



## CENTRAL UNIVERSITY OF HIMACHAL PRADESH

[Established under the Central Universities Act 2009]

PO Box: 21, Dharamshala, District Kangra - 176215 (HP)

[www.cuhimachal.ac.in](http://www.cuhimachal.ac.in)

### SEMESTER- II

**Course code: BOT-403**

**Course Name: Phytochemistry**

**Name of Teacher:** Dr. Shalini Chandel

**Credit Equivalent:** 2 Credits **Objectives**

To understand and know the features related to origin, identification, primitive and advanced nature as well as importance for economic and research purpose of the Bryophytes and Pteridophytes.

#### **Attendance Requirement:**

Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75 percent attendance is a must, failing which a student may not be permitted to appear in examination.

#### **Evaluation Criteria:**

Mid-term Examination: 25%

End-term Examination: 50%

Continuous Internal Assessment: 25%

#### **Course contents**

Introduction to alkaloids, classification, physical, chemical and general methods for isolation of alkaloids

Hallucinating drugs: Hallucinating drugs -Introduction (definition of hallucinations, types and stages of hallucination), Psychoactive plants: stimulants, Hallucinogens, depressants.

Brief overview of plant drug with proven Pharmacological and therapeutic efficacy

Analytic techniques (basic principle) : Introduction to chromatography -Adsorption and column chromatography -Paper chromatography ,Thin layer chromatography, Gas chromatography (GC) -High performance liquid chromatography (HPLC), Affinity chromatography -Ion exchange chromatography

Production of secondary metabolites : Strategies for enhanced production of secondary metabolites in plant cell cultures, Elicitor – induced accumulation of products, Screening Of High Yielding Cell Lines And Extraction Of High Value Industrial Products.

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#### **Suggested readings-**

"Medicinal Plant Constituents" (1981), 3rd ed. by Balbaa S., Hilal S.H. and Zaki A.Y., Egyptian Dar El-kotob, Cairo

"Principles and Practice of Phytotherapy: Modern Herbal Medicine" (2000) by Mills S., Bone K., Corrigan D., Duke J.A. and Wright J.V. Churchill Living Stone, Edinburgh; New York

"The alkaloids: Chemistry and Biology" (2002) Volume 59 by Cordell G.A., Elsevier, New York

"Column Chromatography, Gas Chromatography and Liquid Chromatography" (1988) 1st ed. by: Karaway M.S., Pharmacognosy Dept., Faculty of Pharmacy, Cairo University



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### SEMESTER- II

**Course code:** BOT-575

**Course Name:** Cell Biology

**Name of Teacher:** Dr. Shalini Chandel

**Credit Equivalent:** 2 Credits

#### **Objectives:**

To be familiar with the history, requirement of tissue culture, techniques, importance and industrial applications of tissue culture.

#### **Attendance Requirement:**

Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75 percent attendance is a must, failing which a student may not be permitted to appear in examination.

#### **Evaluation Criteria:**

Mid-term Examination: 25%

End-term Examination: 50%

Continuous Internal Assessment: 25%

### **COURSE CONTENTS**

1. General structure and constituents of cell; Similarities and distinction between plant and animal cells; Cell wall, cell membrane, structure and composition of biomembranes, cell surface related functions.
2. Structure and function of major organelles: Nucleus, Chloroplasts, Mitochondria, Ribosomes, Lysosomes, Peroxisomes, Endoplasmic reticulum, Microbodies, Golgi apparatus, Vacuoles, etc.
3. Cell motility: Cilia, flagella of eukaryotes and prokaryotes.
4. Transport of nutrients, ions and macromolecules across membranes: Active and passive transport.
5. Cell division, Cell cycle and its regulation

#### **Suggested readings:**

1. Cell and molecular biology concepts & experiments (2008) by Gerald Karp (John Wiley).
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2. Molecular biology of cell (2009) by Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter (Garland Science).

3. The world of the cell (2009) by Wayne M. Becker, Lewis J. Kleinsmith, Jeff Hardin, Gregory Paul Bertoni, (Pearson education Inc. Pearson/Benjamin Cummings).

4. Molecular cell biology (2008) by Harvey F. Lodish, Arnold Berk, Chris A. Kaiser, Monty Krieger, Matthew P. Scott (Anthony Bretscher W.H. Freeman).

