

DISCIPLINE SPECIFIC ELECTIVE COURSE (DSE-11): Reproductive Ecology

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Reproductive Ecology DSE-11	4	2	0	2	Class XII pass with Biology/ Biotechnology	Nil

Learning Objectives :

- To acquaint students about the diversity in floral architecture, floral rewards so that they can correlate the concepts with breeding mechanisms.
- To help them appreciate the adaptive significance of various traits associated with pollination, seed dispersal and seedling recruitment.
- To sensitize students towards challenges faced by flowering plants on account of climate change and other anthropogenic activities.
- To build on the concepts of inbreeding and outbreeding depression, seed ecology and resource allocation.

Learning Outcomes:

After completing this course students will:

- Become familiar with interesting concepts involved in understanding of reproductive ecology such as floral rewards, plant-pollinator interactions and pollinator guilds.
- Have an understanding of intricacies and complexities involved in the reproductive success.
- Will have background knowledge and an opportunity to utilize this knowledge to undertake interdisciplinary research in conservation biology and other allied fields such as plant breeding.

Theory:**30 hours****Unit 1: Floral Ecology****10 hours**

Floral architecture (transitions between symmetrical and asymmetrical flowers,) role of pollination systems (any two examples), Phenology, Sexual systems, (monoecy, dioecy, hermaphroditism, gynodioecious, androdioecious etc.) cryptic sexuality- resource allocation and reproductive allocation, evolution from solitary flowering to inflorescence, floral attractants, and rewards (pollen, nectar, scent, colour)..

Unit 2: Pollination Ecology**8 hours**

Pollination syndromes, (transitions from generalized and specialized pollination system, including mutualistic and non-mutualistic interactions with two examples each), pollinator guilds (concept with two examples); ambophily, pollen banks, pollen mediated gene flow, mating systems, Factors affecting pollen-pistil interactions (abiotic, biotic, and anthropogenic);, inbreeding and outbreeding depression; resource allocation.

Unit 3: Seed Ecology**4 hours**

Dispersal mechanisms (primary and secondary with two examples), viability, dormancy, germination; seedling recruitment; natural seed banks and species survival, seed shadow, seed mediated gene flow .

Unit 4: Reproductive Ecology- Challenges and Contemporary Issues 8 hours

Impact of climate change on sexual reproduction, global pollinator crisis and pollination failure; crop yield reduction, habitat fragmentation and altitudinal shifts; impact of invasive species on native plants and pollinators, Effect of pollution on reproductive biology of plants

PRACTICALS:**60 hours**

1. To study diversity in floral architecture (type of soil, temperature, humidity etc. to be mentioned).
2. To carry out histochemical tests in pollen (proteins, lipids, starch).
3. To study the structure of nectary of any flower available in the campus (through section, whole mount).
4. To analyse nectar volume and composition (using refractometer/chromatography)
5. To study through temporary preparations - types of stigma (dry and wet) and style (hollow and solid).
6. To calculate pollen to ovule ratio and predict the mating system using established literature.
7. Study of species survival (ovule to seed ratio).
8. Effect of antibiotics on pollen germination.

Essential Readings:

- Tandon, R., Shivanna, K.R., Koul, M. (Eds) 2020. Reproductive Ecology of Flowering Plants: Patterns and Processes. Springer LINK
- Shivanna, K.R., Tandon, R. 2014. Reproductive Ecology of Flowering Plants: A Manual. Springer LINK
- Lovett-Doust, J., Lovett-Doust, L. 1988. Plant Reproductive Ecology: Patterns and Strategies: Oxford University Press, USA.
- Rustagi, A., Chaudhry, B. (Eds) 2022. Plant Reproductive Ecology-Recent Advances. Intech Open, London, U.K
- Mangla, Y., Khanduri, P., Gupta, C.K. 2022. Reproductive Biology of Angiosperms: Concepts and Laboratory Methods. Cambridge University Press.

Suggested Readings:

- Spencer C.H. Barrett & Christopher G. Eckert (1990) Current issues in plant reproductive ecology. Israel Journal of Botany 39:1-2, 5-12.
- Nicolson, S.W., Wright, G.A. 2017. Plant–pollinator interactions and threats to pollination: perspectives from the flower to the landscape. Functional ecology 31:22-25
- Hicks, L. 2020. Flowers colors are changing in response to climate change; Pigment changes can make plants less attractive to pollinators. Science News.