Biodiversity and Ecology
BDE 334 2022

Global Change Biology

First semester
3 lectures and 1 practical per week
16 credits

Module coordinator:
Prof Sophie von der Heyden (SvdH)
Natuurwetenskappe Building, Office 3043
svdh@sun.ac.za
A: Impacts of global climate change on biodiversity: marine & terrestrial perspectives

Other lecturers:
Prof Susana Clusella-Trullas (SCT)
Natuurwetenskappe Building, Office 3071
sct333@sun.ac.za
B: Impacts of climate change on terrestrial species and communities: a mechanistic perspective

Dr Nasreen Peer (NP)
Natuurwetneskappe Building, Office 2048
npeer@sun.ac.za
C: Climate change impacts on socio-economics and human livelihoods

Prof Guy Midgley (GM)
Natuurwetenskappe Building, Office 1027
gfmidgley@sun.ac.za
D: Summary of Climate change: Understanding global to regional change

Course Assistant:
Ms Fawzia Gordon
Natuurwetenskappe building, Office 3056
fg1@sun.ac.za

Prerequisites: In order to participate in this module, you need to have passed four of the following: BDE 212, BDE 214, BDE 224, BDE 244, BDE 254, BDE 264

Language: please refer to the language policy for BDE334 on the departmental website

Aims: This module covers a wide variety of topics concerned with natural and anthropogenic climate change (CC) scenarios and other drivers of global change in both the past and future. It aims to equip students with an understanding of global CC, other drivers of anthropogenically driven changes, the impacts of change on biotic and abiotic systems and the consequences of CC for terrestrial and marine systems on earth.

On completion of this module you should be familiar with the following concepts:

- Assess and discuss historical and contemporary evidence for global change
- Understand the main drivers of global change and climate change
- Understand how large-scale analyses draw together data from different temporal and spatial scales and at different levels of biological organisation

Module materials and book: This module does not make use of a set textbook, as the field of global change pushes forward rapidly and thus cannot be summarised in one book. We make extensive use of reports of the Intergovernmental Panel on Climate Change (IPCC, 2007 and onwards, available online at www.ipcc.ch) and selected journal articles; students will be advised on these, and all articles are made available on the SunLearn (http://learn.sun.ac.za) platform. It is expected that students will use the resources provided to them.

Assessment of module: In this module you will write ONE theory (semester) test, hand in FOUR practical reports, might receive spot tests (or peer assessments) and write ONE exam paper. The final mark is the sum of your semester mark (40%) and the mark obtained in the June exam (60%). Your semester mark comprises the theory test (40%) and the practical reports (60%; there are four reports, each counts 15% towards the semester mark). To qualify for the exam you must have obtained at least 40% for the semester mark. An exam mark of at least 40% is required to obtain a final mark of 50%. To pass the module you must obtain a final mark of 50%.

Important information: All practical sessions and discussion/guest lectures are compulsory and may not be missed without excuse. In instances where a test or deadline is missed, a valid original doctor certificate is required within five working days after the test/deadline. In special circumstances (e.g. participation in provincial or national sporting events) a letter is required from the sporting body. In these instances, granting of permission to miss tests or deadlines is at the discretion of the course coordinator and is not automatic. If you are unable to make scheduled lectures, practicals or any of the deadlines you should contact Prof Sophie von der Heyden in advance to make alternative arrangements.

Documentation must be handed in to Ms Fawzia Gordon and a sick test (oral) will normally be held one week (five working days) after the original test date. It is the student's responsibility to determine the time and place of this test. No time extensions will be allowed for handing in practical reports and reports handed in late will not be marked (or a marks penalty will be applied).

All tests and reports will be handed back to the students within 14 days after submission, unless otherwise communicated to the students.

Lecture programme: This module consists of 36 lectures. All lectures will be 'in person' and will take place **Monday 10am, Tuesday 8am and Friday 11am in Room 1030** in the Natural Science Building. Please follow the relevant Covid-19 protocols at all times when attending lectures and practicals.

