BDE 264

Plant Form and Function

Year 2021 Second semester, 16 credits

Course coordinator: Prof AJ Valentine

Lecturers:

Prof LL Dreyer (LLD)
ld@sun.ac.za

Prof AJ Valentine (AJV)
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Prof NP Makunga (NPM)
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Course assistant:
Mrs. Megan Mathese
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Aims: The aims of this module are to explore the diversity of plant form and function to understand how plants grow, respond to natural cycles, capture resources and survive in adverse conditions.

After completion of this course you should:

- master the integration of morphological and physiological evolution across the embryophytes
- relate the diversity of plant form to functionality
- interpret the structure of plants at the anatomical and morphological levels (organelles, cells, tissues, organs)
- integrate the structural understanding with the physiological processes at all of these levels
- understand how plants utelise and exploit the biotic and abiotic environments via structural and physiological adaptations
- think and communicate laterally and critically about plant form and function

Text Book: Prescribed textbook: Plant Physiology and Development. 2015. Taiz and Zeiger. Complimentary textbook: Anatomy of flowering plants. 2007. Rudall

Assessment: The course will have flexible assessments, which will consist of 3 tests and 2 assignments:

1. Theory Test 1 (25%): Plant morphology and anatomy (On the 08th of Sep 2021, test will be based on Prof. Dreyer's lectures)
2. Theory Test 2 (25%): Plant function, growth and development (On the 4th of Oct 2021, based on Prof. Valentine's lectures)
3. Theory Test 3 (25%): Plant function, growth and development (On the 22nd of Nov 2021 at 14:00, based on Prof. Makunga's lectures)
4. Assignment 1 (12.5%): Plant resource capture and metabolism
5. Assignment 2 (12.5%): Plant growth and development

- **= Final Mark of 100%**

- In order to pass the module, you need to achieve a *Final Mark* of at least 50%.

Lecture programme: The course comprises 36 lectures and 11 practicals. Lecture times are Tuesdays (9h00-9h50), Wednesdays (11h00 – 11h50) and Fridays (12h00-12h50). Course material will be made available online in weekly blocks. The Friday (12h00 – 12h50) lecture has been selected as the one during which lecturers will be available online in real time for questions and direct communication with students.

Week 1 Prof. LL Dreyer			
Date	**Week**	**Lecturer**	**Theme**
10 Aug	1	LLD	Plant anatomy - introduction
11 Aug	1		No Lecture, following Monday timetable
13 Aug	1	LLD	Plant meristems
Week 2 Prof. LL Dreyer			
17 Aug	2	LLD	Plant dermal tissue
18 Aug	2	LLD	Plant dermal tissue
20 Aug	2	LLD	Plant dermal tissue
Week 3 Prof. LL Dreyer			
24 Aug	3	LLD	Plant ground tissue
25 Aug	3	LLD	Plant ground tissue
27 Aug	3	LLD	Plant ground tissue
Week 4 Prof. LL Dreyer			

