

UNIVERSITY OF VICTORIA
Biology 326 – DEVELOPMENT AND GENETICS OF MODEL PLANTS
COURSE OUTLINE - FALL 2024

Lecture: TWF, 1:30pm; CUN146 (A01, CRN 10373)

Lab: F, 2:30-5:20; CUN118 (B01, CRN 10374)

Course Instructor: **Dr. Jürgen Ehling**
Office: Cunn. 159a, ph. 250-472-5091
email: je@uvic.ca

Laboratory Teaching Assistant:

David Shen
Office: CUN 159, ph. 250-853-3663
email: runyishen@uvic.ca
Office hours by inquiry, please email to make an appointment.

Course Description: Plant cell, tissue and organ differentiation, and the evolution of ecotypes explained through molecular and genetic tools developed using model plants such as *Arabidopsis*. The genetics of anatomy, development, physiology and ecological differentiation of plants. The role of model species in studies integrating cell biology, anatomy, physiology and ecology. Lab sections will emphasize plant mutants in comparison to wild types.

Intended Learning Outcomes: On completion of this course, students should:

- Understand the significance of model plant systems, particularly *Arabidopsis thaliana*, in studying plant development and genetics.
- Recognize the use of *Arabidopsis* as a model system to investigate cellular differentiation, genetic pathways, and evolutionary adaptations.
- Have a working knowledge of the stages of plant embryogenesis, root development, vascular differentiation, and flowering, and of the key genetic and molecular mechanisms involved.
- Understand the role of specific genes and mutations in these developmental processes
- Gain proficiency in genetic and molecular techniques by demonstrating competence in laboratory techniques such as morphological and histological mutant analysis of plant tissues, and genomic DNA extraction and PCR validation.
- Have basic knowledge of *in silico* tools and omics techniques to investigate gene expression and functional genomics in plants.
- Have learned to critically assess current research in plant development and genetics, and synthesize and present, in writing and orally, findings from the scientific literature.
- Work effectively in a team during laboratory sessions to carry out experiments, analyze results, and present findings.

Resources: There is no required textbook for this course, but background readings in ‘*Plant Biology*’ (by A Smith *et al.*, 2010; Garland Science) and ‘*Plant Physiology and Development*’ (by L Taiz *et al.*, 2023; Oxford University Press) will be helpful. Lecture slides and recordings will be made available through BrightSpace. BrightSpace will also host lab-related material, including manuals, general announcements, and evaluation results. Students should check BrightSpace before coming to lectures and labs.

Evaluation:	Midterm exam	20%
	Essay	20%
	Oral presentation	5%
	Laboratory	25%
	Final exam	30%

Please inform the course coordinator as soon as possible (within one week), if you were unable to submit any of the course component listed above.

Exams will be based on lecture and lab material; only material covered in class or lab will be evaluated but background readings in the textbooks may be helpful. The final exam will cover predominantly the material learned after the midterm, but approximately one-third of the final will cover material from throughout the course, i.e. it is cumulative. A deferred in-course midterm exam will be arranged if you had to miss the midterm due to unexpected and unavoidable circumstances, or conflicting responsibilities (as detailed [here](#)). If you are also unable to write the deferred midterm with excuse, it will not be included in calculating the course grade and all other course components will be reweighted. Likewise, if you must miss, with excuse, any other course component, the remaining components will be re-weighted proportionally. It is important to note in this context that every single course component can be worth less than 50% of your final grade after reweighing, so you cannot miss too many course components. For example, if you miss the midterm, the weight of the final exam will increase to 37.5% (30/80). However, if you would be unable to submit your essay with excuse in addition to the midterm, your final exam would increase to 50%, (30/60) which is not permitted, and you will receive an N as a course grade regardless of marks obtained in the course components submitted. To complete the lab section of the course, you must not miss more than two laboratories; completing the lab portion is a course requirement. Labs missed with excuse will not be included in calculating your lab grade and the remaining labs will be reweighted proportionally to calculate your lab grade.

Students must abide by academic regulations as set out in the university calendar. They must observe standards of scholarly integrity with regards to plagiarism and cheating. Please read the definitions, watch the tragi-comic video, and look at the other information available at this [link](#).

The use of generative artificial intelligence (AI) tools, such as ChatGPT or GrammarlyGO, are not allowed for assignments (or during closed book exams, of course). We reserve the right to use anti-plagiarism or AI detection software.

