



# PHOTONICS

MASTER OF SCIENCE

# ENGINEERING

Joint programme



**GHENT  
UNIVERSITY**



VRIJE  
UNIVERSITEIT  
BRUSSEL

# WHAT DO WE OFFER ?



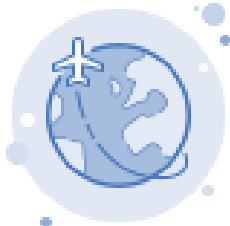
## **FUNDAMENTAL & SPECIALIZED PHOTONICS COURSES**

A large number of fundamental and specialized photonics courses are available.



## **MASTER THESIS PROJECTS & RESEARCH**

Do cutting-edge research in one of our research labs. Many topics are multidisciplinary in nature and combine photonics with electronics, physics, biomedical engineering or data science.



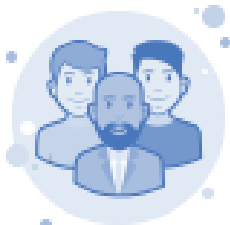
## **INTERNATIONAL EXPERIENCE**

Acquire the indispensable international experience which is required in today's society and the current job market.



## **DIGITAL FIRST MASTER YEAR**

Choose whether you join the program on campus or online during your first year.



## **WORLDWIDE NETWORK**

Meet new people and build a network all around the world. Joining one of the student chapters can bring you in touch with local & international students as well as other exchange students.



## **VIBRANT CITY LIFE**

Enjoy the city of Ghent or Brussels, a student city with plenty of leisure possibilities, cinemas, museums, exhibitions, bars & clubs, restaurants, sports facilities, ...

# WHY CHOOSE PHOTONICS ?

## PHOTONICS



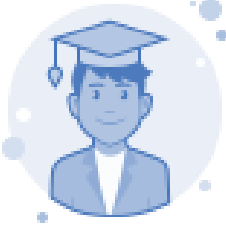
Photonics plays an essential role in a variety of new and innovative technologies such as green energy, biotech, industry 4.0, ICT, multimedia & healthcare.

## EDUCATION BY WORLD-CLASS RESEARCHERS



The education is given by professors who not only excel in teaching but also excel in research on a European and even worldwide scale. A fair number of professors have received a prestigious European Research Council Grant.

## MIXED STUDENT POPULATION



The photonics classes are followed by a diverse mix of students: local Belgian students, students from elsewhere in Europe and students from outside Europe. Besides photonics students, other engineering students can attend the photonics courses as well.



Annual intake of about 28 students,

of which 80% is  and 20% 

About 30% has  nationality,

20% comes from another  country

and 50% are from  outside EU.

## ACCREDITATION



Our photonics courses and curriculum were audited by CTI (Commission des Titres d'Ingénieur), as part of the EUR-ACE® quality audit carried out by ENAEE (European Network for Accreditation of Engineering Education).

# ABOUT GENT



**“Smack in the middle of Brussels, Bruges and Antwerp, Ghent distils their greatest attributes into one engaging and enchanting city.”**



# ABOUT UGENT

Ghent University, founded in 1817, is one of the top 100 universities worldwide and located in the Dutch language area, with more than 44,000 students and 15,000 staff members.

Our 11 faculties are divided into 86 departments and offer high-quality and research-supported training courses in most scientific disciplines.

Ghent University	Position
Academic Ranking of World Universities (Shanghai Ranking) 2020	<b>66</b>
National Taiwan University Ranking 2020	<b>77</b>
U.S. News Best Global Universities Ranking 2021	<b>85</b>
Times Higher Education (THE) World Universities Ranking 2021	<b>96</b>
QS World University Ranking 2021	<b>141</b>
Europe's most innovative universities 2019	<b>48</b>

Watch



## FACULTY OF ENGINEERING AND ARCHITECTURE °1835

- 12 departments
- About 50 research teams
- About 130 FTE Professors
- Over 100 Doctoral Degrees per year
- Over 700 International publications per year
- Total student population (BSc + MSc): 4900

Watch



# ABOUT THE PROGRAM

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Ghent University (UGent) and Vrije Universiteit Brussel (VUB) jointly offer a two-year (120 ECTS) **Master of Science in Photonics Engineering**. It leads to a joint UGent-VUB Master of Science degree.