31 Aug	4	LLD	Vascular tissue
01 Sep	4	LLD	Vascular tissue
03 Sep	4	LLD	Vascular tissue
Week 5 Prof. AJ Valentine			
07 Sep	5	AJV	Resource capture (CO_2 and light utilisation via photosynthesis)
08 Sep	5	AJV	Resource capture (CO_2 and light utilisation via photosynthesis)
10 Sep	5	AJV	Resource capture (mineral uptake and assimilation)
Week 6 Prof. AJ Valentine			
14 Sep	6	AJV	Resource capture (mineral uptake and assimilation)
15 Sep	6	AJV	Resource capture (mineral uptake and assimilation)
17 Sep	6	AJV	Resource capture (mineral uptake and assimilation)
University Spring break: 18 – 26 September 2021			
Week 7 Prof. AJ Valentine			
28 Sep	7	AJV	Resource capture (mineral uptake and assimilation)
29 Sep	7	AJV	Resource capture (mineral uptake and assimilation)
01 Oct	7	AJV	Resource capture (mineral uptake and assimilation)
Week 8 Prof. AJ Valentine			
05 Oct	8	AJV	Live Discussions & Assignment Feedback: Resource capture
06 Oct	8	AJV	Live Discussions & Assignment Feedback: Resource capture
08 Oct	8	AJV	Live Discussions & Assignment Feedback: Resource capture
Week 9 Prof. NP Makunga			
12 Oct	9	NPM	Growth & Development (hormones and growth regulators)
13 Oct	9	NPM	Growth & Development (hormones and growth regulators)
15 Oct	9	NPM	Growth & Development (hormones and growth regulators)
Week 10 Prof. NP Makunga			
19 Oct	10	NPM	Growth & Development (hormones and growth regulators)
20 Oct	10	NPM	Growth & Development (hormones and growth regulators)
22 Oct	10	NPM	Growth & Development (hormones and growth regulators)
Week 11 Prof. NP Makunga			
26 Oct	11	NPM	Growth & Development (senescence)
27 Oct	11	NPM	Growth & Development (senescence)
29 Oct	11	NPM	Growth & Development (seed germination)
Week 12 Prof. NP Makunga			
02 Nov	12	NPM	Growth & Development (seed germination)
03 Nov	12	NPM	Growth & Development (flowering)
05 Nov	12	NPM	Growth & Development (flowering)

Practical programme: The course includes 11 practical sessions, and the completion of all of these practicals is **COMPULSORY**. Official practical sessions are on Monday afternoons (14h00-17h00). The practical sessions will comprise of the following:

Date	Week	Lecturer	Theme
09 Aug	1		No practical
16 Aug	2	LLD	Stems
23 Aug	3	LLD	Roots
30 Aug	4	LLD	Leaves
06 Sep	5	AJV	Resource capture
13 Sep	6	AJV	Resource capture
20 Sep			No practical
27 Sept	7	AJV	Resource capture
04 Oct	8	AJV	Test 2
11 Oct	9	NPM	Growth & development
18 Oct	10	NPM	Growth & development
25 Oct	11	NPM	Growth & development
01 Nov	12	NPM	Webinar Report Back

Important information: In the event of missing a test or important deadline, a valid, original medical certificate must be submitted **within 5 days** after the test or the assignment hand-in date. This certificate must be emailed to Mrs. Mathese, and the second test (oral) will normally be scheduled within one week (7 days) after the original test date. It is the responsibility of the student to establish the time and place of the "siektetoets". No postponement will be granted for the hand in of assignments or practical reports, and a penalty of 5% per day will be subtracted from all such marks.

Module summary: The diversity of plant form and function will be explored in themes to understand how plants grow, respond to natural cycles, capture resources and survive in adverse conditions.

1) "What do plants look like to achieve an integrated function?": Plant form will be explored at various levels of structure in order to explore the integrated function of plants. Organography (roots, leaves, stems, flowers, seeds) will be introduced and then later complimented with cell and tissue anatomy and ultra-structure.

2) "How do plants eat and drink and defend their resources from harsh environments and predation?": Resource capture and metabolism Plant development and its responses to the natural cycles have a complex integration and interdependence with **resource capture**. The capture of essential resources (water, light CO_2, 0_2, minerals) will be studied in diverse and morphologically different lineages.

Plant survival is dependent upon resource capture during its developmental stages, even during adverse changes in the biotic and abiotic environment. **Plant adaptations to adversities** entail diverse forms and functions as survival strategies for water relations, photosynthesis, mineral nutrition, chemical and physical defences.

3) "How do plants grow and keep track of a changing natural environment?": Growth and development correlates with anatomical and morphological diversity of plants in all stages of development. Growth phases will be studied from seed germination, through vegetative and reproductive growth up to senescence. The control of these growth phases will be explored in relation to internal factors (hormones and growth regulators) and external factors (light, temperature, nutrients).

The mechanisms of how plants keep track of time and natural cycles will be explored in **Plant circadian and diurnal rhythms.** The synchronisation of plantresponses to alterations in day and night (diurnal rhythms) cycles, changes of the seasons and the control of the internal clock (circadian rhythms) will be explored.