Mission and Aims: OTS South Africa

Mission Statement: Provide a holistic learning experience to engage and heighten critical thinking skills and creativity, along with social and intercultural skills in the context of South Africa's ecology and culture.

On the OTS South Africa Course we aim to provide the following:

- Holistic science education through balanced instructional and experiential learning to develop an understanding of socio-ecological systems in South Africa;
- Field problem-based learning, focussing on natural history and personal experience as a vehicle for further education;
- A strong focus on tuition and mentored teaching;
- Exposure to a broad range of top scientists/academics and sites that best illustrate key course concepts;
- Experience conducting independent research;
- Teaching with a firm grounding in the socio-economic context of South Africa: the country provides a unique combination of first and third world circumstances, which inspires constant engagement and innovation
- Skills in relevant science through exposure to global environmental issues within a South African context. Students leave with a deeper understanding of the interaction between science, policy and society that will shape their future scientific career;
- Interaction between RSA and US students, which is central to the success of the course.
- Enjoyment for both staff and students. It is critical that science is an enjoyable pursuit while still producing scientifically robust work.

SYLLABUS

The diagram on the following page, "*Your guide to the OTS syllabus, modules and competencies*" represents a conceptual model of the academic structure of the programme.

- At the base lie the **expected competencies** or hard skills that you will acquire during the programme, as part of the course-work and projects. These are all aimed at providing you with a "tool kit" for a more effective engagement with science.
- Academically, the four **core modules** lie at the heart of the programme, and comply with the traditional model of a University course. Each module comprises of a series of lectures and workshops and require several deliverables from you (see *Grading Breakdown* below).
- The **elective projects** of the course are made up of the **Faculty Field Problems (FFPs)** and the **KNP Long-term research projects (KLTRI).** These elective projects offer you experience in diverse approaches to science and afford you the opportunity to contribute to research in KNP. These two elective projects form part of the field skills and conservation modules, respectively.
- Finally, the course culminates in the **capstone project** or **independent project (IP)**, where you combine all the skills, theory and varying approaches to science you have learnt during the programme and apply these to the final independent research project. This project contributes to ecology module.

MODULE DESCRIPTIONS AND DELIVERABLES

A: South African Ecosystems and Diversity (Duke University - BIO 284A or ENVIRON 284A)

Module outcomes

On completion, the student will have demonstrated that he/she has the following knowledge, skills and values:

a) The ability to retrieve subject-specific and general ecological knowledge and to apply skills to examine and address ecological questions;
b) The ability to analyse ecosystems and represent such analysis meaningfully;
c) The ability to apply the knowledge and skills acquired meaningfully in addressing aspects of the management of social-ecological systems;
d) The ability to exercise leadership in a science community as well serve creatively as a member of a team or peers;
e) The ability to communicate professionally or in general with scientists and the community, whether orally or in writing, while making use of the appropriate structure, style and graphic and electronic support.

Module description

This course serves to integrate field and classroom instruction to provide an integrated understanding of South Africa's diverse ecosystems, with particular emphasis on savannas. We concentrate on factors that determine the form and function of both individual organisms and ecosystems, with a range of African examples (marine, freshwater, savannas, arid-lands and fynbos). In engaging with ecological theory, the course also aims to highlight characteristics distinctive of South African ecology such as climatic variability and the importance of geology (bottom-up controls), the role of disturbance by large herbivorous mammals, the importance of fire and the long presence of people (top-down controls), as well as the spectacular diversity of the Cape Floristic Kingdom. Course topics will focus on conceptual problems and issues that guide current ecological research in South Africa. Classroom instruction will include lectures given by program faculty and visiting faculty, as well as discussions of assigned text readings and selections from the primary research literature. Throughout the semester, researchers working at Kruger National Park (KNP) and other South African field sites, including invited faculty from the University of the Witwatersrand (Wits) and the University of Cape Town (UCT), will deliver lectures outlining the results of on-going projects. Consequently, students will be given frequent exposure to current research activities in South Africa.

Fieldwork is an important component of the course. During the semester, the course is based at Kruger National Park and visits several distinctive field sites within the Park. In addition, short trips will be made to other sites in South Africa to highlight the climatic and biotic diversity of the country. Brief excursions outside the KNP will be made to arid northern Limpopo regions, Barberton mountain range, the Cape coast, and the fynbos. Field orientation at each site will include the identification and natural history of important plant and animal species. These sessions will also serve to stimulate questions that students may address in subsequent independent research projects.

