Division of Academic and Student Affairs
Office of Undergraduate Courses & Curricula
oucc.dasa.ncsu.edu
courses-curricula@ncsu.edu

Campus Box 7105
211A Park Shops
Raleigh, NC 27695-7105
P: 919.515.9769

Council on Undergraduate Education 2016-2017

April 21, 2017
Talley Student Union 3210
1:30pm-3:00pm

Lunch will be served beginning at 1:00 PM
Call to Order 1:30pm

- Welcome and Instructions, Chair Peggy Domingue
- Report for General Education Diversity Taskforce from Dr. Herle McGowan
- Approval of CUE April 7, 2017 Minutes

New Business

- Course and Curricular Business

Consent Agenda			
Action	**GEP**	**Type**	**Notes**
DAN 272 Dance Composition	VPA	Revisions	Revising requisites
IS 200 Introduction to International Studies	GK, IP	Revisions	Revising requisites

Courses New to GEP				
Presenter	**Reviewers**	**GEP Category Under review**	**GEP Action**	**Notes**
Outing	Nowel, Gilmartin, Parker	HES	HESS 195 Special Topics in Health and Exercise Studies	New Course
Outing	Keene, Knowles, Schmidt	HUM, USD	HON 290 Honors Special Topics - Humanities/US Diversity	New to USD, *HUM review
Outing	Levine, Ashwell, Skrzecz	GK, IP	HON 293 Honors Special Topics - Interdisciplinary Perspectives/Global Knowledge	New to GK and IP
Outing	Rabah, Joines, Ozturk	USD, IP	HON 297 Honors Special Topics - Interdisciplinary Perspectives/US Diversity	New to USD, *IP review
Outing	Ash, Ahwell, Sills	GK, IP, VPA	HON 390 Music and the Celtic World	New Course
Outing	Ozturk, Levine, Skrzecz	SS	MS 302 Applied Leadership in Small Unit Operations	New to SS
Knowles	Lee, Outing, Rabah	IP	ENG 341 Literature and Science	New Course
Knowles	Schmidt, Nowel, Allen	HUM, USD	PHI 320 Philosophy of Race	New Course
Gilmartin	Parker, Joines, Sills	SS, USD	SOC 202 Principles of Sociology	New to USD, *SS review

Courses for GEP Category - Review				
Presenter	**Reviewers**	**GEP Category Under Review**	**GEP Action**	**Notes**
Gilmartin	Ash, Parker, Allen	SS, USD	SOC/WGS 204 Sociology and Family	*Major Changes: SLO, title, and offering

Courses for GEP Category - Review				
Presenter	**Reviewers**	**GEP Category Under Review**	**GEP Action**	**Notes**
Sills	Ash, Parker, Allen	IP, GK	IPGK 295 Wildlife Monitoring Technology	1st offering

**Changes to course approved by UCCC.*
SLO= Student Learning Outcomes

Notes:

- All linked course actions are viewable in CIM.
- To view actions, please click on the hyperlink. You may need to use your Unity ID to log in.
- If you experience issues logging in, please go to https://next-catalog.ncsu.edu/courseadmin/ and type the course prefix and number into the search bar.

NC STATE UNIVERSITY

Division of Academic and Student Affairs
Office of Undergraduate Courses & Curricula
oucc.dasa.ncsu.edu
courses-curricula@ncsu.edu

Campus Box 7105
211A Park Shops
Raleigh, NC 27695-7105
P: 919.515.9769

Council on Undergraduate Education 2016-2017

April 7, 2017
Talley Student Union 4140
Call to Order: 1:33 PM

Members Present: Chair Peggy Domingue, Karen Keene, Alice Lee (Proxy), Hatice Ozturk, James Knowles, Tania Allen, Cynthia Levine, Andy Nowel, Frederick Parker, Sarah Ash, Julia Law (Proxy), Tom Koch (Proxy)
Members Absent: Tim Petty, David Gilmartin, Ingrid Schmidt, Chris Ashwell, Jeff Joines, Kim Outing, Ghada Rabah, Erin Sills, Adam Skrzecz

