H.N.B. Garhwal University, Srinagar Garhwal
High Altitude Plant Physiology Research Centre
M. Phil - Environmental Plant Biology
SYLLABUS

I Semester

Core Papers: All compulsory

CEPB-101: **General Environmental Plant Biology** Credits 03

Plant environment and its components; scope and problems of environmental plant physiology; tropical, temperate and alpine environments. Principles of plant response to environment; plant responses and adaptations to radiation, temperature, water, wind and salinity stresses. Climate change; pollutants and plant responses; allelopathy and herbivory; plant-microbial interactions.

Suggested Readings:

1. Plant Physiology by Salisbury and Ross.
2. Plant Physiological Ecology by Hans Lambers, F. Stuart Chapin and Thijis L. Pons, Springer (2008).
3. Plant Physiology by Lincoln Taiz and Eduardo Zeiger, Sinauer Associates (2010).

CEPB-102: Methodology and Instrumentation Credits 04

Aim and scope of biostatistics; elementary idea of data in biology; concepts of statistical population, sampling, frequency distribution, probability, statistical estimation and test of significance; correlation and regression; linear, non-linear and quadratic regressions; modeling in biology with special reference to plant biology. Computer Applications in plant biology.

Colorimetry; spectrophtometry; fluorometry; chromatography; electrophoresis; centrifugation; densitometry; determination of biomolecules; enzyme assays and bioseparation techniques; recombinant DNA Technology. Microscopy methods, fluorescence measurements; methods of plant growth analysis; gas exchange measurements; radiation measurements; leaf area measurements; determination of stomatal aperture; leaf temperature, clonal propagation.

Suggested Readings:

1. An introduction to practical biochemistry by D.T. Plummer (Dr. W. Junk b.v. publishers, The Mague).
2. Gel electrophoresis of proteins, a practical approach by B.D. Hames (D. Rickwood, IRL press, Oxford).
3. Centrifuge A practical approach 2nd ed. by D. Rickwood (IRL press, Oxford).
4. HPLC methods on drug analysis by Montee, K. Ghosh (Springer book India Pvt. Ltd. Panchsheel park, New Delhi)

5. Micro computers in biology, a practical approach by C.R. Ireland and S.P. Long, (Centre for Science and Environment, New Delhi)
6. Analysis of Essential oil by Gas Chromatograph and Mass Spectrometry by Y. Masada (John Wiley & Sons 1986).

Elective Papers: The candidate will have to take any two elective papers

EEPB-101: Reproductive Physiology of Seed Plants Credits 04

Physiology of seed development and maturation; effect of environmental factors on seed development and maturation; definition and measurement of seed germination; seed viability relationship with water and solutes; seed dormancy; inception of germination; environmental factors and photoreceptors; growth regulators, membranes and germination; Juvenility; photoperiodism, vernalization and physiology of flowering; vegetative propagation.

Suggested Readings:

1. Seeds: Physiology of Development, Germination and Dormancy By J. Derek Bewley, Kent Bradford, Henk Hilhorst, Hiroyuki Nonogaki.. Springer , 2013
2. Physiology and biochemistry of seeds in relation to germination 1 Development, Germination, and Growth By J. Derek Bewley, Michael Black Springer London, Limited, 2011
3. Physiology and biochemistry of seeds in relation to germination, Volume 2 By J. Derek Bewley, Michael Black, Springer-Verlag, 1982

EEPB-102: Photosynthetic Mechanisms and Plant Productivity: Credits 04

Biochemical and physical processes of photosynthesis; effects of environmental factors on photosynthesis; water relations and photosynthesis; photosynthesis in different plant forms; characteristics of C_3, C_4 and CAM species and their ecological significance; photosynthetic, light and water use efficiencies of plants; leaf and canopy photosynthesis; respiration and environmental factors; plant adaptation to temperature and light and their relationship to photosynthesis; root/shoot interactions; total dry matter production; modeling of photosynthetic and productivity responses to environment.

Suggested Readings:

01. **Photosynthesis: Photoreactions to Plant Productivity** By Yash Pal Abrol, Prasanna Mohanty, Govindjee, Kluwer Academic Publishers, 1993
02. **Photosynthesis and the Environment** By N.R. Baker, Springer, 1996.
03. **Plant Physiological Ecology** By H. Lambers, Francis Stuart Chapin (III.), Thijs Leendert Pons, Springer, 1998

EEPB-103: Biophysical Plant Biology Credits 04

Importance and problems; atmospheric environment and its components - Radiation (radiation laws, radiation in natural environment, radiation fluxes in and within plant communities, radiation coupling, adaptations of plants to low and high radiation); Temperature (temperature relations of plants, plant adaptation and resistances to low and high temperatures, atmospheric temperature in relation to leaf temperature); Wind (response of single leaves and whole plant to wind and its ecological significance); Plant and water relations (physical and chemical properties of water, cell water relations, liquid phase transport processes); Exchange processes in plants : radiation exchange; CO_2 exchange (photosynthesis as a resistance process); exchange of water vapour (transpiration as a resistance process, resistance network); exchange of heat energy (mechanism of leaf energy balance and its significance); Altitude, latitude and plant growth; Ecological energetics.

Suggested Readings:

1. Plant Ecophysiology By Mular R. Narashima Prasad, John Wiley & Sons, 1997.
2. Physiological Plant Ecology: Ecophysiology and Stress Physiology of Functional Groups By Walter Larcher, Springer, 2003.

EEPB-104 Plant Secondary Metabolism Credits 04

Plant Stress Biology; Plant Stress Tolerance Traits; Genetic engineering in relation to plant stress biology; Physiological role of Plant Secondary Natural Products (PSNP); Ecological aspects of PSNPs; Diversity in relation to plant adaptations under stress; Structure, biosynthetic pathways, storage and accumulation of PSNPs in sub-cellular organelles; Phytochemical analysis of PSNPs from plant extracts; in vitro production and evaluation of PSNPs using molecular biology tools and techniques; molecular genetics techniques for improvement of PSNP production.

Suggested Readings:

01. **Secondary metabolites: their function and evolution, Volume 171 By** Derek Chadwick J. Wiley, 1992.
02. **Biotechnological Production of Plant Secondary Metabolites** By Ilkay Orhan Bentham Science Publishers, 2012.

II Semester

CEPB-201: Dissertation Credits 21

Each candidate will be allotted a topic related to the optional course he or she selects. The candidate shall have to do experimentation in the allotted topic and submit the results with methodology used and proper interpretation of the data in the form of a dissertation.