The program provides an in-depth education in photonics, with a focus on both the fundamental science and the engineering of light-based phenomena and systems.






Photonics graduates move into PhD positions in top level research groups all around the world or into industry.

The program:

- teaches all the **core photonics courses**
- offers **advanced photonics courses in multiple fields of specialization**
- allows students to broaden their degree to with a secondary engineering specialization
  - in electrical engineering & information technology
  - in applied physics & material science
  - in life sciences & biomedical engineering
  - in business engineering & entrepreneurship
- has a strengthened focus on:
  - **Photonic skills**  
(measurement, engineering and research skills)
  - **Employability**  
(internship, entrepreneurship, photonics in industry)
- includes a **master thesis project** in a research lab



# 5 DIFFERENT MOBILITY TRACKS

	Year 1		Year 2, sem 1	Year 2, sem 2
	On Campus	(international) internship	On Campus	On Campus
	On Campus		On Campus	EU Mobility track
	On Campus		EU Mobility track	On Campus
	On Campus		EU Mobility track	EU Mobility track
	Online		On Campus	On Campus

## HYBRID TEACHING

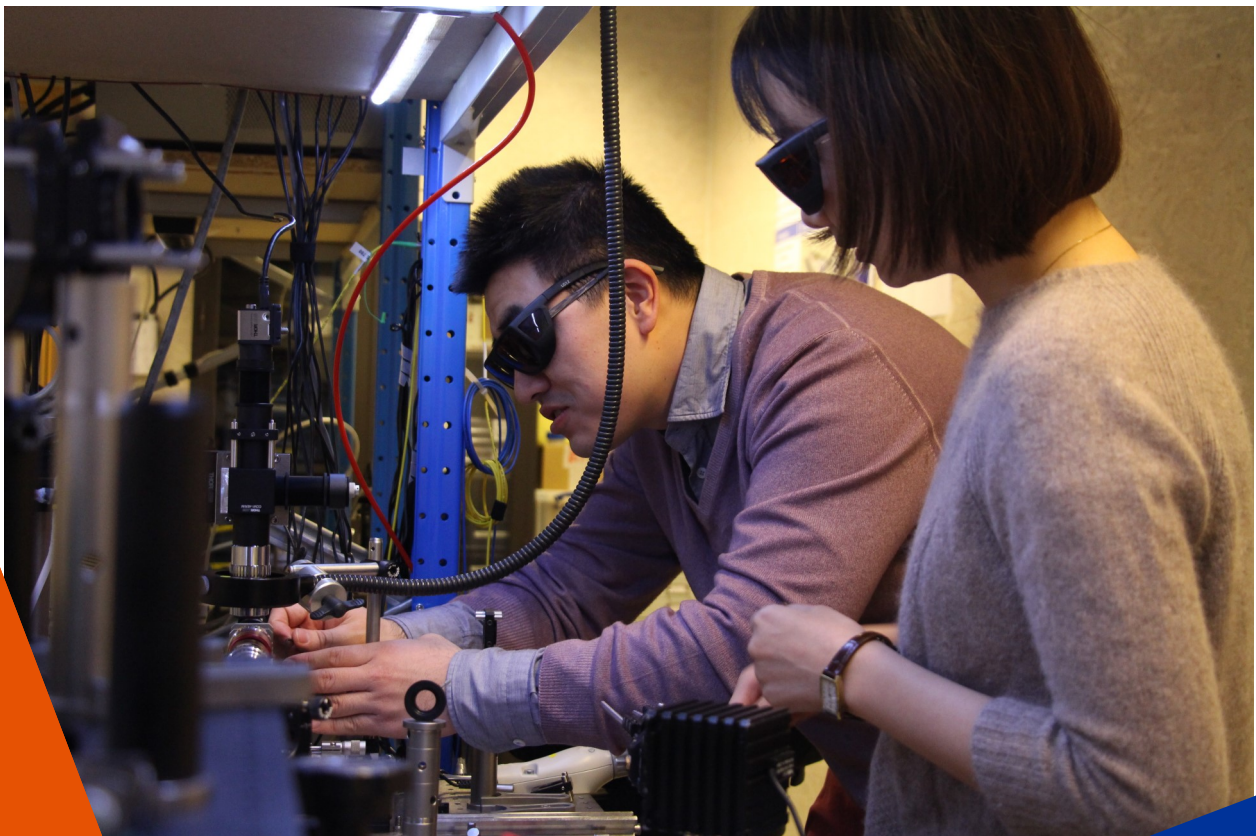
All first year mandatory courses and most electives courses can be taken either on-campus or fully online or in a hybrid mode.

