ES/BL 306 - ECOSYSTEM MANAGEMENT
IES Abroad Freiburg

DESCRIPTION:
This course is about using ecological principles to manage ecosystems. Even though humans depend on ecosystem goods and services, e.g. for food, nutrient cycling and clean water, the human record of ecosystem management is mixed at best. Although mild small-scale human disturbances show ecosystems to be resistant and resilient, severe large-scale disturbances have resulted in ecosystem degradation. You will learn how to best manage and restore the biotic and abiotic factors that makeup and interact over time to form complex systems. Though ecosystems are to varying degrees intricate, dynamic and unique, they can be managed using fundamental principles. These principles have wide application in the environmental sciences and for natural resource managers. You will learn about the importance of adaptive management techniques, especially in the light of expanding human population, climate change and industrial developments which stress ecosystems.

CREDITS: 3 credits

CONTACT HOURS: 45 hours

LANGUAGE OF INSTRUCTION: English

PREREQUISITES: Introductory university level courses in natural resource management/environmental sciences, enjoy the outdoors and be moderately fit for hikes (3 miles/5km) and possible some bicycling.

ADDITIONAL COST: none

METHOD OF PRESENTATION:
• Lectures
• Discussions
• Student Presentation
• Group Work
• Field Studies

Additional material comes from Moodle. This platform is also the place to share assignments and to follow recent developments in the field.

REQUIRED WORK AND FORM OF ASSESSMENT:
- Course participation – 20 %
- Group Presentations – 20 %
- Course-Related Trip Reports – 30 %
- Final Exam – 30 %

Course Participation – 20 %
Students are expected to participate in debates with questions related to the readings and Students are required to complete all reading assignments and will be expected to demonstrate this through regularly assigned homework, pop quizzes, and/or insightful and relevant contributions to in-class discussion. All these components will count toward the class participation grade. Participation also applies to course-related trips, outings and/or special events in and around Freiburg. A rubric for participation is available in the appendix and on Moodle.

Group Presentations – 20 %

You will be assigned to one presentation (depending on enrollment, 1-3 students per presentation) with assigned literature. Each student/group is allowed approx. 10-15 minutes to present the topic and 5-10 additional minutes to facilitate a discussion with the class. The presentation must be uploaded on Moodle by midnight on the evening before it will be held.
The presentations will focus on the basics of and aim for a mutual understanding of each assigned topic. The discussions aim to provide a deeper understanding of the topic with examples.

Course-Related Trip Reports – 30 %
After each field trip, students are required to write two short (250-500 words) reflection papers that review what they have learned and critically relate it to the course content

Final Exam – 30 %
The final exam will be a comprehensive assessment of all topics. Students will have 90 minutes to complete the exam in class, which will consist of essay questions dealing with topics from the entire class. Detailed instructions on the content of the final exam will be distributed in advance

LEARNING OUTCOMES:
By the end of the course students will be able to:

- Identify and describe ecosystem components, functional roles and integration
- Explain the dynamics of ecosystem processes e.g. succession, nutrient cycling, Realize that ongoing ecosystem change requires
- adaptive management techniques
- Explain why the best management practices are usually a balance between environmental, economic and social values
- Recognize the need for a multi-disciplinary approach to ecosystem management
- Compare and contrast ecosystem management practices in Central Europe (e.g. around Freiburg) with those in the US and
- elsewhere
- Give a presentation (15 min.) based on a scientific article
- Present and defend a position in a debate
- Show that you are able to work and contribute towards team goals
- Develop as an independent thinker

