

Advanced Materials for Innovation and Sustainability

Curriculum 2018-2019, 2019-2020

Professor in charge:	Professor Robin Ras
Academic coordinator:	Docent Janne Halme
Degree:	Master of Science (Technology) from Aalto University (120 ECTS) Master of Science or similar degree from partner university
Major:	Advanced Materials for Innovation and Sustainability (SCI3083)
Minor:	Innovation and Entrepreneurship (SCI3091)

University partners

- Grenoble Institut Polytechnique (GINP), France (Coordinator) <http://www.grenoble-inp.fr/>
- Technische Universität Darmstadt, Germany <https://www.tu-darmstadt.de/>
- Aalto University, Espoo, Finland <http://www.aalto.fi/en/>
- University of Bordeaux, France <http://www.u-bordeaux.com/>
- University of Liege, Belgium https://www.ulg.ac.be/cms/c_5000/en/home

Description

Advanced Materials for Innovation and Sustainability (AMIS) major will tackle the theme substitution of critical or toxic materials in products and for optimised performance, but will also cover material chain optimisation for end-of-life products and product and services design for the circular economy — all of which are central themes of the EIT RawMaterials. The primary focus of the adaptation is on metal and mineral raw materials; bio-base and polymer materials are covered in view of their substitution potential and other materials in the context of multi-material product recycling. In addition, AMIS includes a solid package of courses and project work in innovation and entrepreneurship.

The mobility of the students is an integrated part of the programme and during the two-year programme, the students will study at two of the consortium partner universities. The first year studies are taken either in Aalto, Grenoble INP or TU Darmstadt (two semester: autumn + spring). For the second year, the students move to one of these exit universities: Aalto, Grenoble INP, TU Darmstadt, Université de Liege or Université de Bordeaux 1. Upon completion of the programme, students will receive a double degree. The language of instruction of AMIS programme is English.

The AMIS programme will boost young professionals to become change agents with an entrepreneurship mindset able to safeguard the sustainability of EIT RawMaterials throughout the industrial and research landscape.

Learning outcomes at Aalto University

First year learning outcomes

In the first year, students build a body of skills and knowledge that puts them on fast track to becoming specialists in entrepreneurship and materials science. They will know the fundamental principles and concepts of businesses and entrepreneurship, and have an up-to-date picture of nanophysics, nanomaterials and functional materials.

They will apply this knowledge in hand-on exercises and group work. Through tailored methodology and English language courses, the student will get introduced into project management, group dynamics, entrepreneurship and oral communications, in a setting that mimics a professional environment. Such integrated training of soft and hard skills is needed for the rest of the Master's studies. The year is completed by summer camp, jointly with all the other AMIS students, and internship in the field.

Second year learning outcomes

Building on the foundations laid in the 1st year, the students learn advanced topics in areas of their choice and continue to improve their research and hands-on skills. They will have in-depth understanding of some specialist topics in nanophysics, nanomaterials and functional materials. Through tailored methodology and English language courses, the student will get introduced into project management, group dynamics, entrepreneurship and oral communications, in a setting that mimics a professional environment. The students are able to apply their knowledge and present technical information in written and spoken form.

Degree structure at Aalto University

- 55 ECTS Advanced Materials for Innovation and Sustainability Major
- 35 ECTS Innovation and Entrepreneurship Minor
- 30 ECTS Master's Thesis

Language courses (AMIS)

According to the degree regulations at Aalto University, students must take at least 3 ECTS of foreign language studies for the degree. The students have the option to choose between an English course, fulfilling both oral and written requirements (o,w) or at least 3 ECTS of Finnish courses. We recommend the English course [LC-1310](#) Academic Communication for everyone. Taking the Finnish course(s) as part of the degree requires an application for exemption from the foreign language course requirement. Please contact your study affairs secretary for more information.

Curriculum - First year at Aalto

Autumn semester

Code	Period	Name	ECTS	Comments
<i>Compulsory courses</i>				
LC-1310	I-II	Academic Communication for MSc Students (o,w) (for example)	3	Compulsory degree requirement, both oral and written requirements. Elective studies.
25E50000	I	Venture Ideation	6	Innovation and Entrepreneurship Minor

PHYS-E0424	I-II	Nanophysics	5	Major
PHYS-E0425	I-II	Innovation and entrepreneurial approach to materials and technology	8	Innovation and Entrepreneurship Minor
PHYS-E0426	I-II	Inno-Project I (autumn part)	3	Innovation and Entrepreneurship Minor
PHYS-E0417	I-II	Experimental methods in physics	5	Major

Total 30 ECTS

Spring semester

Code	Period	Name	ECTS	Comment
<i>Compulsory courses</i>				
PHYS-E0525	III-IV	Microscopy of Nanomaterials	5	Major
PHYS-E0428		Inno-Mission Internship	9	Innovation and Entrepreneurship Minor
PHYS-E0426	III-IV	Inno-Project I (spring part)	3	Innovation and Entrepreneurship Minor
PHYS-E0429		Summer Camp 1: Advanced Functional Materials: From Science to Technology and from Innovation to Entrepreneurship	3	Innovation and Entrepreneurship Minor
<i>Select two optional courses (10 ECTS):</i>				
PHYS-E0423	III-IV	Surface physics	5	Major. Every other year. Lectured spring 2020.
PHYS-E0422	III-IV	Soft condensed matter physics	5	Major
PHYS-E0526	IV-V	Microscopy of nanomaterials, laboratory course	5	Major
PHYS-E0421	IV-V	Solid-state physics	5	Major
CHEM-E5115	IV-V	Microfabrication	5	Major
PHYS-E6570	III-IV	Solar energy engineering	5	Major. Every other year. Lectured spring 2020.
CHEM-E5145	III-IV	Materials for Renewable Energy P	5	Major
PHYS-E0412	III-V	Computational physics	5	Major
PHYS-E6571	III-IV	Fuel Cells and Hydrogen Technology	5	Major. Every other year. Lectured autumn 2019.

Total 30 ECTS

Total of the whole year: 60 ECTS

Curriculum - Second year at Aalto

Autumn semester

Code	Period Name		ECTS	Comments
<i>Compulsory courses</i>				
LC-1310	I-II	Academic Communication for MSc Students (o,w) (for example)	3	Compulsory degree requirement, both oral and written requirements, 3 ECTS
25E50000	I	Venture Ideation	6	Innovation and Entrepreneurship Minor
PHYS-E0424	I-II	Nanophysics	5	Major
PHYS-E0425	I-II	Innovation and entrepreneurial approach to materials and technology	8	Innovation and Entrepreneurship Minor
PHYS-E0427	I-II	Inno-project II	3	Innovation and Entrepreneurship Minor
<i>Select one optional course (5 ECTS):</i>				
PHYS-E0417	I-II	Experimental methods in physics	5	Major
PHYS-E6572	I-II	Advanced wind power technology	5	Major. Every other year. Lectured autumn 2018
PHYS-E0541		Special Course in Physics: Gas phase synthesis of nanomaterials for selected applications	4	Major. Lectured autumn 2019.
		AND		
PHYS-E0544		Individual Studies in Physics	1	Major
CHEM-E5140	I-II	Material Characterization, laboratory course	5	Major
Total 30 ECTS				

Spring semester 2019

Code	Period	Name	ECTS	Comments
PHYS.thes		Master's Thesis	30	

Total of the whole year: 60 ECTS