As such, students can opt to take the full first year in an online mode; however for the second year on-campus presence is required.

But also the on-campus students can opt to attend certain courses, or just some classes or some days (or hours) per week online or vice versa, some professors may decide to give some classes in an online mode (eg when they are abroad on a conference).

In practice, they will mostly mean that the professor is teaching in the lecture room for some students on-campus while other are following the class 'live' remote through teleclassing platform (and being able to interact with the on-campus students and professor).

Furthermore, all lectures are recorded to be viewed afterwards. So, if you miss a class, you can follow it asynchronously.



## BALANCED PROGRAM

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## MULTIDISCIPLINARY PROGRAM

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Photonics plays a vital role in numerous application fields. As such, we want to prepare our students to combine an in-depth knowledge of photonics with one or more application areas (electronics, physics, biomedical engineering, data science or even architecture, arts, archeology).

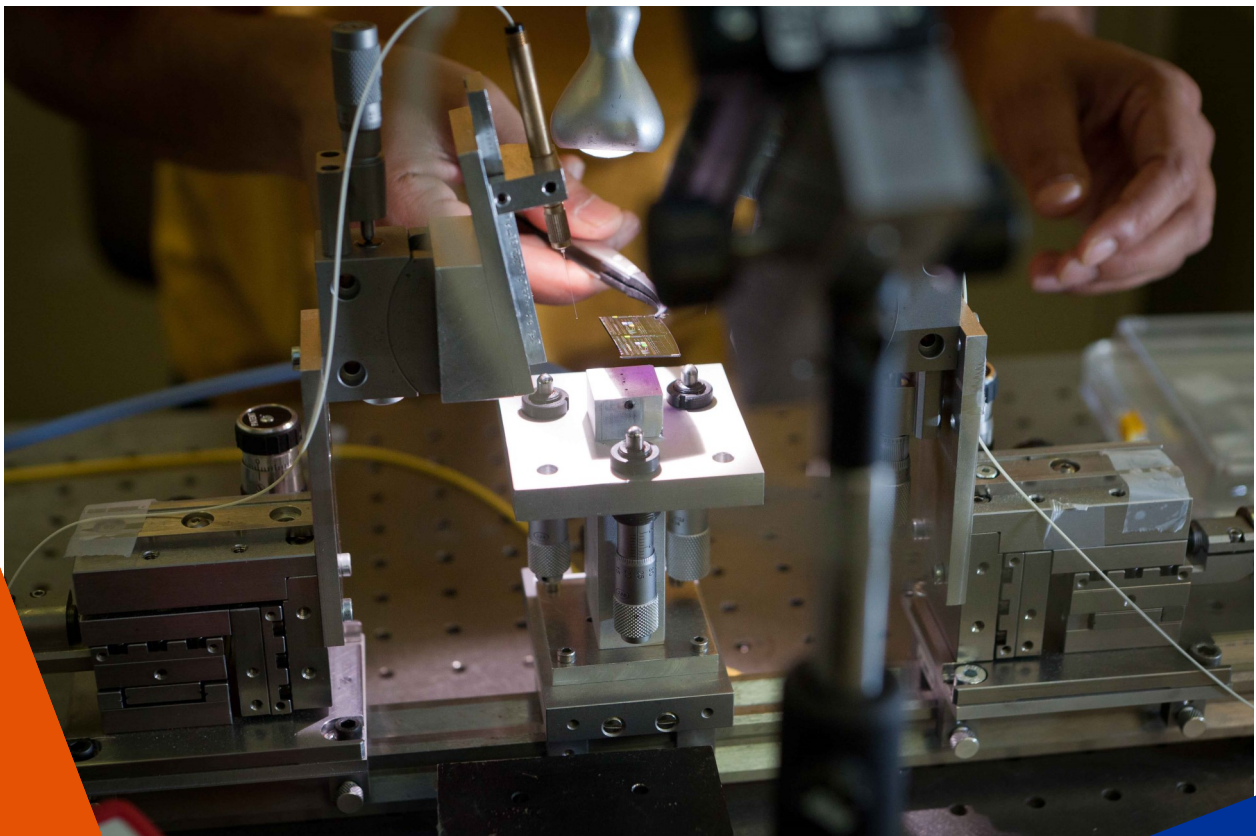
We therefore broaden the background and the degree of the graduates, with a **secondary specialization** in 1 out of 4 Engineering Clusters

