科目ナンバリング	U-LAS15 10014 LE58						
授業科目名<英訳>	Science on Water, Soil and Ecosystems-E2 Science on Water, Soil and Ecosystems-E2			担当者所属職名・氏名	農学研究科　特定助教 SHARMA, Vikas		
群	自然科学科目群			分野(分類)	地球科学(基礎)	使用言語	英語
旧群	B群	単位数	2単位	週コマ数	1コマ	授業形態	講義（対面授業科目）
開講年度・開講期	2026・後期	曜時限	金2	配当学年	主として1・2回生	対象学生	全学向

[授業の概要・目的]

Ecosystem science is a vast subject that comprises the study of biotic and abiotic components in an ecosystem and the interactions among them. This course provides an introduction to the science of two major physical components of ecosystems: water and soil. Understanding the earth's structure, the movement and distribution of water and the mechanics of soils can help answer issues related to sustenance of life like the availability of fresh water and food sources, natural and anthropogenic disturbances leading to geo-disasters etc. Study of such interactions between the physical and living environment will help develop tools for the assessment, management and mitigation of environmental impacts.

Based on a scientific perspective, the course will also provide a foundation for the quantification of hydrological and geotechnical data. The contents of this course will aid students interested in a career in diverse fields like environmental sustainability, climate modeling, geology, hydrology, ecology, agriculture, forestry and many more.

[到達目標]

Upon successful completion of the course, students will be able
(1) to understand and quantify different aspects related to the circulation of water in the environment, (2) to understand the basic mechanics of soil and explain the mechanism of commonly occurring geo-hazards, e.g. landslides, (3) to integrate these concepts along with those of nutrient movement in the ecosystem to develop and manage tools for environmental sustainability.

[授業計画と内容]

The following topics and sub-topics will be covered during this course.

1. Introduction
2. Moisture in the atmosphere
Vapor pressure, relative humidity, dew point, adiabatic processes, cloud formation
3. Atmospheric circulation
Wind flow, global air circulation, regional wind and weather systems
4. Runoff and streamflow
Stream behavior, meanders, sediment load, hydrograph
5. Internal structure of the earth
Rocks and minerals, plate tectonics
6. Weathering and Erosion
Weathering, erosion, properties of sand, clay and silt
7. Groundwater hydraulics
Soil as a three-phase material, hydraulic gradient, Darcy's Law
8. Fundamentals of soil mechanics
Total and effective stress in soils
9. Mechanism of soil failure leading to geohazards

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Upward seepage flow, critical hydraulic gradient, internal erosion in dams
10. Biogeochemical cycles
11. Ecological energetics and biodiversity
Trophic webs, ecological pyramids, trophic cascades and biodiversity
12. Environmental sustainability - methods, tools, management (I)
13. Environmental sustainability - methods, tools, management (II)
14. Reserved week for revision
15. Examination
16. Feedback

[履修要件]

The course is self contained. Students from all disciplines are welcome and no prior knowledge of concepts from natural sciences courses (Mathematics, Physics, Chemistry, Biology, Geology) at high school is necessary. Essential knowledge for the course will be provided as needed in class.

[成績評価の方法・観点]

Students' evaluation will be based on
(1) applying knowledge through answering mini-quizzes (30%);
(2) developing scientific communication skills through writing summary reports of book chapters, research papers and oral presentation (15%);
(3) writing a short essay of a case study using critical & problem-solving skills (15%);
(4) final examination (40%)

[教科書]

未定
Some of the topics covered in the course maybe found in the references section mentioned below.

[参考書等]

（参考書）
Davie T 『Fundamentals of hydrology 』（Routledge）ISBN:0-203-93366-4（Not all chapters are covered in the course (ebook available from library)）
Weathers KC, Strayer DL, Likens GE 『Fundamentals of ecosystem science』（Elsevier）ISBN: 978-0-12-088774-3（Not all chapters are covered in the course (available in library)）
Brian J. Skinner, Barbara Murck 『The blue planet: an introduction to earth system science』（Wiley, 2011）ISBN:9781118139721（Not all chapters are covered in the course (available in library)）
Additional reading materials may be introduced in some lectures.

[授業外学修（予習・復習）等]

Students are highly encouraged to develop data collection skills by visiting various sources of study materials such as libraries, online sources, reference books, journals, or articles. The collected materials can enhance students' understanding of the introduced topics and highlight other applications of the concepts to interdisciplinary topics outside the purview of this course.

[その他（オフィスアワー等）]

Prior arrangement is highly necessary, preferably email notice is recommended before any consultation on the subject.

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[主要授業科目（学部・学科名）]