

PHYS-450

Radiation biology, protection and applications

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Cursus	Sem.	Type
Ing.-phys	MA1, MA3	Opt.
Nuclear engineering	MA1	Obl.
Physicien	MA1, MA3	Opt.

Language of teaching	English
Credits	4
Session	Winter
Semester	Fall
Exam	Written
Workload	120h
Weeks	14
Hours	3 weekly
Courses	2 weekly
Exercises	1 weekly
Number of positions	

Summary

This is an introductory course in radiation physics that aims at providing students with a foundation in radiation protection and with information about the main applications of radioactive sources/substances in the industry. The course includes presentations, lecture notes and problem sets.

Content

- Radioactivity and interactions of ionising radiation in matter
- Health effects of ionising radiation
- Dosimetry and population exposure
- Space radiation dosimetry
- Radioisotope production using reactors and accelerators
- Industrial applications: radiation gauges, tracer techniques, radioisotope batteries, radiation imaging, radiography, etc.
- Applications in research: dating by nuclear methods, applications in environmental and life sciences, etc.

Learning Outcomes

By the end of the course, the student must be able to:

- Explain the origin ionising radiation and give a few examples of the origin of neutron radiation.
- Explain interactions of ionising radiations in matter.
- Explain biological/health effects of the ionising radiations
- Explain the principles of dosimetry
- Explain population's exposure and cite exposure levels
- Explain the principles of radiation protection, cite the dose limits
- Explain the concept of risk
- Describe the protection means for external and internal exposure
- Explain radiation shielding and give examples
- Explain the use of radiation in industrial and research applications.
- Explain exposure to the general population and cite exposure levels
- Explain the origin of ionising radiation
- Explain interactions of ionising radiation in matter.

- Explain biological/health effects of the ionising radiation
- Design appropriate radiation shielding for a given source or application

Assessment methods

Written, Multiple Choice Question exam

Resources

Bibliography

Handouts will be distributed

- James E. Martin, "Physics for Radiation Protection", Wiley-VCH (2nd edition, 2006)
- G.C. Lowenthal, P.L. Airey, "Practical Applications of Radioactivity and Nuclear Reactions", Cambridge University Press (2001)
- K.H. Lieser, "Nuclear and Radiochemistry", Wiley-VCH (2nd edition, 2001)

Ressources en bibliothèque

- [Physics for Radiation Protection / Martin](#)
- [Nuclear and Radiochemistry / Lieser](#)
- [Practical Applications of Radioactivity and Nuclear Reactions / Lowenthal](#)

Moodle Link

- <https://go.epfl.ch/PHYS-450>