

Strengthening Education in Modern Optics at UU

Action 1 (internal):

streamline education flow

Basic optics “Optik och vågor”



“Optics & photonics”



“Accelerator physics”



“Synchrotron radiation”



Advanced courses & seminars by Photon Center



Master thesis on optics



Notes: no new courses or extra funding.

Action 2 (internal):

teaching via physics apps with a focus on optics + laser lab.

Build with students and for students apps illustrating optical phenomena.

Set up a *learning laser lab* bridging the gap between a basic lab on optics and a real, no-touch, research lab like Helios.

Required investments:

- physics apps ~ 70 kSEK
- laser lab ~ 100 kSEK

Action 3 (external):

Erasmus Mundus Master Program on Modern Optics

- 120 ECTS (24 months)
- 4 consecutive student intakes
- Up to 88 students in total
- 3-4 MEuro (mostly to support students)
- Good visibility for the University
- Inflow of excellent students for master work

A great deal of effort is needed to prepare an application ~ 1 000 hours.¹

Vision of Erasmus Mundus Program (EMJMD)

Title: Moderns (X-ray) Optics and Lasers

Aim: educate a new wave of specialists able to efficiently apply methods and instruments of modern optics for conducting forefront research in academia or high-tech industry.

Specializations: (i) X-ray optics and applications, (ii) ultrafast optics and lasers, (iii) physics of photon and charged particle beams.

Learning outcomes:

Career prospects: R&D units in industry (give examples) and research career in Academia
















Joint (dual) degree: All enrolled students are registered either at Uppsala University or Hamburg University. The students will receive a degree from the university of registration *and* a university where master work is performed. (we need to see how to make this working.)

Motivation for the program

- Optics is a quickly growing sector of industry
 - 300,000 highly skilled jobs in EU
 - annual turnover in excess of €60 billion
 - 6.2% growth in recent years, EU average*
- Growing demand for young professionals*
- Optics is the field most fruitful in terms of discoveries and Nobel prizes
- Optical measurements are crucial in many fields of physics, chemistry and engineering
- Many industrial standards depend on optical measurements
- Next generation X-ray lasers rely on the symbiosis of accelerator physics and laser physics

* *“Europe’s age of light!” Strategic Roadmap 2021–2027*

Possible model of Erasmus Mundus Program

<p>1st semester: basic courses I</p>	 UPPSALA UNIVERSITET	<ul style="list-style-type: none"> • Optics and Photonics (10 credits) • Accelerator Physics (10) • Scientific programming in Python with applications in physics (5) • Synchrotron radiation, 10 credits 		
<p>2nd semester: basic courses II</p>	 Universität Hamburg	<ul style="list-style-type: none"> • Modern Molecular physics (8) • Methods of modern X-ray spectroscopy (8) • X-ray physics (3) • Modern Ultrafast Optics I + II (5+5) 		
<p>3rd semester: specialization and advanced courses (choose only one university)</p>	<p>Physics of photon and charged particle beams</p>		<p>X-ray optics and applications</p>	<p>Ultrafast optics and lasers</p>
	 UPPSALA UNIVERSITET  POHANG UNIVERSITY OF SCIENCE AND TECHNOLOGY 1986  MANCHESTER 1824 The University of Manchester Courses: ???	 Universität Hamburg  UPPSALA UNIVERSITET Courses: ???	 Universität Hamburg  MANCHESTER 1824 The University of Manchester  UNIVERSITY OF TRIESTE	
<p>4th semester: master work (30 credits)</p>	 UPPSALA UNIVERSITET  Universität Hamburg  MANCHESTER 1824 The University of Manchester  POHANG UNIVERSITY OF SCIENCE AND TECHNOLOGY 1986  UNIVERSITY OF TRIESTE			

Towards a successful grant proposal

Some background info:

The guide for evaluators is 99-page long. One can expect that the evaluators are trained to check all possible details to find weak points.

Successful proposal requires:

- a broad knowledge of Erasmus program
- a broad knowledge of national and European education systems
- a broad knowledge of legal frameworks
- integration of EMJMD into the degree catalogues of the HEIs partners
- national/international needs analysis
- internationalisation of European higher education
- implementation of intercultural awareness and transferable skills
- ...

84 questions to be addressed

A more realistic time estimate for the amount of work needed for preparing the proposal is 1 year full time.

Steps to a successful grant proposal

- Involve people from the Physics Didactics Division at our Department
- Involve people from the Department of Education
- Seek support from the Erasmus Program Office in UU
- Apply for funding to prepare a grant proposal for EMJMD
- Meet with the course responsible and directors of studies at partner's universities
- Organize a joint meeting of all partners in Uppsala to align curriculums of all partner's universities to ensure a seamless Erasmus program.