



# Master Optique, Image, Vision, Multimédia Radiation and its Effects on MicroElectronics and Photonics Technologies (RADMEP)

**Diplôme** Master

**Domaine d'étude** Sciences, Technologies, Santé

**Parcours** Radiation and its Effects on MicroElectronics and Photonics Technologies (RADMEP)

## Objectifs

Le Erasmus Mundus Joint Master Degree RADMEP offre un programme multidisciplinaire et innovant couvrant les interactions entre les radiations et les technologies microélectroniques et photoniques, deux technologies clés pour l'avenir de l'Europe.

L'objectif de RADMEP est de former les étudiants à ces technologies avancées, en fournissant une méthodologie et en introduisant des applications pratiques pour leur mise en œuvre dans une variété d'environnements naturels ou artificiels riches en radiations. Le premier semestre se déroulera à l'Université de Jyväskylä (JYU, Finlande) et le second semestre à la KU Leuven (KUL, Belgique). Pour le troisième semestre, un choix entre deux spécialisations différentes est proposé aux étudiants du master RADMEP :

- > Spécialisation en effets des radiations sur les technologies photoniques (Université Jean Monnet, Saint-Etienne, France).
- > Spécialisation en effets des radiations sur la microélectronique et les technologies électroniques avancées (Université de Montpellier, France).

Au cours du quatrième semestre, les étudiants devront effectuer leur stage de 6 mois dans une industrie, une agence ou un centre de recherche, par exemple dans le vaste réseau RADMEP qui compte plus de 35 partenaires associés.

### English

*The RADMEP Erasmus Mundus Joint Master Degree provides a multidisciplinary and innovative programme covering the interactions between Radiations and MicroElectronics and Photonics, two Key Enabling Technologies for the future of Europe.*

*RADMEP's objective is to educate students in those advanced technologies, providing methodology and introducing practical applications for their implementation in a variety of natural or man-made radiation-rich environments. The first semester will take place at the University of Jyväskylä (JYU, Finland) and the second semester at KU Leuven (KUL, Belgium). For the third semester, a choice between two different specialisations will be offered to the RADMEP master students:*

- > *Specialisation in Radiation Effects on Photonics technologies (Jean Monnet University, Saint-Etienne, France)*
- > *Specialisation in Radiation Effects on Microelectronics and Advanced Electronic Technologies (University of Montpellier, France).*

*During the fourth semester, students will undertake a 6-months master thesis either in an industry, an agency or in a research centre, for example from the large RADMEP network of more than 35 associate partners.*

## Pour qui ?

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### Conditions d'admission

Les candidats doivent être titulaires d'une Licence (ou tout autre diplôme de premier cycle reconnu au niveau national et équivalent à 180 ECTS), de préférence dans les domaines de la microélectronique, de la photonique ou de la physique. Bien que cette condition doive nécessairement être remplie au moment de l'inscription, le consortium RADMEP accepte les candidatures d'étudiants en dernière année d'études supérieures (L3). Les candidats doivent posséder une solide formation académique dans les domaines généraux de la physique, de la photonique, de la physique des semi-conducteurs et de la microélectronique.

*Applicants must hold a Bachelor of Science (or any nationally recognized first cycle degree equivalent to 180 ECTS), preferably in the fields of microelectronics, photonics and physics. While this condition must necessarily be fulfilled at the time of enrolment, the RADMEP consortium accepts applications from students in the last year of their higher education degree. Applicants must possess a solid academic background in the general fields of physics, photonics, semi-conductor physics and microelectronics.*

## Et après ?

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### Poursuites d'études

Le parcours RADMEP est conçu pour répondre aux besoins et aux défis des industries. Il ouvre également sur des opportunités de carrières internationales et stimulantes, puisque le besoin de diplômés experts en photonique et microélectronique pour les environnements radiatifs et experts en recherche fondamentale et appliquée est croissant sur le marché international du travail. Les étudiants ont l'opportunité de poursuivre leurs études en doctorat.

*RADMEP opens up for international and challenging career opportunities. The demand for postgraduates in photonics and microelectronics in radiated environments as well as basic and applied research is high on the international job market. Postgraduates will be qualified to work in any company related to aerospace or nuclear activities with a special focus on photonics and microelectronics. This master programme also qualifies the postgraduate for PhD studies.*

# Programme

YEAR 1

Induction week held at University Jean Monnet (UJM) from August 30th to September 5th 2021

**SEMESTER 7 - University of Jyväskylä (JYU) - From September 6th to December 31st 2021**

Minimum of **30 ECTS** from the following courses

Major units - 22 ECTS	Credits	Syllabus	Instructor
Applied Semiconductor Physics	5	<a href="#">Syllabus</a>	Dr. Kai Arstila
Electron, Photon and Ion Beam Methods in Materials Science	5	<a href="#">Syllabus</a>	Prof. Timo Sajavaara
Measuring Techniques	5	<a href="#">Syllabus</a>	Dr. Panu Ruotsalainen
Numerical Methods in Physics	4	<a href="#">Syllabus</a>	Dr. Kimmo Niskanen
Workshop #1: Basics of Radiation Environments and Challenges related to radiation effects	3		Dr. Arto Javanainen Dr. Kimmo Niskanen

Optional Units - (min. 8 ECTS)	Credits	Syllabus	Instructor
Electronics part A	4	<a href="#">Syllabus</a>	Dr. Arto Javanainen
Electronics part B	4	<a href="#">Syllabus</a>	Dr. Arto Javanainen
Electronics Workshop	2	<a href="#">Syllabus</a>	Risto Kronholm
Nuclear Physics	8	<a href="#">Syllabus</a>	Prof. Iain Moore