Ex-Officio Members Present: Li Marcus, Lexi Hergeth, Dr. Barbara Kirby, Erin Dixon, Stephany Dunstan, Melissa Williford
Guests: Deborah Acker, Alison Arnold, Anthony Scalabrino, Jonathan Kramer

WELCOME AND INTRODUCTIONS

- *Remarks from Chair Chair Peggy Domingue* - Welcomed the committee and proxy and introduced the guests.
- *Remarks from Dr. Barbara Kirby, Associate Vice Provost*- Reminded the committee this is the second to last CUE meeting. Wrapping up the US Diversity task force meeting, Dr. Mullen will determine how to vet the task force recommendations and future review.
- Approval of the Minutes from January 20, 2017. – *Approved Unanimously*
    - Discussion: Motion to approve the past minutes by member Andy Nowel.

NEW BUSINESS

Consent Agenda : The consent agenda was presented by member Sarah Ash. *Approved Unanimously*

New to GEP

- **NS 420 Naval Leadership and Ethics**: (HUM,IP) *– 9 Approved 1 abstention*
  Discussion: Presented by proxy Tom Koch. Guest Anthony Scalabrino explained the course has been updated based on recommendations from consultations and explained how the GEP attributes will be useful to ROTC students. Member asked how the faculty member is addressing the leadership and ethics disciplines within Naval theory for the IP category. Guest explained the topics in the course are addressing more than just leadership and ethics but all topics will relate to these emphasized by the instructor and assignments.
  Member asked if leadership is a discipline, members had no issue with Humanities, but asked if leadership would be discipline and/or perspective. Members and XNVO members spoke about leadership being a discipline, especially with leadership being a body of knowledge, degree awarding program, CIP codes, professional organizations, ect. Members discussed that the IP category could be considered a Naval Science perspective at this point. Member asked if leadership is too vague of a concept, other member responded leadership is a discipline. Member asked how specific instances are related to leadership, guest explained how leadership will be discussed with other aspects of a course. Member asked if every course could be considered for a leadership discipline, guests and members discussed. Members agreed that many courses would have aspects of leadership principles, but not every course and not to the extent of being approved for an IP discipline, as this course is. Li Marcus explained leadership has been an approved discipline for the IP attribute in the past. Members asked if they could vote on Humanities and Interdisciplinary Perspectives separately. Dr. Kirby explained that the IP category reflects how a principle or discipline is addressed from each perspective.
  Member said NS 420 is focusing on leadership within the navy. Members discussed amending the discipline from leadership to naval Tom Koch moved to amend the “leadership” discipline to “Naval leadership”. Member suggested guest speakers for each perspective.

- **MUS 200 Understanding Music: Global Perspectives**: (IP,GK,VPA) *–9 Approved 1 abstention*
  Discussion: Presented by proxy Tom Koch. Member brought attention to the mythological basis not being taught by anthropology or history professor and indicated there may be too low of a threshold. Guest Jonathan Kramer responded that both instructors co-teaching the course have anthropological training and the methodology is, by definition, interdisciplinary.
  Member asked if the instructor doesn’t have a degree in the discipline can they say they are meeting that discipline. Guest asked if a course can only be considered for the IP category if multiple instructors with degrees in each specific discipline teach the course, or an instructor with multiple degrees related to each discipline. Members discussed this is

not the case.
Members reflected on the IP discussion from earlier in the year when the committee agreed instructors would not need a degree specific to each discipline to teach IP courses. Members discussed the complexity of the IP category and the possibility for a large number of courses to be considered for the IP GEP category, but the efforts instructors make to relate the disciplines is how the GEPs meet the IP category requirements.

GEP Review

- **MUS 320 Music of the 20th Century**: (GK,VPA) – *Approved Unanimously*
  Discussion: Presented by proxy Tom Koch.

