

## Course Profile Stress Management in CSA

**Course Code:** CSA 6106

**Course Title:** Stress Management in CSA

**Credit Hour:** 2

**Student Level:**

### **Rationale:**

The inexorable exposure of plants to biotic and abiotic stresses has affected the productivity and survival of crop plants worldwide, including Bangladesh. The ever changing climate may exacerbate these adverse effects of stresses on crops. Finding climate smart approaches for sustained yields under stresses has been an important goal of agricultural researchers and stakeholders while it may get momentum in the coming decades. To cope with biotic and abiotic stresses, it is of utmost importance to understand plant responses to these stresses at morpho-physiological and molecular levels, and their management strategies for achieving a high yield. Being a part of human resources development for sustainable management of crops grown under stress, this course will provide an in-depth understanding on the consequences of stresses in crop production. Importantly, the course will offer sustainable management strategies of different agricultural stresses. Therefore, the proposed course may contribute to achieving global food security.

**Objectives:** At the end of this course, the students will gain considerable-

- (i) Understanding on the major global agricultural stresses and their impacts.
- (ii) Knowledge on the stress-induced morpho-physiological and molecular responses in plants.
- (iii) Competency in planning and managing crops grown in stress conditions.

<b>Learning Outcomes</b>	<b>Course Content</b>	<b>Teaching-Learning Strategy</b>	<b>Assessment Strategy</b>
-Understand on the major global agricultural stresses and their impacts on crop productivity -Identify the major stresses and stress-prone areas for Bangladesh agriculture	<b>Major agricultural stresses and their impacts in relation to global crop productivity</b> Lectures and reading materials on the major agricultural stresses and their impacts on crop production, especially focusing on the frequency, severity and yield losses in relation to global as well as Bangladesh context. Group assignments on major stress factors in Bangladesh and their impact on crop productions.	Lecture Reading assignment Individual writing assignment	-Short Answer -Essay

<p>-Understand and explain stress-induced morphological, physiological and molecular responses in plants under stress conditions</p>	<p><b>Morpho-physiological and molecular responses of crops under different stresses</b>  Lectures and reading materials on the aspects of morphological, physiological and molecular responses of crops under biotic and abiotic stress conditions. Growth and yield attributes of crops, photosynthesis, respiration and source-sink activities, plant water balance, hormonal homeostasis, oxidative damages caused by stress, osmoprotectants and stress responses in plants.</p>	<p>Lecture  Individual writing assignment  QA</p>	<p>-Short Answer  -Essay  -Completion</p>
<p>-Understand the potential impacts of biotic stresses in plants  -Explain management strategies in response to biotic stresses in crops for ensuring higher yields</p>	<p><b>Major biotic stresses, their impacts and management strategies</b>  Lectures and reading materials on important plant pathogens and insects, their mode of damages and management strategies   Lectures and reading materials on weeds, their interactions with crops and management strategies. Improving biotic stress tolerance in crops. Individual/group assignments on the effects of some common biotic stresses in Bangladesh on plants and their managements.</p>	<p>Lecture  Reading assignment  Individual writing assignment</p>	<p>-Short Answer  -Essay</p>
<p>-Understand the potential impacts of abiotic stresses in plants  -Explain management strategies in response to various abiotic stress factors in crops for ensuring higher yields.</p>	<p><b>Major abiotic stresses, their impacts and management strategies</b>  Lectures and reading materials on salinity, drought, waterlogging, submergence and flood, high and low temperature, freezing, ultraviolet radiation, elevated CO2 and temperature, heavy metals, microplastics, antibiotics and interactions of multiple stresses. Improving abiotic stress tolerance in crops.   Individual/group assignments on the frequently occurring abiotic stress in</p>	<p>Lecture  Reading assignment  Individual writing assignment</p>	<p>-Short Answer  -Essay</p>