Fission and its Applications	5	Syllabus	Dr. Heikki Penttilä
Systematic Information Seeking	1	Syllabus	Johanna Kinnunen
Creating Careers	1	Syllabus	Anu Ojala

Extra units	Credits	Syllabus	Instructor
Survival Finnish	2	Syllabus	Tuija Lehtonen
Each-one-teach-one	3	Syllabus	Tuija Lehtonen
E-Learning Module: Academic Reading/ Supplementary Module	2	Syllabus	Lilja Salmi
E-Learning Module: Academic Vocabulary	2	Syllabus	Lilja Salmi
E-Learning Module: Grammar for Writing	2	Syllabus	Hanna Bauer

### SEMESTER 8 - Katholieke Universiteit Leuven (KUL) – From February XX 2022 to June XX 2022

Minimum of **30 ECTS** from the following courses

Major units - 22 credits	Credits	Syllabus	Instructor
Analog CMOS design	3	Syllabus	Prof. Paul LEROUX
Embedded systems	5	Syllabus	Prof. Jeffrey PRINZIE
Ethics	1	Syllabus	
Digital chip design	4	Syllabus	Prof. Jeffrey PRINZIE
Analog and mixed signal chip design and image sensors	6	Syllabus	Prof. Paul LEROUX and Dr. Guy MEYNANTS
Workshop #2: Basics of Photonics Technologies and	3		Dr. Guy MEYNANTS (Guest lecturers: Prof. Heidi

Their use in Harsh Environments			OTTEVAERE (VUB Brussels), Prof. Wim BOGAERTS (UGent)
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Optional units (min. 8 credits)	Credits	Syllabus	Instructor
Machine Learning	4	Syllabus	Prof. Peter KARSMAKERS
Big Data	4	Syllabus	Prof. Peter KARSMAKERS / Prof. Mariya ISHTEVA
Radiation to electronics project	4	Syllabus	Prof. Valentijn DE SMEDT
RF and PLL Design	4	Syllabus	Prof. Paul LEROUX
Digital Signal Processing	4	Syllabus	Prof. Peter KARSMAKERS

Extra credits	Credits	Syllabus	Instructor
Survival Dutch – 40h of lectures including also some excursions	3		
2-month internships	10	Syllabus	

**YEAR 2 - 2 tracks available**

**SEMESTER 9 – From September XX 2022 to January XX 2023**

**TRACK 1: Photonics Specialization - Courses at University Jean Monnet (UJM)**

Minimum of **30 ECTS** from the following courses

Major units	Credits	Syllabus	Instructor
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<b>22 credits</b>			
Laser Physics	4	Syllabus	Prof. Youcef Ouerdane / Prof. Sylvain Girard
Optical Engineering	2	Syllabus	Arnaud Meyer
Advanced Photonic and Optoelectronic Technologies	5	Syllabus	Ass. Prof. Adriana Morana, Prof. Sylvain Girard, Prof. Emmanuel Marin and external RADMEP guest lecturers
Radiation Effects on Photonic and Optoelectronic Technologies	5	Syllabus	Ass. Prof. Adriana Morana, Prof. Sylvain Girard, Prof. Emmanuel Marin and external RADMEP partners
Photonics Labs	3	Syllabus	Prof. Emmanuel Marin, Ass. Prof. Adriana Morana
Workshop #3: @CERN Simulation tools for Radiation-Matter Interaction and radiation effects on materials, components and systems	3	Syllabus	

<b>Optional Units - min. 8 credits</b>	<b>Credits</b>	<b>Syllabus</b>	<b>Instructor</b>
Digital Innovation and Entrepreneurship	5	Syllabus	Ass. Prof. Stéphane Foliard
Scientific Methodology and Project Management	3	Syllabus	Nathalie Destouches
Analytical Instrumentation for Detection	3	Syllabus	Ass. Pr. A. Morana, Dr. R. Stoian

Radiation to photonics project	2	Syllabus	Ass. Prof. A. Morana, Prof. S. Girard
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Extra units	Credits	Syllabus	Instructor
French language and culture	5		

## TRACK 2: MicroElectronics Specialization - Courses at University of Montpellier (UM)

Minimum of **30 ECTS** from the following courses

Major units - 20 credits	Credits	Syllabus	Instructor
Radiation and Reliability of Electronics for Transport, Aerospace and Nuclear	3	Syllabus	
Test and reliability of Integrated Circuits and Systems	5	Syllabus	
Industrial Tools and methodologies for devices qualification for space missions	3	Syllabus	
Embedded electronics and wireless communication	6	Syllabus	
Workshop #3: @CERN Simulation tools for Radiation-Matter Interaction and radiation effects	3	Syllabus	

Optional units - min.	Credits	Syllabus	Instructor
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10 credits			
Digital Innovation and Entrepreneurship	5	Syllabus	Prof. Stéphane Foliard
Acoustic sensors with associated systems	5	Syllabus	
Optical and thermal sensors with associated systems	5	Syllabus	
System on Chip and Embedded systems	5	Syllabus	

Extra credits	Credits	Syllabus	Instructor
French language and culture	5	Syllabus	

## SEMESTER 10 – From February/March 2023 to July/August 2023

Master's Thesis

- > Can be done in a company or research center.
- > Minor (optional) units are available in a research center: Scientific or Language and Culture units.

## Coût de l'inscription

4500€

### Détail coût d'inscription

4500€ / year for European Students

9000€ / year for non-European students

Scholarships available with the EU, the RADMEP consortium and the Manutech-SLEIGHT Graduate School

Self-funded students will be able to pay participation costs in three instalments.

## Contact



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## Contact(s) scolarité

### Master RADMEP

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