5. Biology, concept & applications (2008) by Cecie Starr, Ralph Taggart, Christine Evers (Lisa Starr Brooks/Cole).

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### SEMESTER- II

**Course code:** BOT-415

**Course Name:** Plant Physiology and Biochemistry

**Name of Teacher:** Dr. Kanika

**Credit Equivalent:** 4 Credits

#### **UNIT-1 (8 Lectures)**

Respiration: Overview of plant respiration, Glycolysis, the TCA cycle, electron transport and ATP synthesis, pentose phosphate pathways, alternative oxidase system and glyoxylate cycle.

Stomatal physiology: Chemiosmotic mechanism of stomatal movements, hormonal regulation and significance of calcium ions.

#### **UNIT-2 (8 Lectures)**

Photosynthesis: General concepts and historical background, evolution of photosynthetic apparatus, photosynthetic pigments and light harvesting complexes, mechanism of electron and proton transport, carbon assimilation: the calvin cycle, photorespiration and its significance, the C<sub>4</sub> cycle, the CAM pathways.

#### **UNIT-3 (8 Lectures)**

Plant growth regulators: Physiological effects and mechanism of action of Auxins, Gibberellins, Cytokinins, Ethylene and Abscisic acid.

Phytochrome: Photochemical and Biochemical Properties, localization of phytochrome in tissues and cells, characteristics of phytochrome induced whole plant responses, ecological functions- shade avoidance, circadian rhythms, phytochrome specializations.

#### **UNIT-4 (8 Lectures)**

Carbohydrate- classification, occurrence, structure and function of monosaccharides and oligosaccharides.

Lipids- classification, occurrence, structure and importance of acyl lipids and phosphates, biosynthesis of fatty acids,  $\beta$ -oxidation and role of polyunsaturated fatty acids.

#### **UNIT-5 (8 Lectures)**

Proteins: amino acids, peptides, structure of proteins-primary, secondary and tertiary, protein denaturation and folding.

Nucleotides and Nucleic acid: Structure and function of nucleic acids and different kinds of RNA.

**Suggested Readings:**

- Moore, T. C. 1989 Biochemistry and Physiology of plants hormones (2<sup>nd</sup> edition) Springer Verlag, New York, USA.
- Salisbury, F. B. and Ross, C. W. 1992. Plant Physiology (4<sup>th</sup> edition) Wadsworth publishing company, California, USA
- Taiz, I. and Zeiger, E 1998. Plant Physiology (2<sup>nd</sup> edition) Sinaur Associates Inc. Publishers, Massachusetts, USA
- Wilkins, M. B. (ed.) 1984 Advanced plant physiology, ELBS, Longman, UK.
- Zubay, G. 1988, Biochemistry (2<sup>nd</sup> ed.) Macmillan Publ. House N. Y.
- Mahler, H. R. and codes E. H. 1971. Biologist chemistry, Harper International
- Lehinger A. 1. 1978. Biochemistry Kalyani Publishers, Ludhiana
- Goodwin T.W. and Meriar L. e. I. 1989 Introductory plant Biochemistry pergamon press VY.



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### SEMESTER- II

**COURSE CODE:** BOT 416,

**COURSE NAME:** EMBRYOLOGY OF ANGIOSPERMS

**CREDIT-02**

**TEACHER:** Dr. REENA SHARMA

**Course Objectives:** The course is designed to provide a comprehensive coverage of the embryology in angiosperms as well as detail of advance techniques used.

#### **Attendance Requirement:**

Students are expected to attend all the lectures pertaining to the Course. To appear in the examination, a minimum of 75% attendance is compulsory.

#### **Evaluation Criteria:**

1. Mid Term Examination: 25%
2. End Term Examination: 50%
3. Continuous Internal Assessment : 25% (Breakup is following)
  - a. Assignment/Quiz/: 40%
  - b. Presentation/Seminar/: 40%
  - c. Class participation: 20%

#### **Course Contents:**

##### **Unit-I: Male gametogenesis:** (4 Lectures)

Structure of anther, microsporogenesis, role of tapetum, development of male gametophyte, pollen embryo sacs.

##### **Unit-II: Female gametogenesis:** (4 Lectures)

Ovule structure, types, development of ovule, megasporogenesis, megagametogenesis, types of embryo sacs and its organisation.

##### **Unit-III: Pollination and fertilization:** (4 Lectures)

Types and mechanism of pollination; Pollen-pistil interaction; Self-incompatibility; double fertilization; In-vivo and in-vitro fertilization.

