UNAM
Universidad Nacional
Autónoma de México

Nuclear fuel management: a practical approach Specialization

Nuclear fuel management: a practical approach. The aim of this course is to introduce students to the wonderful world of the nuclear fuel management, taking advantage of resources available through the Web, based on professional information from organizations like the International Atomic Energy Agency and the World Nuclear Association, among others. What is expected, at the end of it, is that the student can understand the different steps of the fuel cycle, is capable to find updated information and knowledge about the subject of study and has the skills to perform basic calculations of all stages of the nuclear fuel cycle.

Instructor: Juan Luis François Lacouture

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3 course series
Get in-depth knowledge of a subject

4.9 ⭐
(24 reviews)

Intermediate level
Some related experience required

4 weeks to complete
at 10 hours a week

Flexible schedule
Learn at your own pace

What you'll learn

 The specialized program is divided into three MOOCs:

Front-end of the nuclear fuel cycle, Back-end of the nuclear fuel cycle, and In-core fuel management.

The student will navigate the Integrated Nuclear Fuel Cycle Information System, of the International Atomic Energy Agency, to learn about the nuclear fuel cycle facilities around the world, uranium deposits, including their classification, technical information, detailed geological information on regions, districts, and deposits; and the thorium database, which includes details of thorium deposits and resources in the world. In addition, the student will develop skills to estimate the requirements for materials and services associated with the stages of the nuclear fuel cycle, to perform basic calculations for nuclear fuel and reactor core design, as well as to calculate the levelized nuclear fuel cycle cost.

Applied Learning Project

Based on case studies, one for each of the three MOOCs, assessment tests and practical assignments, the student will discover and understand the different stages of the nuclear fuel cycle, as well as the fundamentals of in-core fuel management.

After completing MOOC 1, the student will be able to calculate the masses of materials associated with each stage of the front-end.

After completing MOOC 2, the student will be able to calculate the composition, the decay heat, and the radiotoxicity of the spent fuel.

After completing MOOC 3, the student will be able to estimate the fuel batch reload fraction and its enrichment for an equilibrium cycle, to perform basic calculations for nuclear fuel and reactor core design, and to calculate the levelized cost of the open (once-through) nuclear fuel cycle.

Read less

Skills you'll gain

Simulation and Simulation Software | Environmental Engineering | Manufacturing Processes | Process Engineering | Design Specifications | Mathematical Modeling

Environment and Resource Management | Natural Resource Management | Energy and Utilities | Safety Standards | Manufacturing and Production | Waste Minimization

Engineering Calculations | Materials science | Chemistry | Chemical Engineering | Radiation Protection | Cost Estimation | Engineering Design Process

Production Process | View less skills

Details to know

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Specialization - 3 course series

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Out of core nuclear fuel management: front end

Course 1 • 10 hours

Course details ⌃

What you'll learn

You will be will be able to recognize and describe the basic principles of the different steps of the front end of the fuel cycle, will be capable to find updated information and knowledge about the subject of study and will have the skills to perform basic calculations of the front end of the nuclear fuel cycle.

Skills you'll gain

Process Engineering   Natural Resource Management   Engineering Calculations   Environment and Resource Management   Manufacturing Processes

Energy and Utilities   Manufacturing and Production   Materials science   Chemical Engineering   Production Process   Chemistry

Out of core nuclear fuel management: back end

Course 2 • 5 hours

Course details ⌃

What you'll learn

After completing this MOOC, the student will be able to recognize and describe the basic principles of the different steps of the back end of the fuel cycle, will be capable to find updated information and knowledge about the subject of study and will have the skills to perform basic calculations of the back end of the nuclear fuel cycle.

Read more

Skills you'll gain

Radiation Protection   Materials science   Chemical Engineering   Safety Standards   Chemistry   Energy and Utilities   Waste Minimization

Engineering Calculations   Environmental Engineering

In core nuclear fuel management

Course 3 • 7 hours

Course details ⌃

What you'll learn

Upon completion of this MOOC, students will gain comprehensive knowledge in nuclear fuel management and reactor core design. They will learn to list and understand the basic parameters involved in in-core fuel management, including the estimation of fuel batch reload fraction and enrichment for equilibrium cycles using the linear reactivity method. The course will also cover the core aspects of reactor core design, the stages of fuel reloads design, and the principles of nuclear fuel assembly design, including the role of burnable poisons. Students will delve into the various aspects of fuel assembly design, both radial and axial, and learn to identify and solve optimization problems in these areas using metaheuristic techniques. Additionally, they will explore core loading pattern design, control rod pattern design, and the associated requirements and knowledge rules.