Electronics &  
Information Technology

Physics &  
Materials

Life Sciences

Business Engineering &  
Entrepreneurship



# PROGRAM DETAILS

## Mandatory courses

ECTS		Location
Year 1, Semester 1		
Optical Materials	6	UGent online
Microphotonics	6	
Lasers	4	
Mathematics in Photonics	4	
Introduction to Entrepreneurship	3	
Year 1, Semester 2		
Laboratories in Photonics Research <i>(for Year 1 on-campus students only)</i>	6	UGent + VUB
Optical Communication Systems	6	UGent Online
Sensors and Microsystem Electronics	6	
Physics of Semiconductor Technologies and Devices	4	
Innovation in Photonics	3	
Year 2, Semester 1		
Laboratories in Photonics <i>(for Year 1 online students only)</i>	4	UGent + VUB
Recent Trends in Photonics	4	UGent or VUB
Year 2, Semester 2		
Master Thesis Project	30	UGent or VUB
Electives	38 to 40	
Total		120

# PROGRAM DETAILS

## Elective courses

	ECTS	Location
Basic Photonics		
<b>Photonics</b>	4	UGent or VUB or online
<i>The Photonics course is only intended for students without Bachelor's Degree from Ghent University and must be taken up in Y1.</i>		
Advanced Photonics	16	UGent or VUB or online
<i>See list of Photonics Elective courses. Students with a UGent Bachelor Degree, must take up 4 additional ECTS credits.</i>		
Engineering Cluster	18	UGent or VUB
<b>Electronics &amp; Information Technology</b>		
<b>Physics &amp; Materials</b>		
<b>Life Sciences</b>		
<b>Business Engineering &amp; Entrepreneurship</b>		
<b>Total</b>	<b>38</b>	

## Typical weekly calendar example at UGent

### Lecture schedule Year 1 – Semester 1

Monday	Tuesday	Wednesday	Thursday	Friday
8:30-11:30 Microphotonics	10:00-11:30 Lasers	<i>Reserved for electives</i>	08:30-11:30 Mathematics in Photonics	10:00-13:00 Optical Materials Lab
	11:30-13:00 Lasers Lab		11:30-13:00 Optical Materials	
13:00-16:00 Microphotonics Lab	13:00-14:30 Optical Materials			
	15:30-18:00 Introduction to entrepreneurship			

### Lecture schedule Year 1 – Semester 2

Monday	Tuesday	Wednesday	Thursday	Friday
	Laboratories in Photonics Research	<i>Reserved for electives</i>		
10:00-13:00 Optical Communication Systems			10:00-13:00 Physics of Semiconductor Technologies and Devices	10:00-11:30 Optical Communication Systems Lab
				13:00-16:00 Sensors and Microsystem Electronics Lab
16:00-19:00 Innovation in Photonics			14:30-17:30 Sensors and Microsystem Electronics	
Lectures		Labs		Entrepreneurship

# PROGRAM DETAILS **Advanced Photonics**

In total students can spend between 16 & 20 ECTS credits from the list below.