Attendance Policy (see also the detailed version on Moodle ESS Academics page)
IES Abroad courses are designed to utilize the unique contribution of the instructor; the lecture/discussion format is regarded as the **primary mode of instruction**. Therefore, attendance is mandatory. Any unexcused absence will incur a penalty on your final course grade. Deductions from grades due to absences are based on contact hours (= 45 minutes). Any unexcused absence will result in a penalty on your final course grade (1 unexcused contact hour absence - 1%, 2nd unexcused contact hour absence -2%, 3rd unexcused contact hour absence – 3% and so on). Any student who misses more than 25% of a course (= more than 11 contact hours), whether the absences are excused or are unexcused, will receive an "F" as the final grade in the course.
ESS courses may have entire course blocks that take place on one day in addition to longer field trips that count for several contact hours. In this case, the actual missed contact hours are added together, and the absences are sanctioned according to the rule above.
If you are late for a planned field trip, you will generally not be able to join the trip, since the group needs to leave on time and cannot wait for one person. Punctuality is therefore essential here. If you miss a class, it is **your responsibility** to make up on everything that was covered in class. Tests/presentations missed during unexcused absences **cannot be made up.**
Arriving late for class: Punctuality is important for the planned course schedule. If you are late for class, the late time will be recorded and added up at the end of the course. You will receive a grade reduction based on the accumulated amount of missing contact hours (as outlined above; i.e., if you were late by 15 minutes on 3 days, your grade would be reduced by 1% for 1 missing contact hour).
LATE OR FAILURE SUBMISSION OF ASSIGNMENTS: Late submission of assignments or failure of submission of assignment results in the grade F of that particular assignment. This does not apply to late or non-submission due to illness with an excused absence.

Excused absence: Please call the IES Center before the start of your first class if you are ill and would like to be excused from your course, as outlined in the "Cell Phone and Attendance Policy" handed out during orientation. Student Affairs staff will decide whether your absence can be excused directly or whether a doctor's note is necessary. Absences due to religious observances and family emergencies may be excused at the discretion of the Center Director, with written approval. A petition for an excused absence due to a religious holiday needs to be submitted 2 weeks in advance. If permission is granted, the student needs to inform the Academic Dean, the Student Affairs Team and their instructors. Absences due to private travel or travel delays cannot be excused, even with advanced notice.

ACADEMIC INTEGRITY CODE:
Students are expected to abide by the IES Abroad Code of Academic Integrity. The detailed IES Abroad academic integrity code can be accessed on Moodle.
All work submitted by a student for academic credit should constitute the student's own original work. Regardless of the quality of work, plagiarism will result in a failing grade for the course and/or an academic review and possible expulsion from the program. Plagiarism may be broadly defined as "copying of materials from sources, without acknowledging having done so, claiming other's ideas as one's own without proper reference to them, buying materials such as essays/exams, and using AI-generated content without disclosure."
As AI tools continue to evolve, learning how to use them responsibly is an important emerging skill. Some of our courses allow students to explore the use of generative artificial intelligence (GAI) tools such as ChatGPT for some assignments and assessments. The instructor of each course will communicate whether GAI may be used in a course and provide specific guidelines and procedures for its appropriate use.

Updated information on your course and readings, including additional readings from journalistic articles, can be found on the Moodle platform at https://moodle.iesabroad.org/login/index.php

CONTENT:

	Content	Assignments and Readings
Week 1		
Day 1	Welcome and introduction to course resources & structure Assignments of topics and readings for short presentations	• Ellenberg, Vegetation ecology of Central Europe, pp. 33-34. • Ellenberg, Vegetation ecology of Central Europe, pp. 253-256. • Chapin et al. Principles of Terrestrial Ecosystem Ecology, pp. 3-17. • Chapin et al. Principles of Terrestrial Ecosystem Ecology, pp. 356-365.
Day 2	Lecture Introduction: Ecosystems and their management – focus grasslands	• www.the-jena-experiment.de
Day 3	Field excursion to different managed grassland ecosystems in the Dreisam Valley	• Chapin et al., Principles of Terrestrial Ecosystem Ecology, pp. 46-67.

Day 4	Lecture Restoration ecology: Wildlife habitats and their management. Case study nature reserve Feldberg (1)	• Ellenberg, From coppiced woods to…, pp.26-29. • Kraus and Krumm, Integrative approaches, pp. 22-23, pp. 44-49, pp. 79-80, pp. 84-101.
Day 5	Lecture Restoration ecology: Wildlife habitats and their management. Case study nature reserve Feldberg (2) The factor of soil water in ecosystem management.	• Chapin et al., Principles of Terrestrial Ecosystem Ecology, pp. 238-243.
Week 2		
Day 1	Field excursion Management of ecosystems and special wildlife habitats in the nature reserve Feldberg	
Day 2	Lecture Waterways and their management	
Day 3	Field excursion Waterway management, the floodplains of the river Rhine	• Ellenberg, Raised bogs, pp. 324-333.
Day 4	Lecture Bogs in the Black Forest, their ecology and their importance (EU-directive “Natura 2000”), Round table discussion	
Day 5	Lecture Bogs in the Black Forest, their ecology and their importance (EU-directive “Natura 2000”), Round table discussion	
Week 3		
Day 1	Field excursion Bogs in the Black Forest	