At the end of the semester, you will complete an independent, short-term research project (of about 10 days' duration from start to finish). Working individually or in small groups, you will present a research protocol to the group, collect data in the field and analyze data, and then prepare a short report in the style of a scientific paper. You will also present their data orally in mini research symposia. For the independent projects, faculty members provide close mentoring throughout the process of experimental design, implementation, and analysis.

Specific Goals:

- Orientation to the origin and maintenance of the diverse ecosystems of South Africa.
- Study of patterns and processes governing ecosystem dynamics in savanna, fynbos, freshwater and marine ecosystems.
- Examination and application of contemporary ecological theory in a South African context.
- Introduction to the basic procedures for identifying South African ecosystems and associated taxa, with emphasis on plants, mammals, birds, reptiles, and insects.
- Immersion in an environment that encourages direct observation of the natural history of important plant and animal taxa in South Africa.
- Link ecological dynamics to conservation and management practices in the KNP.
- Exposure to research interests of faculty and scientists at the KNP, Wits, and UCT.

Instructors:
Dr. Bernard Coetzee, Dr. Lisa Nupen & Dr. Laurence Kruger and visiting faculty.

Textbooks:
Prescribed:
Du Toit, J.T., Rogers, K.H., and H.C. Biggs. 2003. *The Kruger Experience.* Island Press, Washington D.C., USA

Available in RSA
Scholes, R.J., and B.H. Walker. 1993. *An African Savanna: Synthesis of the Nylsvley Study*. Cambridge: Cambridge University Press.

The course travels with an extensive library of textbooks, field guides, and scientific reprints. Research articles are assigned throughout the course.

B: Field Research in Savanna Ecology (Duke University – BIO 285LA or ENVIRON 285LA)

Module outcomes

On completion, the student will have demonstrated that he/she has the following knowledge, skills and values:

a) The requisite knowledge of the concepts and logic of the scientific method and the ability to apply these in research;
b) The ability to independently design, plan and conduct research on a specific problem in savanna ecology, to collect, process and analyse data, and to compile these findings in a report and present them orally;
c) The ability to apply the knowledge and skills acquired meaningfully in addressing aspects of the management of social-ecological systems;
d) The ability to exercise leadership in a science community as well as serve creatively as a member of a team of peers;
e) The knowledge and skills needed to build and curate natural history collections
f) The ability to communicate professionally or in general with scientists and the community, whether orally or in writing, while making use of the appropriate structure, style and graphic and electronic support.

Module description

This course, the scientific "toolbox" of the programme, introduces students to research design (approach, methods, and techniques) in the context of South African ecosystems. Several approaches to scientific inquiry are demonstrated and discussed, with special emphasis on hypothesis testing and statistical analysis. Students will also be trained in the design and implementation of long-term ecological monitoring and research projects. Tutoring sessions to reflect on Faculty Field Problems (FFPs) will illuminate the different approaches adopted by visiting faculty to anticipate approaches to independent field projects.

The emphasis of the statistics component of this course is to get students comfortable with 1) curating and managing their data, 2) selecting and interpreting appropriate statistical tests, and 3) writing-up and graphically presenting their findings. The course starts by discussing the role of statistics as a part of the scientific method, and aims to get students to a point where they are equipped with the necessary design and analysis skills to carry out their own research projects. This includes orientation to software packages (Excel, Statistica and Primer).

This module includes workshops dealing with philosophy and methods of science and culminates in a science-writing workshop, which focuses on the product of your scientific project. The science-writing workshop introduces you to the standards of science writing that will apply in this course.

In faculty-guided field projects, resident or visiting faculty members select the topic and guide you through the process of identifying critical questions about the topic, developing relevant hypotheses, designing tests of these hypotheses and interpreting data. Projects illustrate concepts of field ecology, and are each two to three days in length. Although all of you will participate in data collection, only a core group will produce a report on the topic. You will choose a project and mentor per your interest, and lead the design and management of the project under the guidance of the visiting faculty.

An additional requirement of the course is to participate in an insect, plant and small vertebrate collection. Not only do these collections provide practical skills and experience in collecting and curating of specimens, but they also afford the opportunity to learn more about the taxonomy and natural history of the collected species. Furthermore, student collections provide SANParks with valuable specimens from key sites on the long-term research plots (the Granite "supersite"). These are then accessioned in the herbarium and museum at Skukuza.

