ST. JOSEPH’S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM

III SEMESTER **AGRICULTURE AND RURAL DEVELOPMENT** Time: 3hrs/week

CPHY261 (1) **ECO-PHYSIOLOGY** Marks: 100

w.e.f AJ 2022-2023

**OBJECTIVES:**

* To study about relation between environment and the functioning of the live organisms
* To study about how life process depend on the environment at different levels.
* To study about connection between life process in the context.
* To study about different life conditions in different environment.

**COURSE OUTCOMES:**

At the end of the course, students will be able to

**CO1:** Explain concepts and components of eco physiology and its influence on crop distribution.

**CO2:**Outline the impact of different environments on biotic and abiotic components.

**CO3:** Distinguish between iconic and osmotic balance and types of competition in agriculture cropping.

**CO4:** Explain the scope of allele pathy and phyto-remediation in agriculture

**CO5:** Summarize the sources, effects of pollution, global warming on agricultural field crop productivity.

**CO6:** Examine aspects of controlled environment and different models of environment management.

**THEORY**

**UNIT-I: (4hrs)**

1. Eco physiology – Introduction – Definition – Importance in agriculture and horticulture – Ecosystem – Definition of ecosystem, ecotypes and ecads – Biosphere and ecosystem – Sub divisions of biosphere – Pathways of energy in the biosphere – Concept of ecosystem – Components of ecosystem – Basic structure of ecosystem.
2. Different types of ecosystem – Freshwater, marine, forest and crop ecosystem – Energy in ecosystem – Productivity – Primary production – Secondary production – Types of food chains.
3. Global climates and crop distribution – Influence of climate on crop distribution (rice, wheat, maize, sorghum and sugarcane) – Important climatic regions of the world – Agro-climatic zones of India – Crop distribution in India and Andhra Pradesh.
4. Environment – Definition – Components – Biotic and abiotic environments – Biotic environment – Biotic factors and anthropic factors – Abiotic environment – Climatic, edaphic, physiographic and pyric factors – Climatic factors – Radiation – Effect of radiation on plant functions –Classification of ultraviolet (UV) radiation – Effects of UV-B radiation.

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**UNIT- II: (3hrs)**

1. Abiotic environment – Climatic factors – Precipitation – Forms of precipitation – Effect of water deficit and water logging on plant processes – Temperature – Cardinal temperature – Effects of temperature on plant processes – Temperature injuries – High temperature and low temperature stress – Classification of plants based on heat resistance and cold resistance – Heat units.
2. Edaphic factors – Classification of plants based on adaptation to different soil types – Halophytes and salt stress tolerance mechanisms.
3. Physiographic factors – Altitude of the place, steepness of the slope, direction of mountain chain and exposure of the slope to light and wind – Effects of topographic factors on vegetation – Wind effect on physiological processes - Pyric factors – sources and type of fires – Effects of fire on vegetation and environment – management of fires and rejuvenation of crops.

**UNIT – III: (3hrs)**

1. Biotic factors – Herbivores (grazing effect), symbiosis (Mycorrhiza and Rhizobium associations), insectivorous plants, epiphytism and parasites - Anthropic factors – Industrialization – Shifting cultivation – Crop improvement.
2. Physiological approaches for climate resilient agriculture.
3. Competition – Ecological succession – Dominance and subordination – Types of competition – Inter-specific, intra-specific and intra-plant competition – Monoculture and polyculture – Multistoried cropping system – Mutual shading.

**UNIT – IV: (2hrs)**

1. Allelopathy – Definition – Concept – Sources of allelopathic chemicals in crop and weed species – Natural products identified as allelopathic chemicals – Mode of action – Scope for allelopathy.
2. Phyto-remediation – Definition – Concept – Applications in agriculture and industry.
3. Pollution – Air pollution – Sources – Physiological effects on plants and its Management - Water pollution – Sources – physiological effects on plants and its Management - Soil pollution – Sources – Physiological effects on plants and its Management

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**UNIT – V: (3hrs)**

1. Global warming – Greenhouse effect – Causes of global warming – Methane, carbon dioxide, chlorofluoro carbons’ (CFC), nitrous oxide (NO) gas and ozone – Impact of global warming on climate and agricultural productivity – Measures to reduce build-up of greenhouse gases.
2. Controlled environment – Purposes – Types – Designs of structure – Commercial applications.
3. Carbon dioxide fertilization – Definition – Concept – Importance – Sources – Methods of CO2 fertilization – Effects on crop yields and limitations - Eco physiological models - Concept – Models for different environmental management.

**REFERENCES TEXT BOOKS:**

1. Agrwal, A. K. and Deo, P.P. 2013. Plant Ecology. Agrobios (India) Jodhapur
2. Varshneya, M. C and Balakrishna Pillai, P. 2006. Textbook of Agricultural Meteorology. ICAR, New Delhi
3. Lenka, S., Lenka, N.K., Kundu, S and Subba Rao, A. 2013. Climate change and Natural Resources Management, New India Publishing Agency, India
4. Prasad and Kumar. 2010. Green House Management for Horticulture Crops. Agrobios, Jodhpur.
5. Schulze, E.C., Beck, E and Muller-Hohenstein, K. 2005. Plant Ecology. Springer Science & Business Media, New York City

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