	ECTS	Location
<b>Optical Spectroscopy of Materials</b>	4	UGent
<b>Display Technology</b>	4	UGent <sup>1</sup>
<b>Non-linear Optics</b>	4	UGent <sup>1</sup>
<b>High Speed Photonic Components</b>	4	UGent <sup>1</sup>
<b>Biophotonics</b>	4	UGent <sup>1</sup>
<b>Photonic Integrated Circuits</b>	4	UGent <sup>1</sup>
<b>Optical Sensors</b>	4	VUB <sup>1</sup>
<b>Design of Refractive and Diffractive Optical Systems</b>	4	VUB
<b>Optical Design with Ray-tracing Software: Laboratory</b>	4	VUB
<b>Technological Processes for Photonics and Electronics: Laboratory</b>	4	UGent
<b>Photovoltaic Energy Conversion</b>	4	UGent <sup>1</sup>
<b>Quantum Optics</b>	4	UGent <sup>1</sup>
<b>Micro- and Nanophotonic Semiconductor Devices</b>	4	UGent <sup>1</sup>
<b>Research in Photonics</b>	6	UGent
<b>Short Internship in Photonics</b>	5	Research institute or company
<b>Long Internship in Photonics</b>	10	Research institute or company

1. can be taken online

# FAST TRACK

Students who already obtained a Master degree or a 4-/5-year Bachelor degree with a dedicated focus on Photonics, can apply for a fast track of this master program whereby the master can be completed in 1 academic year (60 ECTS).

Fast Track program	ECTS	Location
Mandatory courses		
<b>Recent Trends in Photonics</b>	4	UGent or VUB
Advanced Photonics	16	UGent or VUB
Engineering Cluster	10	UGent or VUB
Electronics & Information Technology		
Physics & Materials		
Life Sciences		
Business Engineering & Entrepreneurship		
<b>Master Thesis</b>	<b>30</b>	UGent or VUB
<b>Total</b>	<b>60</b>	



# COLLABORATION MODELS **3 + 2**

With the Master of Science in Photonics Engineering, the following 3+2 programs are in place (see list below) whereby student can enroll after their 3rd year of their Bachelor into the Photonics program and are awarded:

- Bachelor degree from home university (after year 1)
- Master of Science degree in Photonics from UGent-VUB (after year 2)



大连理工大学

DALIAN UNIVERSITY OF TECHNOLOGY



HUAZHONG UNIVERSITY  
OF SCIENCE & TECHNOLOGY



南开大学

Nankai University



北京交通大学

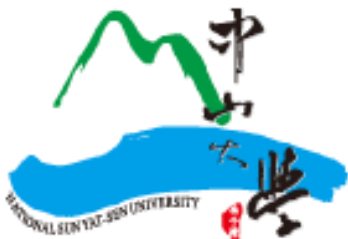
BEIJING JIAOTONG UNIVERSITY

# COLLABORATION MODELS $1 + 1$

With our double degree programs students study 1 year (either first or second) in their home university and study 1 year (either second or first) at UGent or VUB. In the end students will receive two Master of Science degrees.

- Master of Science degree in Photonics from their home university
- Master of Science degree in Photonics from UGent-VUB

We currently have double degree agreements with National Sun Yat-sen University (ROC Taiwan) and are finalizing agreements with Zewail City of Science and Technology (Egypt) and National Taiwan University (ROC Taiwan). Our own student (local or international) can also join in these double degree programmes.



國立中山大學  
National Sun Yat-sen University



## Other collaborations



Collaborations in place for joint PhD programs, student exchanges on Master or PhD level.

# INTERNATIONAL EXPERIENCE

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The programme strongly recommends & supports students to complete part of their programme abroad. This can be a **short research visit of a couple of weeks** in the context of a master thesis or **a longer visit (up to one year)** with one of our renowned partner institutes.