Specific Goals:

- Critical review of methods of scientific inquiry and their application to field savanna ecology (understanding approaches to science).
- Instruction in key principles of design of quantitative research (surveys and experiments), analysis, and long-term ecological monitoring.
- Training in the logic and procedures of statistical inference.
- Use of statistical tests, such as chi-squared tests, t-tests, regression analyses, ANOVAs, and various nonparametric tests for analysing data.
- Design, execution, and analysis of projects in a savanna, fynbos and marine ecosystems.
- Intensive training in writing scientific papers and preparing papers outlining research findings.
- Training in presentation of oral reports (following the format of scientific meetings) describing research projects.
- Experience in contributing to and interpreting long-term data sets.
- Introduction to and experience in the basic procedures for collecting, trapping, handling, identifying and curating taxa, with emphasis on plants, mammals, birds, reptiles, and insects.

Instructors:
Dr. Bernard Coetzee, Dr. Lisa Nupen, Dr. Laurence Kruger, Dr. Fred Kruger and visiting faculty.

Textbooks:
Prescribed:
Fowler, J., L. Cohen, and P. Jarvis. 1998. *Practical Statistics for Field Biology*. New York: John Wiley & Sons.

Available in RSA:
Strunk, W. and White, E. B. 2000. *The Elements of Style*. New York: Longman Publishing. Scientific writing
Krebs, C.J. 1999. *Ecological Methodology*. Second Edition. Menlo Park, CA USA: Addison, Wesley, Longman, Inc.
Zar, J. H. 1999. *Biostatistical Analysis*. Fourth Edition. Upper Saddle River, New Jersey, USA: Prentice-Hall Inc.

C: Conservation & Management of Protected Areas in South Africa (Duke University - ENVIRON 281A)

Module outcomes

On completion, you will have demonstrated the following knowledge, skills and values:

a) The ability to understand the history of the effect of humans on ecosystems.
b) Understand policy and practice in biodiversity management and what such history means to present biodiversity management within and without protected areas.
c) Understand the principles of community based conservation and its risks and benefits to biodiversity management.
d) The ability to analyse the meaning of biodiversity in terms of human wellbeing through the concept of ecosystem services and apply this knowledge in biodiversity management.
e) The ability to apply biogeography concepts in the design of biodiversity management systems, such as bioregional plans.

Module description

The Conservation and Biodiversity Management course explores the history of conservation biology as a science and a practice and attempts to convey the importance of biodiversity in functioning ecosystems. Emphasis is placed on understanding 1) the links between pattern and process, 2) the strategies and tools available to conservationists to maintain biodiversity and ecosystem functioning and 3) the debates around the maintenance of biodiversity in human-dominated landscapes.

The course is designed to teach current global concepts and place them in a South African context. This is done by exposing students to scientific concepts that have arisen in places such as the USA, Europe, Australia, and South Africa and demonstrating how these concepts are being used to achieve conservation goals across South Africa. Finally, students will gain extensive knowledge on the realities of conservation management in Kruger National Park. Students will study major issues such as control of invasive exotic species, fire as a management tool, partnerships between national parks and local human communities, water quality and management within the Park and surrounding communities, relocation of big game, and transfrontier parks.

The course poses three broad questions: 1) What is biodiversity conservation? 2) Why conserve biodiversity? and 3) How do we currently understand best practice for biodiversity conservation? Through these questions students will grapple with definitions of biodiversity, how it is measured, why it is important and its current state both globally and within South Africa.

The history of, and ethical motivations for conservation will be covered with emphasis on the shifting paradigms from species based conservation to that of functional ecosystems. The role of ecology and the contribution of ecological theory to conservation biology both past and present will be covered through teachings on island biogeography, meta-population and patch dynamic theory as well as complexity theory, resilience, and adaptive management. Students will then examine how our understanding of systems better allows us to conserve them both within protected areas and outside of protected areas by learning about systematic conservation planning, and integrated conservation strategies.

Students will also confront the problem of identifying what is "natural" in a landscape with a long and complex human influence and will be lectured on community-based conservation, natural resource use and common property resource management. They will also debate the feasibility of simultaneously achieving conservation and development goals.

Instruction consists of lectures, discussions, case studies and faculty-led field projects. In addition, research papers and review articles are regularly assigned as readings. Work conducted in the Kruger National Park and exposure to park scientists will highlight major conceptual themes as well as practical challenges faced by South Africa and other African countries. The primary focus will be an in-depth analysis of management issues within Kruger National Park, with additional visits to HaMakuya and Pullen Farm outside of the park, and to the fynbos ecosystems on the South-eastern coast.