Special Topics

- **IPGE 295 Integrating STEM Education**: (IP) – *Approved Unanimously*
  Discussion: Presented by member Karen Keene. Li Marcus explained that if a student wants the GEP information to appear in their Degree Audit automatically they will need to enroll in this section of the course. Member asked how the course defines the discipline of doing science as opposed to teaching science. Member discussed how some of the readings indicate how science is done versus the history of science. Members discussed there are different methods for how to study science as well as how to teach science, the methods of delivery help differentiate these within the course. Presenter explained the goal is to show the way science is currently taught is not the best way; school science is not the same thing.
  For the second offering, members would like more information on specifically how science is practiced and taught and how the readings reflect this. Member pointed out that "hard science" should be referred to as "STEM" because hard science is not a commonly used term anymore. XNOV member suggested a few minor grammatical errors be corrected.

Discussion: No further discussion.

Meeting adjourned at 2:28 PM

Respectfully submitted by Lexi Hergeth

GEP Interdisciplinary Perspectives & Global Knowledge Special Topic Shell Offering (IPGK 295)

*This form is to be used for submitting a Special Topics shell offering for the **Interdisciplinary Perspectives** and **Global Knowledge** GEP categories to the Council on Undergraduate Education (CUE)*

Course action proposals for a GEP shell offering must provide documentation to show how the course is designed to enable a student to achieve the particular GEP category objectives.

The ***GEP Interdisciplinary Perspectives objectives*** will provide instruction and guidance that help students to:

1. Distinguish between the distinct approaches of two or more disciplines; and
2. Identify and apply authentic connections between two or more disciplines; and
3. Explore and synthesize the approaches or views of the two or more disciplines.

The ***GEP Global Knowledge objectives*** will provide instruction and guidance that help students to:

4. Identify and examine distinguishing characteristics including values, images, cultural artifacts, economic structures, technological or scientific developments, and/or attitudes of people in a society or culture outside the United States.

And at least one of the following:

5. Compare these distinguishing characteristics between the non-U.S. society and at least one other society.
6. Explain how the distinguishing characteristics relate to their cultural and/or historical contexts in the non-U.S. society.
7. Explain how these distinguishing characteristics change in response to internal and external pressures on the non-U.S. society.

IPGK 295		
Department(s)/Program	Forestry & Environmental Resources/Fisheries, Wildlife, & Conservation Biology and Mechanical and Aerospace Engineering	**New GEP Special Topics Offering** ☑
Special Topic Title: (30 character limit)	Wildlife Monitoring Technology	**Review for 2nd Offering** ☐
Term to be Offered	Fall 2017	
Instructor Name/Title	Dr. Werner Dorgeloh/Adjunct Associate Professor & Dr. Larry M. Silverberg, Professor	

SECTION 1: GEP CRITERIA

Instructions:

- At least one of the Instructor's student learning outcomes must be listed under each GEP category objective.
- Achievement of the outcomes must allow students to meet the GEP category objectives.
- Outcomes must illustrate what students will do in order to demonstrate they have achieved the outcome.
- At least one means of evaluation must be listed under each outcome and provide data to allow the instructor to judge how well students have achieved outcomes.
- Student learning outcomes that are relevant to the GEP category objectives must be applied to all course sections.
- For assistance with writing outcomes and list of active verbs using ***Bloom's Taxonomy*** [Click Here]

Interdisciplinary Studies

List the Instructor's student learning outcomes for the course that are relevant to GEP *Interdisciplinary Perspectives Objective 1*:

Obj. 1) Distinguish between the distinct approaches of two or more disciplines.

• recognize, explain, apply, outline, analyze, contribute to the design of, and contrast state-of-the-art methods in UAS technology,
• recall facts, describe, demonstrate, break down, analyze, and contrast wildlife ecology in management of wildlife species, and
• predict, categorize, design, evaluate, and make informed decisions in the use of UAVs in monitoring and managing wildlife species.

Measure(s) for above Outcome:

Describe the assessments that will be used to determine if students have achieved the outcome. Including a relevant example assignment/question/prompt is encouraged for clarity.