	Bangladesh agriculture, their impact and management strategies.		
-Apply the knowledge on the effects and management techniques in response to various stress factors in crops. -Assess the levels of impact of various stresses in crop plants and recommend management strategies	<b>A trial on impact of stresses in plants / a case study on the impact of a contemporary stress in agriculture.</b> Students will set a study individually or in groups, applying the acquired knowledge on the above mentioned important stress factors and practice different management strategies for increasing stress tolerance in plants. Alternatively, students will visit crop fields and study the impact of contemporary stresses on farmers' fields and employ management strategies improving crop productivity.	Field Trip Group assignment Presentation Report	-Field trip report - Individual / Group presentation and report

### Recommended Books and Periodicals

1. Hall A.E., 2001. Crop responses to environment. CRC, Boca Raton
2. Shame, S. Goyal, S.K. Sharma, D.W., 2003. Crop Production in Saline Environment: Global and Integrative Perspectives. Haworth Press. New York, USA.
3. Masood, A. 2006. Drought Management: Strategies for pulse Crops. Udaipur, 165-E, Kamla Nagar, New Delhi.
4. Nilsen, E.T. and Orcutt, D.M., 1996. Physiology of plants under stress. Abiotic factors. *Physiology of plants under stress. Abiotic factors.*
5. Hale, M.G. and Orcutt, D.M., 1987. The physiology of plants under stress. John Wiley & Sons.
6. Jones, H.G., Flowers, T.J. and Jones, M.B., 2008. Plants under stress: biochemistry, physiology and ecology and their application to plant improvement. Cambridge University Press.
7. Nilsen, E.T.O. and David, M., The physiology of plants under stress: abiotic factors/Erik T. Nilsen, David M. Orcutt.
8. Orcutt, D.M. and Nilsen, E.T., 2000. *Physiology of plants under stress: Soil and biotic factors* (Vol. 2). John Wiley & Sons.
9. Iqbal M. Khan R. and Singh A., 2020. Improving Abiotic Stress Tolerance in Plants.
10. Shanker, A. and Shanker, C. eds., 2016. Abiotic and Biotic Stress in Plants: Recent Advances and Future Perspectives.
11. Hasanuzzaman, M., Hakeem, K.R., Nahar, K. and Alharby, H.F. eds., 2019. *Plant abiotic stress tolerance: Agronomic, molecular and biotechnological approaches.* Springer.

12. Shamim, M. and Singh, K.N. eds., 2017. *Biotic stress management in rice: molecular approaches*. CRC Press.
13. Shinwari, Z.K., Tanveer, F. and Iqar, I., 2019. Role of Microbes in Plant Health, Disease Management, and Abiotic Stress Management. In *Microbiome in Plant Health and Disease* (pp. 231-250). Springer, Singapore.
14. Dresselhaus, T. and Hückelhoven, R. eds., 2019. *Biotic and abiotic stress responses in crop plants*. MDPI.
15. Tripathi, D.K., Singh, V.P., Chauhan, D.K., Sharma, S., Prasad, S.M., Dubey, N.K. and Ramawat, N. eds., 2020. *Plant Life Under Changing Environment: Responses and Management*. Academic Press.
16. Poltronieri, P. and Hong, Y. eds., 2019. *Applied Plant Biotechnology for Improving Resistance to Biotic Stress*. Academic Press.
17. Ahmad, P. and Prasad, M.N.V. eds., 2011. Environmental adaptations and stress tolerance of plants in the era of climate change. Springer Science & Business Media.
18. Singh, H.P., Batish, D.R. and Kohli, R.K. eds., 2006. *Handbook of sustainable weed management*. CRC Press.
19. Tuteja, N. and Singh, G.S. eds., 2012. Plant acclimation to environmental stress. Springer Science & Business Media.
20. Ahmad, P., 2016. *Plant metal interaction: emerging remediation techniques*. Elsevier.
21. Ratnadewi, D. ed., 2018. *Plant Growth and Regulation: Alterations to Sustain Unfavorable Conditions*. BoD–Books on Demand.