

Biodiversity and Ecology (BDE) 354

Evolutionary Patterns and Processes

Year **2022** Second semester

3 lectures and 1 practical per week.

Exam module 16 credits

Continuous Assessment

Coordinator: Prof. Savel Daniels (SRD)

Lecturers:

Prof. Savel **Daniels** (SRD)
srd@sun.ac.za, Office no. 4006

Dr. Victor **Rambau** (VR)
rvr2@sun.ac.za, Office no. 4005

Prof. Sophie **von der Heyden** (SVDH)
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Course Assistant:

Ms Fawzia **Gordon**
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Aims:

- grasp the fundamentals of phylogenetics which is the way biologists reconstruct the pattern of events that have led to the distribution and diversity of life
- be able to collect, analyse and interpret morphological and genetic data for species identification and phylogeny reconstruction
- understand the underlying evolutionary processes that gave rise to biodiversity
- understand eukaryotic nuclear genome composition
- understand the processes and consequence of chromosomal evolution.
- understand phylogenetic reconstruction using different methods
- understand the combination of events associated with the origin, diversification, extinction, and interactions of organisms which produced the species that currently inhabit the Earth.

Assessment: In this module you will write two tests and have 3 practical reports/essays to hand in.

The final mark (PP) is the sum of your:

A1-Test (SRD) 35% +

A2 Test (SVDH+RVR) 40% +

Prac report 1 (SRD) 10% +

Prac report 2 (SVDH) 10% +

Prac report (RVR) 5%.

Spot tests may also be conducted during class.

To pass the module you must at least obtain an average of 45% for your two tests and a have a final mark of 50%.

Lecture programme: Lectures are held on Mondays (12:00), Wednesdays (08:00) and Fridays (09:00) in Broom lecture hall, room 2020 in the Natural Science building. This module will be offered on campus with NO simultaneous live streaming. Powerpoints of lectures will be available on SunLearn at the discretion of each lecturer.

No.	Date	Topic	Lecturer
1	18 Jul Mo	Molecular Markers I	SRD 1
2	20 Jul Wed	Molecular Markers II	SRD 2
3	22 Jul Fri	Phylogenetic terminology I	SRD 3
4	25 Jul	Phylogenetic terminology II	SRD 4
5	27 Jul	Sources of phylogenetic information	SRD 5
6	29 Jul	Tree building methods I: Distance	SRD 6
7	01 Aug	Tree building methods II: Parsimony	SRD 7
8	03 Aug	Tree building methods III: Likelihood	SRD 8
9	05 Aug	Tree building methods IV: Bayesian analyses	SRD 9
10	08 Aug	Confidence intervals in phylogenetics	SRD 10
11	10 Aug	Divergence time estimations	SRD 11
12	12 Aug	Testing Biogeographic patterning	SRD 12
13	15 Aug	Case study I	SRD 13
14	17 Aug	Case study II	SRD 14

15	19 Aug	Case Study III	SRD 15
16	22 Aug	What are phylogeography and population genetics	SVDH 1
17	24 Aug	Phylogeography and population genetics II	SVDH 2
18	26 Aug	Spatio-temporal patterns of populations	SVDH 3
19	29 Aug	Species and genetic diversity	SVDH 4
20	31 Aug	Habitat and genetic diversity	SVDH 5
21	02 Sep	Demographic change I	SVDH 6
	05-09 Sep	<i>US Vacation</i>	
22	12 Sep	Demographic change II	SVDH 7
23	14 Sep	Next generation sequencing and RAD-seq	SVDH 8
24	16 Sep	RAD-seq, adaptation & outlier detection	SVDH 9
25	19 Sep	RAD-seq: multi-species patterns	SVDH 10
26	21 Sep	Environmental DNA	SVDH 11
27	23 Sep	Transcriptomes (AN)	SVDH 12
28	26 Sep	Self-Study	SVDH 13
29	28 Sep	Eukaryotic Chromosomes	VR 1
30	30 Sep	Chromosomal Fusions as isolating mechanisms	VR 2