(1) Written Test of Lectures (10%)
(4) Draft journal publications (30%)

List the Instructor's student learning outcome(s) for the course that are relevant to GEP *Interdisciplinary Perspectives Objective 2*:

Obj. 2) Identify and apply authentic connections between two or more disciplines.

• identify behavioral reactions to the presence of UAVs
• decide which technique to apply to count animals
• apply UAVs and system integration methods in the monitoring and management of wildlife species

General GEP objectives per the course syllabus

Measure(s) for above Outcome:

Describe the assessments that will be used to determine if students have achieved the outcome. Including a relevant example assignment/question/prompt is encouraged for clarity.

(1) Written Test of Lectures (10%), (2) Data collection and data analysis reports (30%), (3) Field Activity Reports (Flight, Monitoring Assessments, etc.) (30%), (4) Draft journal publications (30%) Assessment per the course syllabus

List the Instructor's student learning outcome(s) for the course that are relevant to GEP *Interdisciplinary Perspectives Objective 3*:

Obj. 3) Explore and synthesize the approaches or views of the two or more disciplines.

• maintain a log book of field observations
• collect and process aerial and ground video
• assess statistical significance of data
• design experiments and adapt them as needed
• distill results for journal publication
• write professionally for journal publication

Measure(s) for above Outcome:

Describe the assessments that will be used to determine if students have achieved the outcome. Including a relevant example assignment/question/prompt is encouraged for clarity.

(2) Data collection and data analysis reports (30%)
(3) Field Activity Reports (Flight, Monitoring Assessments, etc.) (30%)

To assist CUE in evaluating this course for Interdisciplinary Perspectives, please provide answers to the following questions:

A. Which disciplines will be synthesized, connected, and/or considered in this course?

Wildlife species (wildlife ecology) and unmanned aerial systems (engineering)

B. How will the instructor present the material so that these disciplines are addressed in a way that allows the students "to integrate the multiple parts of view into a cohesive understanding"?

Broadly, the students are studying wildlife species and assisting with deploying a UAS over animal conservancy sites in Namibia and studying selected species.

Global Knowledge

List the Instructor's student learning outcome(s) for the course that are relevant to GEP *Global Knowledge Objective 4*:

Obj. 4) Identify and examine distinguishing characteristics including values, images, cultural artifacts, economic structures, technological or scientific developments, and/or attitudes of people in a society or culture outside the United States.

This is a study abroad experience in Namibia. The students work closely with local personnel in animal conservation. Examples: exposure to local economic structures, the high value placed on wildlife (central to their economy), visits to communal farms.

Measure(s) for above Outcome:

Describe the assessments that will be used to determine if students have achieved the outcome. Including a relevant example assignment/question/prompt is encouraged for clarity.

(1) Written Test of Lectures including a cultural report after the field work (10%)

List the Instructor's student learning outcome(s) for the course that are relevant to GEP *Global Knowledge* Objective 5, 6, or 7:

Students become culturally sensitive and are able to distinguish between different cultural values. Examples: Differences in values placed on wildlife, local ethnic identities, communal living, lifestyles.

Measure(s) for above Outcome:

Describe the assessments that will be used to determine if students have achieved the outcome. Including a relevant example assignment/question/prompt is encouraged for clarity.

(1) Written test of lecture material and a cultural report after the field work (10%)

SECTION 2: REQUISITES AND SCHEDULING

General guidelines:

- GEP Courses should have at least 25% of seats non-restricted (i.e. available to all students).
- GEP Courses should have no more than ONE pre-requisite.
- GEP Special Topics are approved as a one-term offering.
- The course syllabus for all sections must include the GEP ***Interdisciplinary Perspectives and Global Knowledge*** category designations and GEP student learning outcomes.

Special Topics Term Scheduling:

- List below the course scheduling detail:
  - Meeting time and day(s):

    Contact hours: Lectures 12 hrs, Test 2 hrs, Field Activities 250 hrs
  - Seat count: 15
  - Room assigned or room preference including needed classroom technology/seat type:

    N/A
- If this course is to be piggy-backed with a department special topic, list the piggy-backed course prefix/number below. (EX: BIO 295 with NSGK 295)

What percentage of the seats offered will be open to all students? 100 ***%***

a. If seats are restricted, describe the restriction being applied.

b. Is this restriction listed in the course catalog description for the course?