Day 2	Student presentations	
Day 3	Student presentations	
Day 4	Student presentations Self-study / Final preparation	
Day 5	Final exam	

COURSE-RELATED TRIPS:

- Kappler-Tal (Kappel Valley)
- Kaiserstuhl
- Dreisam-River
- Rhine-River / Rhine-Valley
- Freiburg Schlossberg
- St. Wilhelmer-Tal (St. Wilhelm Valley)
- Black Forest

REQUIRED READINGS:

- Allan, Eric et al. "A comparison of the strength of biodiversity effects across multiple functions" in Oecologia, 173/1 (2013), pp. 223-37.
- Chapin III, Stuart et al. Principles of Terrestrial Ecosystem Ecology. New York: Springer, 2002. URL: http://www.crc.uqam.ca/Publication/Principles%20of%20terrestrial%20ecosystem%20ecology.pdf
- Ellenberg, Heinz. Vegetation ecology of Central Europe. Cambridge (UK): Cambridge Univ. Press, 4th ed., 2009.
- European Environment Agency. The Impact of Invasive Species in Europe. EEA Technical report No 16/2012. Luxembourg: Publications Office of the European Union, 2012. URL: http://www.eea.europa.eu/publications/impacts-of-invasive-alien-species
- Isbell, Forest et al. "Biodiversity increases the resistance of ecosystem productivity to climate extremes" in Nature, 526/7574 (2015), pp. 574-557.
- Kraus, Daniel and Krumm, Franz. (eds). Integrative approaches as an opportunity for the conservation of forest biodiversity. Joensuu: European Forest Institute, 2013. URL: http://www.efi.int/files/attachments/publications/integrate_2013.pdf
- Lange, Markus et al. "Plant diversity increases soil microbial activity and soil carbon storage" in Nature Communication, 6/6707 (2025), pp. 1.8. URL: https://www.nature.com/articles/ncomms7707
- Lipowsky, Annett et al. "Plasticity of functional traits of forb species in response to biodiversity" in Perspectives in Plant Ecology, Evolution and Systematics, 17/1 (2015), pp. 66-77.
- Thakur, Madhav P. et al. "Plant diversity drives soil microbial biomass carbon in grasslands irrespective of global environmental change factors" in Global Change Biology, 21/11 (2015), pp. 4076-4085.

REQUIRED RESSOURCES:

- The Jena Experiment: URL: www.the-jena-experiment.de

RECOMMENDED READINGS:

- Valentine, Peter (Ed.). Ecological Restoration for Protected Areas: Principles, Guidelines. Ottawa: IUCN, 2012.

Appendix:

Rubric for course participation:

A	**Excellent participation** The student's contributions reflect an active reading of the assigned bibliography. Skillfully synthesizes the main ideas of the readings and raises questions about the applications and implications of the material. Demonstrates, through questions and comments, that they have been capable of relating the main ideas in the readings to the other information discussed in the course and with their own life experience. The student makes informed judgments about the readings and other ideas discussed in class, providing evidence and reasons. They respectfully state their reactions about other classmates' opinions and can contribute to the inquiry spiral with other questions. The student gets fully involved in the completion of the class activities.
B	**Very good participation** The student's contributions show that the assigned materials are usually read. Most of the time, the main ideas are identified, even though sometimes it seems that applications and implications of the information read were not properly reflected upon. The student can construct over others' contributions, but sometimes seems to interrupt the shared construction to go over tangents. They are respectful of others' ideas. Regularly involved in the activities but occasionally loses concentration or energy.
C	**Regular participation** The participant evidences a regular reading of the bibliography but in a superficial way. They try to construct over others' ideas, but commonly provide comments that indicate a lack of preparation about the material. Frequently, contributions are shallow or unarticulated with the discussion in hand.
F	**Insufficient participation** Consistently, the participant reads in a shallow way or does not read at all. Does not participate in an informed way and shows lack of interest in constructing over others' ideas.