addison Wesley Longman Inc, New York.

16. **Chapman, J.L. and Reiss, M.J. (1995).** *Ecology; Principles and Applications*. Cambridge University Press. U.K.

17. **Odum, E.P. (1970).** *Basic Ecology*. V/B. Saunders. Philadelphia.