Students can apply for a Erasmus+ **scholarship** in order to get a monthly stipend to compensate (part of) their costs.

We collaborate with prestigious **high-level** European partner universities.

The program **supports** the students **in an active manner** by selecting, together with the students, the appropriate courses at the partner universities or to define, together with professors or research labs from the partner universities, a suitable master thesis project .

## Internationalisation Possibilities

**Courses** (30 ECTS)  
at a partner university

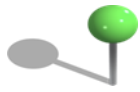
**Master thesis** (30 ECTS) project  
at a partner university

**Courses** (30 ECTS) and **master thesis** (30 ECTS) project  
at a partner university

**Short/Long (International) internship** (5/10 ECTS)  
in a company or research lab

**Master thesis** project  
in collaboration with a partner university  
1-2 visits (6 ECTS) to the partner's research labs

# Partner Universities



St Andrews (GBR)

DTU (DNK)

ICFO / UPC (ESP)

UPV (ESP)

Vilnius (LIT)

ITMO (RUS)

KIT (GER)

ECM / Aix-Marseille

(FRA)

ETH Zurich (CHE)

TUBerlin (GER)

Institute d'Optique (FRA)

KTH (SWE)

Polimi (ITA)

Univ. Rouen (FRA)



# EMPLOYABILITY

Within the program, there is a strong focus on both employability and on entrepreneurship / entrepreneurial skills.

- **Courses**

Introduction to Entrepreneurship

Innovation in Photonics

- **Internships opportunities**

(Industrial) Internship in Photonics - 5 weeks

International (Research / Industrial) Internship - 10 to 12 weeks

- **Company visits**

- **Lectures** by people from industry



**EU MSc. in Photonics**  
@eu\_photonics



Caro (UGent Photonics student on exchange at DTU) participates with her team at the mai Bangkok Business Challenge



**EU MSc. in Photonics**  
@eu\_photonics



Nice work from EMSP-alumnus Francesco (et al.) @infinityPV @eu\_photonics #EMSPalumni@work! Good luck!



**infinityPV** @infinityPV  
Nov 9th: @infinityPV at @kickstarter  
HeLi-on hell-on.com, the flexible organic solar cell #OPV charger.



**EU MSc. in Photonics**  
@eu\_photonics



Congrats to EMSP alumnus Chiao-Wei Hsu with third place! #swbru



**StartupWeekend BRU** @swbru  
Shield 3rd place

## IRDiagnostics

Technical University of Denmark, Denmark



“ For the industry,  
photonics engineers can  
make the quantum leap.

Shaping the photonic  
industrial revolution starts  
with the right education. “



- Jan Watté -

group leader R&D Optics  
Commscope

“ I enjoyed my internship  
within AMS/CMOSIS very  
much. A great experience  
to learn how companies  
work and how vital precise  
measurements are in real-  
life. “



- Cheyenne Goeminne -

student  
European MSc. in Photonics



# CAREER OPPORTUNITIES

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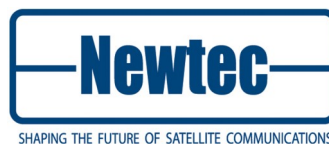
- **45 % industry**  
R&D  
project management  
consultancy  
sales/business support

