放射性廃棄物処分工学特論



本講義は、放射性廃棄物の区分ごとの発生源や特性、その特性に応じた中間処理技術、処分概念、処分施設の安全評価について学ぶことを目的とする。本講義では、ビデオ教材による予習を課し、授業において活発な議論を促す。放射性核種の長期的な挙動を検討するためには、移行メカニズム、地下水理、熱、力学的作用、腐食、放射線分解などを含む化学的、地球化学的なメカニズムを学ぶ必要がある。本講義では、放射性廃棄物管理に関する全体像について学習した後、最新の研究アプローチについての議論を通して個々の分野及びそれらの関連性に関する理解を目指す。

開講期間

2026-09-16 - 2026-09-18

コース

先端研究コース

対象

学生・社会人等

レベル

大学院（修士・博士）

授業形態

対面とオンライン選択可

担当教員



渡邊 直子
教授
工学研究院，北海道大学



小崎 完
教授
工学研究院，北海道大学



Tomo SUZUKI-MURESAN
Associate Professor
Department of Subatech, Institut Mines Telecom Atlantique - IMTA



Chuan-Pin LEE
Associate Researcher
Center for Energy and Environmental Research, National Tsing Hua University, Taiwan

詳細

科目 ID

G031

時間割番号（北大生用）

101531

授業タイプ

講義

開講部局

工学院

開講場所

札幌キャンパス, オンライン

開講教室

工学部 A 棟 A3-71

マップ

https://www.eng.hokudai.ac.jp/english/location/facilities.php

単位（学生のみ）

1 単位

受講料

学生　　：14,800 円

社会人等：52,800 円

言語

英語

定員

20

受講条件

授業の目的

The objectives of the course are to

- Understand the sources and characteristics of different classes of nuclear wastes
- Review current technologies for conditioning and treatment of radioactive waste for storage and disposal.
- Understand chemical and geochemical mechanisms that govern the long-term strategies and procedures of nuclear waste disposal.
- Learn waste disposal systems and concepts for different classes of wastes in Japan, Taiwan, and in France.

到達目標

By the end of this course students will be able to:

- distinguish the differences between low-level, intermediate-level, and high-level radioactive waste

* explain sources and characteristics

* describe how they are managed and disposed of.

- outline the concept of the multi-barrier system or the in-depth-defense
- explain the roles and mechanisms of each barrier.
- integrate various constraints applied on wastes in repository: thermal, hydraulics, mechanical, corrosion, radiation.

授業計画

The concept of nuclear waste management is introduced from waste generation, treatment,

storage, to disposal, with a focus on intermediate and high level wastes. Japanese, Taiwanese, and French nuclear waste management concepts and strategies will be presented, and students will discuss the similarities and differences. Students will also learn about the roles of underground research laboratories (URL).
The classes will cover;
1. Spent fuel reprocessing in open and closed nuclear fuel cycle
2. Classification of nuclear wastes (inventory of nuclear waste from different sources)
3. Low level radioactive waste management (surface and sub-surface repository, designs and concepts, types of waste, etc.)
4. High (and intermediate) level radioactive waste management (geological disposal, designs and concepts, multi-barrier system, types of wastes, underground research laboratories, etc.)
5. Migration of radionuclides in the geosphere

タイムテーブル

日付		8:45 - 10:15	10:30 - 12:00	13:00 - 14:30	14:45 - 16:15	16:30 - 18:00	18:15 - 19:45
09/16	水			✓	✓	✓	
09/17	木			✓	✓	✓	
09/18	金			✓	✓		

希望者は授業時間外にフィールドワークに参加可
(フィールドワーク実施期間：9/13-9/15　申し込み方法：メールによる事前申込制　費用：宿泊費別途負担)

準備学習（予習・復習）

Students may be assigned to watch video lectures prior to classes and prepare responses to questions/discussion topics. Preparations and reviews for each lecture using textbooks, video lectures, and/or handouts are necessary as suggested in the engineering department guideline.

成績評価の基準と方法

Active participation in class discussion 50%
Project/presentation 50%

Questions/discussion topics will be presented prior to each class. Students' understanding will be assessed based on their responses and contribution to the discussions.

関連する科目

教科書

講義指定図書

研究室ウェブサイト

https://nucl-mater.hokkaido.university/

持ち物

PC

備考

- Please bring your laptop or tablet.
- There will be a field trip to Horonobe Underground Research Laboratory from Sept 15 to 17 prior to the course. Please contact the instructor if interested in participating in the field trip. Accommodation will be charged (approximately 10,000 yen per night). Transportation between Hokkaido University and the Laboratory will be provided.