List all course pre-requisites, co-requisites, and restrictive statements ***(ex: Jr standing; Chemistry majors only).*** ***If none, state none.***

None. Course is only offered as part of a Study Abroad Program.

List any discipline specific background or skills that a student is expected to have prior to taking this course. If none, state none. *(ex: ability to analyze historical text; prepare a lesson plan)*

Junior-level standing and above

SECTION 3: ADDITIONAL INFORMATION

Complete the following 3 questions or attach a syllabus that includes this information.

1. Title and author of any required text or publications.

See attached syllabus

2. Major topics to be covered and required readings including laboratory and studio topics.

See attached syllabus

3. List any required field trips, out of class activities, and/or guest speakers.

See attached syllabus

SIGNATURE PAGE FOR IPGK 295

RECOMMENDED BY:

Richard Gould 4-17-17

HEAD, DEPARTMENT/PROGRAM DATE

For GEP Special Topics Submission Form, follow the standard workflow for approval of a special topic offering in your College which may or may not include review by the College CCC.

ENDORSED BY:

CHAIR, COLLEGE COURSES & CURRICULA COMMITTEE DATE

COLLEGE DEAN DATE

APPROVED BY:

CHAIR, COUNCIL ON UNDERGRADUATE EDUCATION DATE

DEAN, DIVISION OF ACADEMIC AND STUDENT AFFAIRS (DASA) DATE

APPROVED EFFECTIVE DATE _____

SYLLABUS

1. COURSE AND CONTACT DETAILS

Courses: Wildlife Monitoring Technology (IPGK 295)

Credits: IPGK 295 3* graded credits

Dates: Fall semester 2017

Location: NC State University and Namibia

Instructors: Dr. Werner Dörgeloh wgdorgel@ncsu.edu and Dr. Larry M. Silverberg lmsilver@ncsu.edu

*The number of contact hours meets the requirements of a 6 credit hours.

Participating Institutions and Organizations

North Carolina State University

Naankuse Lodge & Wildlife Sanctuary, Namibia

Ministry of Environment and Tourism, Namibia

2. PREREQUISITES

None. The course is being offered as part of a semester-long study abroad program.

3. GENERAL EDUCATION PROGRAM (GEP) COURSE DOCUMENTATION

3.1 GEP Categories

Interdisciplinary Perspectives

Global Knowledge

3.2 GEP Category Objectives

The following addresses the a) Interdisciplinary Perspectives GEP requirement and b) the Global Knowledge GEP requirement. Note that the Global Knowledge GEP requirement is generally addressed separately by the Study Abroad Office but is included here for completeness. Broadly, the GEP Interdisciplinary Perspectives component of this course addresses the interdisciplinary nature of engineering and wildlife management. More specifically, it addresses the emerging field of unmanned aerial systems (UAS) and the critical role that they will play in the near future in the monitoring and conservation of African wildlife species. The IP objective is for the students to gain a hands-on perspective of the interplay between the UAS and African wildlife species with a focus on how the UAS advances monitoring and conservation. Broadly, the Global Knowledge component of this course addresses Namibian cultural interaction

(immersion), some of the main economic structural differences, and the roles of the different ethnic groups in Namibia society. The GK objective is for the students, through an immersive experience of Namibian culture, to gain cultural sensitivity. Below, more detail are provided.