Grading scheme:

A+ (90%-100%), A (85-89.75%), A- (80-84.75%), B+ (77-79.75), B (73- 76.75%),
B- (70-72.75%), C+ (65-69.75%), C (60-64.75%), D (50-59.75%), F (<50%)

Tentative Course Schedule:

DATE	LECT/LAB	TITLE (tentative)
Sept	4-W	Course introduction
	6-F	Introduction to the model system <i>Arabidopsis thaliana</i>
	6-F	<i>no lab</i>
	10-T	Background on mutants, genetics, and molecular tools
	11-W	Plant reproductive biology, an overview
	13-F	Embryogenesis I; introduction
	13-F	<i>Lab 1 Abiotic stress response of Arabidopsis - Sowing (Greenhouse intro)</i>
	17-T	Embryogenesis II; morphology
	18-W	Embryogenesis III; genetics
	20-F	Mutant genotyping techniques
	20-F	<i>Lab 2 Genomic DNA extraction, PCR validation of embryo-lethal mutants I</i>
	24-T	Embryogenesis IV; genetics, continued
	25-W	Embryogenesis V; genetics, continued
	27-F	Root development I; morphology
	27-F	<i>Lab 3 PCR validation of embryo-lethal mutants II Chop and stain</i>
	Oct	1-T
2-W		Root development III; genetics, continued
4-F		Vascular differentiation I; cell and tissue types
4-F		<i>Lab 4 Vascular differentiation mutants</i>
8-T		Vascular differentiation II; functional genomics
9-W		Vascular differentiation III; genetics
11-F		<i>MIDTERM 50 minutes</i>
11-F		<i>no lab, Happy Thanksgiving</i>
15-T		Omics' tools in plant development I
16-W		Omics' tools in plant development II
18-F		Omics tools in plant development III
18-F		<i>Lab 1 Abiotic stress response of Arabidopsis - Treatments</i>
		<i>Lab 6 Seed sterilization and plating for GUS expression profiling</i>
22-T		Vegetative to reproductive transition I; vernalization response
23-W		Vegetative to reproductive transition II; day-length response
25-F		Introduction to <i>in silico</i> tools)
25-F		<i>Lab 5 Arabidopsis in silico tools</i>
29-T		Vegetative to reproductive transition II; day-length response, continued
30-W		Flower development I; SAM to IM to FM transition
1-F		Essay and presentation introduction. Introduction to GUS expression
Nov	1-F	<i>Lab 6 GUS expression profiling</i>
	5-T	Flower development II; ABC model,
	6-W	<i>no lecture: November 4 to 8 are 5 Days of Action 2024, attend the concurrent event instead.</i>
	8-F	Flower development II; ABC model, continued
	8-F	<i>Lab 7 Flower development in wild type and ABC mutants</i>
	11-13	READING BREAK

	15-F	Leaf development I
	15-F	<i>Lab 1 Abiotic stress response of Arabidopsis- Conclusion</i>
	19-T	Leaf development II
	20-W	Leaf development III
	22-F 1:30-5:20	<i>Student Presentations</i> <i>Essay due</i>
	26-T	Stomatal and trichome differentiation I
	27-W	Stomatal and trichome differentiation II
	29-F 1:30-5:20	<i>Student Presentations</i>
Dec	3-T	Current Research in the Ehlting lab
	4-W	<i>tbd</i> : Join UVic's activities related to the National Day of Remembrance and Action Against Women
	TBD	<i>FINAL EXAM</i> (during exam period)

Academic Important Dates:

Check [here](#). It is the student's responsibility to attend to Add/Drop dates published in the Calendar (last day to add courses – Sep 20, last day to drop without failure – Oct 31). Students must not assume they will be dropped automatically from any course they do not attend. It is also the students' responsibility to check their records and registration status.

Land Acknowledgement:

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

Diversity, Inclusion, and Resources:

We welcome everyone to learn in this course and we respect every human being, from all ethnic backgrounds, religious beliefs, sexual orientations, genders, socio-economic backgrounds and abilities. UVic is committed to promoting, providing and protecting a supportive and safe learning and working environments for all of its members. Your health and mental well-being are important for succeeding in this course, so please take advantage of UVic resources:

[Centre for Accessible Learning](#) - The CAL staff are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations. Accommodation letters need to be released to instructors at least seven days in advance of an assessment for accommodations to be applied. Please meet with the instructor(s) about specific concerns if needed.

[Learn Anywhere](#) – provides extensive information and student supports for online technology. This portal helps navigate essential resources, services, learning tools and strategies.

Student Mental Health Supports - In addition to providing both face to face and online mental health resources through the new Student Wellness Centre, a 24 x 7 phone & online student mental health resource and support program ([Support Connect](#)) is available for all UVic students, no matter where you are located, at any time.

[Student Wellness](#) - provides a full service, primary health clinic for students, and coordinates healthy student and campus initiatives. They also offer counselling services that can help you make

the most of your university experience. They offer free professional, confidential, inclusive support to currently registered UVic students.

Elders' Voices - The Office of Indigenous Academic and Community Engagement (IACE) has the privilege of assembling a group of Elders from local communities to guide students and others in Indigenous ways of knowing and being.

Office of Student life - promoting a safer and more inclusive campus community and supporting student engagement, development and well-being

Sexualized Violence Prevention and Response - UVic takes sexualized violence seriously. We encourage students to learn more about how the university defines sexualized violence and its overall approach. If you or someone you know has been impacted by sexualized violence and needs information, advice, and/or support please contact the sexualized violence resource office in Equity and Human Rights (EQHR). If you want to take part in the important prevention work taking place on campus, you can also contact the sexualized violence resource office in EQHR; Sedgewick C119, Phone: 250.721.8021, Email: svpcoordinator@uvic.ca.