Week #/ Lecture #	Date	Topic	Lecturer
Week 1/ 1	14/ 02	Course outline & Welcome to the Anthropocene!	SvdH 1
Week 1/ 2	15/ 02	The future of the planet – what do models tell us?	Svdh 2
Week 1/ 3	18/ 02	Broad patterns and impacts of CC on terrestrial spp	SvdH 3
Week 2/ 4	21/ 02	Broad patterns and impacts of CC on marine spp	SvdH 4
Week 2/ 5	22/ 02	Scaling from individuals to communities – do species respond in similar ways?	SvdH 5
Week 2/ 6	25/ 02	Impacts of species range shifts	SvdH 6
Week 3/ 7	28/ 02	Can functional traits explain range shifts in species?	SvdH 7
Week 3/ 8	01/ 03	Ocean acidification and sea level rise	SvdH 8
Week 3/ 9	04/ 03	Over-exploitation and CC as a driver of population and spp extinctions	SvdH 9
Week 4/ 10	07/ 03	Biotic resistance and resilience to changing climates	SvdH 10
Week 4/ 11	08/ 03	Revision / wriggle room	SvdH 11
Week 4/ 12	11/ 03	The multidimensionality of climate change: let's think beyond air temperature	SCT 1
Week 5/ 13	14/ 03	Extreme climatic events	SCT 2
Week 5/ 14	15/ 03	Studying the environment at the scale of the organism	SCT 3
Week 5/ 15	18/ 03	Why do we need mechanistic niche models?	SCT 4
Week 6	21/ 03	*No Class, Public Holiday*	
Week 6/ 16	22/ 03	Heat budgets (terrestrial species)	SCT 5
Week 6/ 17	25/ 03	Water budgets (terrestrial species) **Monday roster**	SCT 6
		RECESS : 28 /03 – 01/04	
Week 7/ 18	04/ 04	Combining fitness components to predict population demography and extinction risk (1)	SCT 7
Week 7/ 19	05/ 04	Combining fitness components to predict population demography and extinction risk (2)	SCT 8
Week 7/ 20	08/ 04	The impact of global change on humans	NP 1
Week 8/ 21	11/ 04	Ecosystem services: regulating the effects of global change	NP 2
Week 8/ 22	12/ 04	Humans as drivers of global change	NP 3
Week 8/ 23	14/ 04	**Friday roster** Mitigation and adaptation	NP 4
Week 8	15/ 04	*No Class, Good Friday*	
Week 9	18/ 04	*No Class, Family Day*	
Week 9/ 24	19/ 04	**Monday Roster** Global change and indigenous knowledge	NP 5
Week 9/ 25	22/ 04	Advancing the Blue Economy in a global change context	NP 6
Week 10/ 26	25/ 04	The importance of scientific objectivity / Research impact and relevance	NP 7
Week 10/ 27	26/ 04	Quiz	NP 8
Week 10/ 28	29/ 04	A biome-level understanding of climate change impacts	GM 1
Week 11	02/ 05	*No Class, Public Holiday*	
Week 11/ 29	03/ 05	Plant functional types, plant traits, and biomes I	GM 2
Week 11/ 30	06/ 05	Plant functional types, plant traits, and biomes II	GM 3
Week 12/ 31	09/ 05	Disturbance versus climatic control of biomes	GM 4
Week 12/ 32	10/ 05	How does atmospheric CO_2 control biomes?	GM 5
Week 12/ 33	13/ 05	Past, present and future of disturbance and CO_2 control of biomes	GM 6
Week 13/ 34	16/ 05	Understanding and predicting the global carbon cycle I	GM 7
Week 13/ 35	17/ 05	Understanding and predicting the global carbon cycle II	GM 8
Week 13/ 36	20/ 05	How you can use this course in different career paths	GM 9

Test and exam dates:

SEMESTER TEST: .

13 April 2022, Wednesday @ 14h00 (was changed from 23 March after class consultation)

NB* There is no written second opportunity for this test. You will be expected to do an oral test.

FINAL EXAMS

Exam 1: 31 May 2022, Tuesday, 14h00 *OR / AND*

Exam 2: 17 June 2022, Friday, 09h00

Practical programme: This module consists of 12 practical contact sessions – one of these is designated for the semester test. Practicals are always in person and will be held every **Wednesday from 14:00 – 17:00** in Lab 2025, or in NARGA B (Rm 2087, Admin A) or in the field as indicated below. Please note that for practicals in NARGA we may need to stagger starting times for the class in order to adhere to restrictions on numbers.

Prac	Date	Topic	Lecturer
1	16/02	Modelling future climates and an overview of the IPC	SvdH (NARGA)
2	23/02	Species Distribution Models	SvdH (NARGA)
3	02/03	Climate modelling prac	SvdH (NARGA)
4	09/03	Choosing a study organism: from simple to complex life cycles	SCT (2025)
5	16/03	Field prac (weather and microclimate data collection)	SCT (Field)
6	23/03	Modelling activity restriction of your study organism	SCT (NARGA)
	30/03	***NO PRAC : RECESS***	
7	06/04	The 'Community Voice' Method	NP (NARGA)
8	13/04	**SEMSTER TEST**	SvdH / SCT (2025)
9	20/04	GDP and environmental performance	NP (NARGA)
	27/04	***NO PRAC: Public Holiday***	
10	04/05	How to beat climate change	GM (NARGA)
11	11/05	Nature based solutions – do they work?	GM (NARGA)
12	18/05	Tutorial to support hand-in work	GM (NARGA)

PRACTICAL ASSIGNMENTS Submission dates:

Prof. Von der Heyden: 16/03/22

Prof. Clusella-Trullas: 08/04/22

Dr. Peer:
Prac assignment 1: Community Voice Method – 20/04/22
assignment 2: GDP and Environmental factors – 22/04/22

Prof. Midgley: 12/05/22