#### **Unit-IV: Post-fertilization changes: (4 Lectures)**

Endosperm development, Embryo development, apomixis; parthenocarpy. Seed; maturation, germination and dormancy.

#### **Unit-V: Advanced techniques in embryology: (4 Lectures)**

Somatic embryogenesis; types, plantlet development and factors affecting somatic embryogenesis, Zygotic embryogenesis; technique and its application, Synthetic seeds; sources, development and uses.

#### **Suggested Readings:**

1. Evert, R.F., 2006. *Esau's plant anatomy: meristems, cells, and tissues of the plant body: their structure, function, and development*. John Wiley & Sons.
2. Beck, C.B., 2010. *An introduction to plant structure and development: plant anatomy for the twenty-first century*. Cambridge University Press.
3. Raghavan, V., 2012. *Developmental biology of flowering plants*. Springer Science & Business Media.
4. Taiz, L. Zeiger E. Ian Max Moller., Angus Murphy., 2018. *Plant Physiology and Development*. Sinauer Associates, Inc. University of California Los Angeles.
5. Raghavan, V. 1976. *Experimental Embryogenesis in Vascular plants*. Academic Press, London.
6. Stanley, R. G. & Linskens, H. F. 1974. *Pollen- biology, Biochemistry, Management*, Springer.
7. Bhojwani, S. S & Bhatnagar, S. P. 2000. *The Embryology of Angiosperms*, Vikas.
8. Bhojwani, S. S & Radan, M. K. 1983. *Plant Tissue Culture : Theory and Practices* Elsevier, Amsterdam.
9. Burgess, J. 1985 *An Introduction to Plant Cell Development* Cambridge Univ. Press, Cambridge.





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### **SEMESTER- II**

**COURSE CODE: (BOT-411)**

**COURSE NAME: ECOLOGY AND ENVIRONMENT**

**CREDIT-02**

**TEACHER: Dr. REENA SHARMA**

**Course Objectives:** The course is designed to enhance the knowledge about the ecology and impact of pollutants on environment.

#### **Attendance Requirement:**

Students are expected to attend all the lectures pertaining to the Course. To appear in the examination, a minimum of 75% attendance is compulsory.

#### **Evaluation Criteria:**

4. Mid Term Examination: 25%
5. End Term Examination: 50%
6. Continuous Internal Assessment : 25% (Breakup is following)
  - d. Assignment/Quiz/: 40%
  - e. Presentation/Seminar/: 40%
  - f. Class participation: 20%

#### **Course Contents:**

##### **Unit-I :Ecology and Ecosystem:(4 Lectures)**

Structure, functions and types of ecosystem , trophic organization, food chains, food webs; Energy flow pathways; Productivity and net energy.

##### **Unit-II: Population Ecology- Growth and Regulation:(4 Lectures)**

Characteristics of a population; population growth curves; population regulation; life history strategies ( $r$  and  $K$  selection); concept of metapopulation – demes and dispersal.

##### **Unit-III: Community Ecology: (4 Lectures)**

Concept of habitat and niche; fundamental and realized niche; Nature of communities; community structure and attributes.

**Unit-IV: Nutrient pathways, Biogeochemical cycles and soil:(4 Lectures)**

Nutrient exchange and cycling; Global biogeochemical cycles of C, N, P, S and hydrological cycle. Soil profile; Physical, chemical and biological properties of soil.**Unit-V: Environmental Pollution and conservation: (4 Lectures)**

Kinds; sources and effects of air, water; soil; noise and radioactive Pollution; Green House gases- trends, role and effect on climate; Acid rain; Global ozone problem and global warming.Different methods for soil and water conservations; Bioremediation and Phytoremedation.

**Suggested Readings:**

1. Smith, R.t.,1996. Ecology and Field biology. Harper Collins, New York.
2. Heywood, V.H. and Watson, R. T. 1995. Global Biodiversity Assessment. Cambridge University Press, Cambridge, U.K.
3. University Press, Cambridge, U.K.
4. MasonC. F. 1991. Biology of Fresh Water Pollution, Orient Longman.
5. Wilson, E.O. 1988. Biodiversity. National Academic Press, Washingtonl D.C.
6. Treshow, M. 1985. Air Pollution and Plant Life. WiteyInterscience.
7. Odum, E.P. 1971. Fundamentals of Ecology. Satilrdrs, Philadelphia
8. Sharma, P.D.2000. Ecology and Environment. RastogiPublications,'Meerut