31	03 Oct	Chromosomal Inversions as isolating mechanisms	VR 3
32	05 Oct	Neutral Genome Changes	VR 4
33	07 Oct	Intra-chromosome variation and Speciation	VR 5
34	10 Oct	Chromosome Polymorphisms	VR 6
35	12 Oct	Inter species chromosome comparison I	VR 7
36	14 Oct	Inter species chromosome comparisons II	VR 8
37	17 Oct	Hybrid Sterility vs Chromosome Suppression	VR9
38	19 Oct	Cytogenetics and Conservation	VR10
39	21 Oct	Cytogenetics and Conservation Plus Revisions	VR11

Practical Programme

Practicals are scheduled for **Tuesdays at 10h00** and will be presented in Lab 2025 (Natural Science building) OR in NARGA B (Room 2087, Admin A).

Lecturers will inform you beforehand regarding the extent of the practicals.

Tues @ 10h00	Prac no	Lecturer	Topic	Venue
19 Jul		-	No Prac	
26 Jul	1	Daniels	Phylogenetics 1	Lab 2025
02 Aug	2	Daniels	Phylogenetics 2	NARGA B
09 Aug			No Prac Public Holiday	
16 Aug	3	Daniels	Phylogenetics 3	NARGA B/ Lab 2025
23 Aug	4	Daniels	Phylogenetics 4	Lab 2025
30 Aug **	5		Term Test @ 10h	LAB 2025
06 Sep			No Prac US holidays	
13 Sep	6	Von der Heyden	Calculating AMOVA & phi-test	NARGA B/ Lab 2025
20 Sep	7	Von der Heyden	Phylogeographic terminology 1	NARGA B/ Lab 2025
27 Sep	8	Von der Heyden	Exploring demographic change	NARGA B/ Lab 2025
04 Oct	9	Von der Heyden	Estimating geneflow	NARGA B/ Lab 2025
11 Oct	10	Rambau	Karyotyping	NARGA B
18 Oct	11	Rambau	Chromosome evolution	Lab 2025

Prac Reports:

Hand in date will be set by each lecturer.

1. Daniels:
2. Von der Heyden:
3. Rambau:

Test and exam dates:

** Assessment A1: Test 1 (SRD): **30 August 2022**

Tuesday @ 10h00 -13h00

(US Timetable schedule test date of 22 September will be shifted to 30 August after consent of all the Students)

Assessment A2: **04 November 2022**, Friday @ 9h00 – 12h00

Assessment A3: None

Important information: In instances where a test or deadline is missed a valid doctor certificate is required within one week of the test or hand-in date. The certificate must be emailed or hand in to Ms. F Gordon (fg1@sun.ac.za) as well as Ms Hutton (janette@sun.ac.za). We reserve the right to request that the hardcopy may be hand in to the department. Failure to submit a note will result in a mark of zero. A sick test will normally be held one week (seven days) after the original test date. It is the student's responsibility to determine the time of this test. No time extensions will be allowed for handing in practical reports. **Reports handed in late will not receive a mark.** All tests and reports will be handed back to the students within 14 days after submission. If you are unable to make scheduled deadlines you should contact Prof Daniels in advance to make alternative arrangements.

Language implementation for BDE 354:

The Department of Botany and Zoology recognises English as the international academic language and a medium through which science can be communicated with each other. It is thus our endeavour to ensure that each and every one of our students are proficient to communicate through the medium of English. We will however accommodate our Afrikaans students to the best of our ability. The following language option will be implemented in this BDE 354 module:

Lectures will only be offered in English.

Language of materials

The materials for learning will be made available as follows:

- (i) All compulsory reading material will be provided in English. Compulsory reading material (excluding published material) will also be provided in Afrikaans unless it is not reasonably practicable to do so.
- (ii) Module frameworks/study guides will be available in Afrikaans and English.
- (iii) Question papers for tests, examinations and other summative assessments will be available in Afrikaans and English. Students may answer all assessments and submit all written work in either Afrikaans or English.