a) Interdisciplinary Perspectives

The IP objective is for the students to gain a perspective of the interplay between the UAS and African wildlife species with a focus on how the UAS advances monitoring and conservation. The overall strategy being employed to meet the stated objectives is to provide an immersive experience, exposing the students to UAS and the varied African wildlife species. The UAS immersive experience is realized by putting the students through a build-design-fly experience. The students will each build their own drone, work in teams to design and build drones that they will operate themselves in Namibia, and set up a network for the data collection and analysis. The African wildlife immersive experience is realized by setting the goal to study specific wildlife species, such as zebra, giraffe, springbok, and baboon (in Fall 2017), etc. In particular, their behavior, habitat, and distribution will be studied. The interplay between the UAS and the African wildlife species is realized by focusing the studies on the response of the selected African wildlife species to the drones that are monitoring them. The students will experience first-hand the advancement realized by UAS in the ability to monitor and study wildlife species.

b) Global Knowledge

The GK objective is for the students, through an immersive experience of Namibian culture, to gain cultural sensitivity. The overall strategy being employed is to bring together the students and local people, some of whom they will work with daily and who are playing a direct role in protecting wildlife species. This will expose the students to the challenges being faced for the conservation of wildlife species. The students will also go on field trips that expose the students to the Namibian way of life. With respect to the economic structure in Namibia, the students will experience how different it is in Namibia: wherein a large percentage of the population is economically disadvantaged, highly dependent on government subsistence, and where other much smaller segments of the population are thriving in very different ways. With respect to the different ethnic groups, the students will be exposed to the current ethnic groups and how they

relate to the historical background of the country, will see how each perceives its contribution to society and how the modern challenges being faced. Much of this strategy involves the relationship between the people and their wildlife – the country's greatest natural resource.

On a higher level, this experience will help students develop versatility of mind, an ability to examine problems individually and collaboratively from global perspectives. For example, the journal articles they will be preparing data for and writing will provide them the guidance and skills necessary to become intellectually disciplined, to be able to construct arguments that are clear, precise, accurate, and of relevant depth and breadth. We hope that this experience encourages them to take personal responsibility for their education, including the ability to find, evaluate and communicate new information, setting the stage for life-long learning.

3.3 GEP Student Learning Outcomes

Overall, students' understanding of the distinct approaches and basic concepts in engineering and wildlife will be assessed with written tests (10% of course grade). Students' ability to identify and apply connections between engineering and wildlife will be tested through descriptions of data collection and other field activities in their reports (60% of course grade). Finally, their ability to synthesize the approaches of the two disciplines and explain how they complement each other will be tested through their contributions to draft journal publications (30% of course grade).

The general GEP student learning outcomes are given below. By the end of the course the students will be able to:

- recognize, explain, apply, outline, analyze, contribute to the design of, and contrast state-of-the-art methods in UAS technology,
- recall facts, describe, demonstrate, break down, analyze, and contrast wildlife ecology in management of wildlife species, and
- predict, categorize, design, evaluate, and make informed decisions in the use of UAVs in monitoring and managing wildlife species.

The specific GEP student learning outcomes are given below. By the end of the course the students will be able to:

- recognize and explain African landscapes
- classify large African mammals
- describe large African mammal behavior
- recognize basic factors pertaining to population growth
- recognize simple counting methods
- explain basic principles of park management
- explain the basic features of the international wildlife trade
- recognize the different driving forces behind poaching
- recognize functionality of UAV methods of communications and imaging
- operate and repair UAV
- assist in design and fabrication of UAV
- assist in design, fabrication, and installation of UAV
- discern how to apply UAS in the monitoring and management of wildlife species
- discern the effectiveness of UAVs systems as a monitoring tool in the fight against poaching
- maintain a log book of field observations
- collect and process aerial and ground video
- assess statistical significance of data
- design experiments and adapt them as needed
- distill results for journal publication
- write professionally for journal publication

Assessments to determine whether students have achieved the outcomes:

The assessments represent important outcomes being reached as the students address the wildlife conservation problem. The types of assessments and the percentages for grading are given below.

(1) Written Test of Lectures (10%)

(2) Data collection and data analysis reports (30%)

(3) Field Activity Reports (Flight, Monitoring Assessments, etc.) (30%)

(4) Draft journal publications (30%)

4. REQUIRED TEXTBOOKS

Jay Gundlach 2012, Designing Unmanned Aerial Aircraft Systems, AIAA Education Series. pp 803.