Another significant aspect of the course is the application of metaheuristic optimization approaches to tackle complex design problems in nuclear fuel management. Students will learn to interpret and apply these techniques to optimize radial fuel lattice design, axial fuel assembly design, and core loading pattern design.

Read less

Skills you'll gain

Cost Estimation   Engineering Calculations   Energy and Utilities   Mathematical Modeling   Process Engineering   Safety Standards

Simulation and Simulation Software   Engineering Design Process   Design Specifications

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Instructor

Juan Luis François Lacouture

Universidad Nacional Autónoma de México

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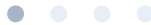
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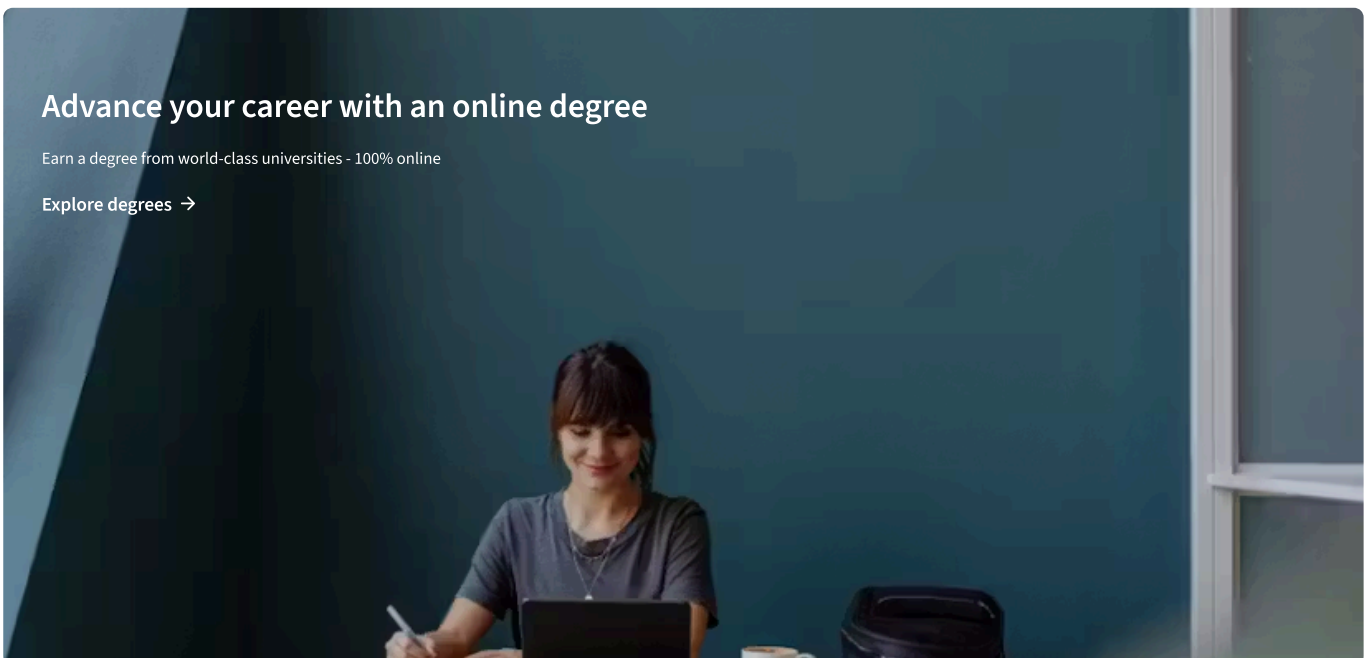
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Frequently asked questions

⌃ **How long does it take to complete the Specialization?**

12-14 weeks

⌃ **What background knowledge is necessary?**

Basic knowledge of calculus and numerical skills

⌃ **Do I need to take the courses in a specific order?**

It is recommended to take the courses in order from 1 to 3

Show all 9 frequently asked questions ⌄

More questions

ⓘ

Visit the learner help center

Financial aid available, learn more

Skills

Artificial Intelligence (AI)

Cybersecurity

Data Analytics

Digital Marketing

English Speaking

Generative AI (GenAI)

Certificates & Programs

Google Cybersecurity Certificate

Google Data Analytics Certificate

Google IT Support Certificate

Google Project Management Certificate

Google UX Design Certificate

IBM Data Analyst Certificate

Industries & Careers

Business

Computer Science

Data Science

Education & Teaching

Engineering

Finance

Career Resources

Career Aptitude Test

Examples of Strengths and Weaknesses for Job Interviews

High-Income Skills to Learn

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Python

IBM Data Science Certificate

Machine Learning Certificate

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