Specific Goals:

- To convey the importance of biodiversity in maintaining the function of an ecosystem.
- To gain insight into the theories that have given rise to current conservation practices and protected area management.
- To explore interactions between patterns of diversity (e.g. hotspots) and processes which drive these.
- Debate issues surrounding the design, effectiveness and efficiency of protected areas for maintaining biodiversity patterns and processes.
- Orientation to the management structures and function of Kruger National Park, the impact of different management strategies and their relative costs and benefits.
- Study of practical issues in the management of specific big game (e.g., elephants, roan antelope and rhino).
- Study of practical issues in the control of invasive species.
- Study of the relationship between the park and surrounding communities, including land claim conflicts and economic opportunities.

Instructors:
Dr. Bernard Coetzee, Dr. Lisa Nupen, Dr. Laurence Kruger and visiting faculty.

Course Textbook:

Conservation Biology for All. Edited by Navjot S. Sodhi and Paul R. Ehrlich (Available online for free http://conbio.org/publications/free-textbook)

Supplemental Textbooks:

Carruthers, Jane. 1995. *Kruger National Park: A Social and Political History.* International Specialized Book Service.

Du Toit, J.T., Rogers, K.H., and H.C. Biggs. 2003. *The Kruger Experience.* Island Press, Washington D.C., USA

Keller, D. 2010. *Environmental Ethics: The Big Questions.* Wiley-Blackwell Publishing.

Lockwood, M., Worboys, G., and A. Kothari. 2006. *Managing Protected Areas: A Global Guide.* Earthscan.

Loreau, M., Naeem, S., and P. Inchausti. 2002. *Biodiversity and Ecosystem Functioning: Synthesis and Perspectives.* Oxford University Press.

Sodhi, N., and P. Erlich. 2010. *Conservation Biology for All.* Oxford University Press.

D: History and Culture of South Africa (Duke University - HISTORY 390A-13)

Module outcomes

On completion of this course you will have demonstrated knowledge of the following:

a) A grasp of the history and culture of South Africa, the challenges faced by an emerging democracy.
b) The ability to analyse the influence of cultural diversity on science and options for the management of biodiversity to contribute to human welfare
c) The ability to align research and biodiversity management with the influence of customs and cultural institutions that shape daily life.

Module description

This module introduces students to the history and culture of South Africa, the challenges faced by an emerging democracy, and the implications these have for the management of natural resources in general, and protected area conservation. The principal goals of this course are to introduce students to the human history of South Africa and to expose them to a broad range of cultural and social aspects of current South African society, to provide critical socio-economic context for the other modules. Emphasis will be on the origin and maintenance of the tremendous cultural diversity of the region, with units on the archaeological record, early migration patterns of humans throughout the African continent, cultural and linguistic diversity in South Africa, ethnobiology, as well as the recent recorded social and political history of the region. Key social and cultural issues in South Africa will be emphasized, along with specific themes chosen to enhance students' familiarity with customs or cultural institutions that shape daily life. The course will include a variety of activities including the following:

- Discussions of readings from South African literature (fiction and nonfiction)
- Workshops on the role of scientists in natural resource management in an emerging democracy
- Visits to archaeological sites (Thulamela/Mapungubwe) museums (including the Apartheid Museum, and Robben Island where Nelson Mandela was jailed for 18 years)
- Cultural exchanges with Zulu, Ndebele, Venda, Sotho/Tsonga communities
- Participation in contemporary South African music and dance

The course will be integrated into the 15-week field program, with some invited professors and practitioners incorporated into activities within Kruger. There will also be visits to sites, projects, and communities outside the park. By the end of the course, students are expected to have a broad overview and understanding of the social, political, and cultural diversity of South Africa. They should also appreciate the historical basis of contemporary issues in South Africa.

Instructors:

Dr. Lannie Birch, Gcobani Qambela & Dr. Fred Kruger

Textbooks and Reference Materials:

Selected works on the history of Southern Africa; contemporary fiction and nonfiction; published articles in peer-reviewed journals. The OTS South Africa program has amassed an impressive library on these topics and students will have access to all

materials as background information as they prepare their independent projects for oral presentation. The course will also make use of music, film, and videos and will develop workshops on topics such Photographic and literature analysis.

Marking Rubric. To come to grips with the difference between South African and US grading systems, we provide the following marking (grading) rubric.