Bothma, J. du P. & du Toit, J.D. (eds.) 2015 (6th ed.). *Game ranch management.* Van Schaik Publishers pp 994. ISBN 0627033466. Text will be provided to student without charge.

5. COURSE ORGANIZATION AND SCOPE

This course is being offered as a semester abroad, combining lectures and field activities. The lectures are given in the first two weeks of the semester, (Aug. 16 – Aug. 30), the field activities are during the next 10 week study abroad period (Sept 1 – Nov 17), a post-mortem of all of the work accomplished and the research performed will be conducted in the last two weeks of the semester, and assessments are done throughout the entire 12 week period. Broadly, the lectures provides background information on African landscapes and wildlife, as well as managing parks and wildlife populations in preparation for the 10 week period in Namibia. The course highlights and investigates the reasons, the extent, and possible solutions to international wildlife trade and poaching. A large part of the course involves practicing and applying technologies to monitor wildlife populations, data analyses and interpretation. The engineering component of the experience focuses on system integration; beginning with each student fabricating a standardized small-scale unmanned aerial vehicle (UAV) which is extended into a detailed engineering system design experience. While in Namibia, the students will be working 25 hours/week in the field at an animal conservancy. They will be studying the relationship between specific large mammals (springbok, giraffe, baboon, and zebra in Fall 2017) and UAV, deploying UAV and supportive communication and software systems at the local sites, and training local personnel and students from a local university how to build, fly, and repair UAV.

Specific topics are listed as per itinerary and the approximate time allocated to each major topic are provided below:

Lectures **(12 hours)**

1. African Landscapes

Distribution and ecology of deserts, savannas, grasslands and tropical rainforests.

2. African Wildlife – Species

Ecological classification of African large mammals, and discussion of common species found in the semi-arid savanna of south-western Africa

3. African Wildlife – Behavior

Behavior of common large mammals and how it influences aerial monitoring

4. Population Dynamics

The basic concepts of population dynamics are explained to illustrate the interactions of biological and environmental parameters that influence population growth

5. Counting Techniques

An overview of different sample and total counting techniques, their applications, assumptions, advantages and disadvantages

6. Park Management

The ecology and scientific management, as well as tourism, legal, economic and political issues of large protected areas are being highlighted with particular reference to the Etosha N.P.

7. International Wildlife Trade

The driving forces and extend of the illegal international wildlife trade

8. Poaching

The driving forces, extend and possible solutions of poaching on a local scale

9. Fabrication

Review of component functionality, engineering requirements, assembly, trouble-shooting, simulators, and flight (At the end of this experience the students own their own UAV, understand it from an engineering systems perspective, and know how to maintain and fly it)

Test **(2 hours)**

The test will be based on the topics covered in class.

Field Activities in Namibia **(250 hours)**

Activity Type 1: Identification of Wildlife Species behavior (60 hours)

Identification practices and behavioral monitoring of selected wildlife species.

Activity Type 2: UAV Flight Operations for the Monitoring of Wildlife Species (60 hours)

Collect data for the study of the applicability of UAV flight operations to the monitoring of wildlife species. The students design, fabricate, and fly two principle types of UAVS: A Security Watch (SW) vehicle (4-prop multirotor) and a Vertical take-off/land fixed-wing aircraft (6-8 foot wingspan), assess its performance and employ it in Activity 3. The engineering system encompasses the pipeline from vehicle, on-board multi-spectral imaging, wireless communications, to the image processing and data manipulation.

Activity Type 3: Analysis and Interpretation of Data (90 hours)

Interpret data collected in Activity 3 such as flight data, specie behavior data, specie counts, etc. and perform such analyses as statistical analyses to discern significance, construct orthomozaics of imagery, etc.

Activity Type 4: Ministry of Environment and Tourism (MET) Discussions (10 hours)
These are discussions with MET leaders about national (Namibian) wildlife conservation priorities.

Activity Type 5: 4 days of cultural field trips (30 hours)

Total contact hours: **greater than 6 credit hours**

6. READING ASSIGNMENTS

A list of example recommended publications will be provided to augment the lectures. All topics will be discussed in class and during field work.

