BIOL 458: PLANT BIOCHEMISTRY & BIOCHEMICAL ECOLOGY (2025/26)

Dr. Peter Constabel (cpc@uvic.ca) **Mon/Thurs 10:00 - 11:20 Cun 146**

TEXTBOOK: The textbook (**Heldt, "*Plant Biochemistry*" 4th ed.**) is available free online https://search.library.uvic.ca/permalink/01VIC_INST/12198k2/alma9957538638007291
You will find it very helpful in the course. Some material is covered by **Taiz and Zeiger's "*Plant Physiology*"** on Reserve. **Readings of original papers will be assigned every other week (5 in total)**. You will be asked to submit brief summaries for each and be prepared to discuss in class.
A **term paper** (10 pp. max plus references) is a required component of this course

WEB CONTENT: Lecture notes or slides will available after the class on Brightspace. **Be aware that my notes are provided in condensed form. It it imperative that you come to class.**

COURSE OBJECTIVES: You will learn about plant constituents and chemicals, their role in the plant and ecosystem, and the biochemical basis of plant adaptation. The focus is on plant-specific biochemical pathways including enzymes and regulation. The course is divided into *primary metabolism* (storage carbohydrates, cell wall biosynthesis, lipid metabolism, nitrogen fixation and assimilation) and *secondary metabolism* (biochemistry and ecology of special plant metabolites such as isoprenoids, phenolics and alkaloids, and their roles in plant-animal and plant-environment interactions). Students will become familiar with the diversity of plant metabolites, and impacts on health and the environment.

LEARNING OUTCOMES: At the end of this course, you will be able to:
- describe the primary biochemical pathways which synthesize carbon-based building blocks of plants and how these pathways are regulated
- understand how key special metabolites are made from primary metabolites
- explain the diverse roles of secondary metabolites and how they mediate ecological interactions.
- provide examples of how plants biochemically adapt to a stressful environment.
- be comfortable finding and reading scientific articles about plant biochemistry and ecology.

EVALUATION:	Mid-term examination (closed book) **(Oct 16th, 2025)**	20%
	Annotated Bibliography* **(due Nov 13)**	5%
	Term Paper Final Draft* **(due Nov 28)**	25%
	Reading Assignment Summaries	10%
	Final exam* (***cumulative***): December 2025	40%
	(* required: must be completed to pass the course)	100%

Grading scheme: A+ (90-100%), A (85-89.5%), A- (80-84.5%), B+ (77-79.5%), B (73-76.5%), B- (70-72.5%), C+ (65-69.5%), C (60-64.5%), D (50-59.5%), F (<50%, after final)

- There will be no supplemental exam. Make-up final exams will only be considered following a Request for Academic Concession https://www.uvic.ca/students/academics/academic-concessions-
- There will be no make-up midterm. Points will be redistributed to the final if you miss the midterm.
- Late term papers will be penalized 1 pt per day late.
- The University deals harshly with plagiarism. See UVic's guidelines on academic integrity! (https://www.uvic.ca/students/academics/academic-integrity/index.php).
- Exam time can be very stressful. Try to avoid cramming and review the material every week. It is helpful discuss course content with your classmates. Don't hesitate to reach out to me directly.
- Stay healthy, and please talk to me if you have any concerns. UVic Counselling Services is free and can help if you feel overwhelmed and don't know which way to turn.
https://www.uvic.ca/students/health-wellness/counselling/index.php#ipn-counselling

LECTURE TOPICS:	**Text Readings (Heldt ed. 4th)**	**Lecture Period #**	**Dates** (approximate)
Introductory lecture			
• Importance of plant biochemistry & biochemical ecology		1	Sept 4
Part A. Primary Metabolism (Carbon and Nitrogen)			
• Tree Walk on campus. Enzymes review		2	Sept 8
• Calvin cycle & overview of metabolism		3	Sept 11
• Carbohydrates: starch, sucrose, fructans, & other sugars	pp. 241-268	4-5	Sept 15, 18
• Structure and function of the cell wall	pp. 4-9, 268-270	6-7	Sept 22*, 25
• Fatty acid biosynthesis; plant oils & biotechnological applications	pp. 359-378, 385-387	8-9	Sept 29, Oct 2
• Nitrogen assimilation	pp. 273-288	10	Oct 6*
• Nitrogen fixation amino acid synthesis	pp. 307-318	11	Oct 9
Thanksgiving Monday (Oct 13)	***no lecture***		
MIDTERM EXAM		***12***	**Oct 16**
• Shikimate pathway, aromatic amino acids, herbicides	pp. 297-300	13	Oct 20
• Phenylpropanoid pathway & lignin biosynthesis	pp. 431-440	14	Oct 23*
Part B. Secondary Metabolism & Chemical Ecology			
• Phenolics: biosynthesis and ecological functions	pp. 399-402, 431-440	15	Oct 27
• Flavonoids and their diverse functions	pp. 442- 449	16	Oct 30
• Isoprenoids I - plant volatiles and signals	pp. 409-424	17	Nov 3
• Isoprenoids II - carotenoids, toxins, rubber		18	Nov 6*
Fall Reading Break (Nov 10-12)	***no lectures***		
PAPER BIBLIOGRAPHIES DUE			**Nov 13 (Thurs)**
• Alkaloids & medicinal plants	pp. 402-404	19-20	Nov 13, 17
• Glucosinolates and cyanogenic glycosides	pp. 404-407	21	Nov 20
FINAL TERM PAPERS DUE			**Nov 28 (Fri)**
• Terpenophenolics and Cannabis		22	Nov 24*
• Special Topics		23	Nov 27
• Special Topics / Review		24	Dec 1

NB: Textbook Heldt 3rd edition page numbers will be slightly different but otherwise ok.
** Reading summaries due date. Readings will be assigned at least one week before.*

We acknowledge and respect the lək̓ʷəŋən peoples on whose traditional territory the university stands and the Songhees, Esquimalt and W̱SÁNEĆ peoples whose historical relationships with the land continue to this day.