SA grade	Description	US Grade
85%	Excellent work; ideas are insightful, original, ambitious, exciting; command of fundamentals is excellent (e.g. Latin, Greek, English prose, research methods); may tackle especially challenging scholarly puzzles. Work shows considerable promise of scholarly excellence, and gives supervisor new insights into the topic.	A+
75 – 84%	Very good work; solid command of fundamentals; shows facility for formulating insightful and original arguments, and defending them with clear, compelling scholarly prose. Range depends on degree of originality, synthesis of ideas in literature and technical excellence.	A
70 – 74%	Good, solid work; makes valid scientific argument and uses appropriate substantiation to back it up. Shows decent command of fundamentals--work to do, but a solid foundation from which to do it. May have insightful, even original, ideas, but some difficulty expressing them.	A-
68 -69%	More than adequate; work exceeds the minimum stated requirements and expectations; Understands the key issues, with some appropriate substantiation, argument and evidence of own reading/thinking about the topic. Shows competence in fundamentals and provides a solid framework for the argument. Good work, but let down by instances of weak expression/logic and/or technical flaws	B+
64 – 67	Adequate; work exceeds the minimum stated requirements and expectations; Understands the key issues with some appropriate substantiation, argument and evidence of own reading/thinking about the topic. May demonstrate competence in fundamentals but suffers from, thin evidentiary support, weak expression/logic, solid use of scholarly resources.	B
61 - 63	As above. Place in the mark range depends on the seriousness or frequencies of flaws.	B-
58 - 60	Above acceptable work but less than fully adequate and some serious flaws e.g. weak command of fundamentals and expression, factual errors, no clear argument or unsubstantiated arguments. Little sign of own thinking or reading on the topic.	C+
55 – 57	Acceptable basic work but less than fully adequate and several serious flaws e.g. weak command of fundamentals and expression, factual errors, no clear argument or unsubstantiated arguments. Little sign of own thinking or reading on the topic.	C
52 – 54	As above. Mark range depends on the seriousness and frequency of the flaws.	C-
50 – 51	Barely acceptable as undergraduate-level work.	D

<50	Unacceptable work; may be characterized by inadequate command of fundamentals, absence of ideas or critical thought. Did not perform the required tasks	F

Plagiarism and Academic Honesty

The staff at OTS takes academic ethics very seriously. Cheating, forgery, plagiarism or dishonest conduct will lead to a fail in this course. Each fact or opinion that you obtain from a published source must be referenced when writing a scientific paper or an assignment, you may not copy text from a journal article, textbook, website, or any other source of information unless you clearly indicate that the text is a quotation. See the section on plagiarism in How to write a scientific paper.

Conducting Group Work

Group work is becoming a more prevalent in university courses mainly as it promotes intercultural skills and teamwork, a highly valued skill by employers, and as means of developing communication and interpersonal skills. On OTS, you will have several group assignments and these next pages are some tips, gathered from several universities and organizations, which might help you engage better for a group task.

Top Group Work Tips from OTS staff

- *Effective and open communication*
- *Accountability and consensus*
- *Structure and organisation*
- *Enthusiasm and humility*

**Make sure that any assessed work reads as a whole document (i.e. – rather than it being obvious that each section is of a different style and standard). Continually review the document as a group to ensure that each section "speaks" to the other and that there is a well-established logical flow throughout the document.*

Effective group work

Group work can be stressful: not everyone works in the same way or at the same pace, and you may need to find ways to negotiate these issues. Some advice:

- ***Understand roles***: members of a team naturally adopt different roles, or where roles overlap, need to learn to manage conflict to make progress
- ***Manage conflict:*** Clarify and if necessary revisit your common purpose, stay as objective as possible - focus on the issue that you disagree on, not on the personal qualities of people in the group,
- ***Learn facilitation skills:*** agree on the facilitation role, ensuring that you take turns sharing ideas and opinions; be open to constructive criticism
- ***Practice reflective listening:*** make time and space to reach a common understanding by exploring what each other means in their statements; ask dumb questions
- ***Get organised****:* decide when and where to meet, set a realistic schedule to complete your task, and participate
- ***Give constructive feedback:*** put yourself in the other's shoes; think about how you would feel if someone criticised your ideas, and keep this in mind when giving feedback. Be empathetic and supportive.

- If the group cannot agree after discussing the pros and cons of the idea, then have a vote and go with the majority decision or discuss with lecturers.
- ***Be inclusive:*** Help all group members to feel involved. Play on strengths and nurture weaknesses of team members to build a stronger unit.