Bothma, J. du P. & du Toit, J.D. (eds.) 2015 (6th ed.). *Game ranch management.* Van Schaik Publishers pp 994. ISBN 0627033466

Bothma, J. du P.; Peel, M.J.S., Pettit, S. & Grossman, D. 1990. Evaluating the accuracy of some commonly used game-counting methods. *S. Afr. J. Wildl. Res.* 20(1): 26-32.

Ottichilo, W.K. & Khaemba, W.M. 2001. Validation of observer and aircraft calibration for aerial surveys of animals. *Afr. J. Ecol*. 39(1): 45-50.

Peel, M.J.S. & Bothma, J.du P. 1995. Comparison of the accuracy of four methods commonly used to count impala. *S. Afr. J. Wildl. Res*. 25(2): 41-43.

Reilly, B.K. & Emslie, R.H. 1998. Power and precision of replicated helicopter surveys in mixed bushveld. *Koedoe* 41(1): 47-56.

Saltz, D., D. Ward, I. Kapofi, and J. Karamata. 2004. Population estimation and harvesting potential for game in arid Namibia. *SA J Wildl Res* 34:153-161.

Van Hensbergen, H.J., Berry, M.P.S. & Juritz, J. 1996. Helicopter-based line-transect estimates of some Southern African game populations. *S. Afr. J. Wildl. Res.* 26(3): 81-87.

Daniel J. Edwards, J. Aircraft 2010 Autonomous Soaring: The Motegue Cross-Country Challenge. Vol. 47, No. 5, Sept-Oct.

Larry M. Silverberg and Chad Bieber 2014, Central Command Architecture for High-Order Autonomous Unmanned Aerial Systems, J. Intelligent Information Systems, 6, 183-185.

Jay Gundlach 2012, Designing Unmanned Aerial Aircraft Systems, AIAA Education Series.

7. GRADING

The test will be graded and the final numerical grade will be calculated as follows:

Grade	Minimum % of total points
A+	96%
A	93%
A-	90%
B+	86%
B	83%
B-	80%
C+	76%
C	73%
C-	70%
D+	66%
D	63%
D-	60%
F	<60%

8. ATTENDANCE

Students are required to attend all lectures, field lectures, field work, discussions and other program activities prior to and during the program. The responsibility of attending these activities lies with the student. Makeup of materials missed for legitimate reasons e.g. those of a medical nature, should be arranged with the program director.

For more information on the NCSU policy on Attendance Regulations, see the web address at: http://www.ncsu.edu/policies/academic_affairs/courses_undergrad/REG02.20.3.php

9. ACADEMIC INTEGRITY

Students are expected to conform with accepted Academic Integrity standards. The NCSU Academic Integrity Statement is available on the web at: http://www.ncsu.edu/stud_affairs/osc/academic_integrity This is a semester abroad program offered through lectures, field lectures, discussions, fieldwork, participation, field excursions, and written homework assignments. Cooperating in fieldwork and taking field notes forms part of the program. Plagiarism - the use of other person's or organization's written materials without attribution or permission - is explicitly forbidden. Further information on student conduct is available at http://www.ncsu.edu/policies/student_services/student_discipline/POL11.35.1.php

10. STUDENTS WITH DISABILITIES

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with the Disability Services Office at Suite 2221, Student Health Center, Campus Box 7509, 919-515-7653. For more information on NC State's policy on working with students with disabilities, please see the Academic Accommodations for Students with Disabilities Regulation (REG02.20.01)

Note: Participants on this semester abroad program should be in good health and reasonably physically fit due to the nature of the program. Please note that local tour operators used in the host country do not provide facilities for physically impaired clients.

11. RISK ASSUMPTION

A safety, health and emergency plan is available to students prior to departure.

12. TRANSPORTATION IN NAMIBIA

Students are required to book and pay their own air tickets. All land transportation, accommodation and most meals are arranged and are included in the program costs.