- **55 % PhD**

\* based on over 300 graduates since 2006-2007



# PHOTONICS COMPANIES IN BELGIUM




ON Semiconductor



# PHOTONICS RESEARCH @UGENT

**PHOTONICS**  
**RESEARCH GROUP**

Liquid Crystals  
  
and Photonics

**IDLab**  
INTERNET & DATA LAB

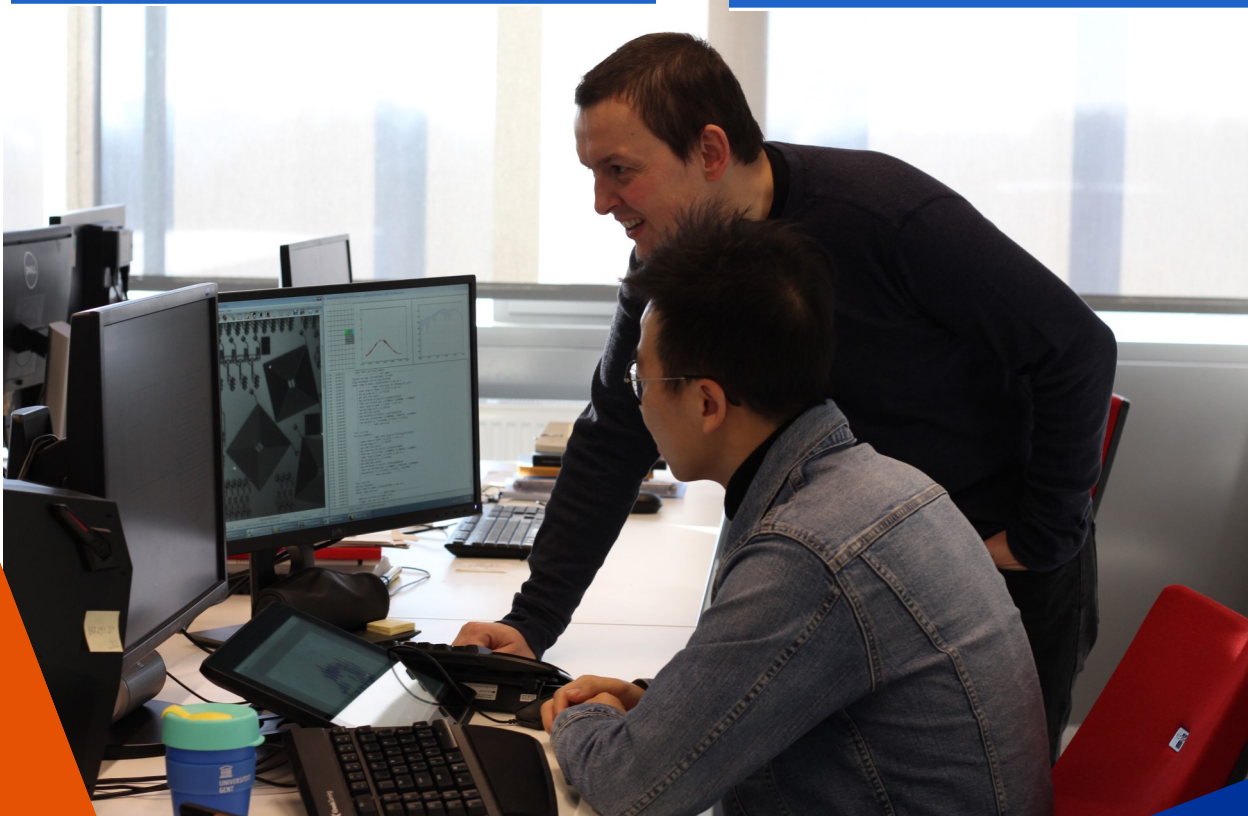
**Cmst**

- 4 research groups, 20+ professors, 150+ researchers

Two university-wide research centers:

NB-PHOTONICS - CENTER FOR NANO- AND BIOPHOTONICS

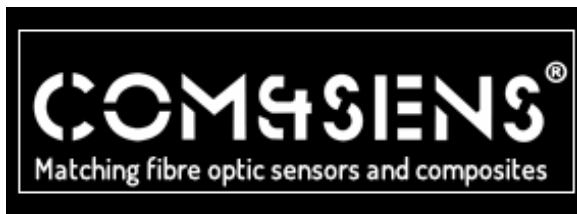
NAMIFAB - EXPERTISE CENTRE FOR NANO- AND MICROFABRICATION



# UGENT PHOTONICS SPIN-OFFS

  
trinean

  
Caliopa  
silicon photonics

  
COM4SIENS®  
Matching fibre optic sensors and composites

  
LUCEDA  
P H O T O N I C S

indigo

 SENTEA

 ANTELOPE DX

  
MORROW

  
BiFAST  
By far the fastest

  
AZALEA  
VISION

 QustomDot

# OUR ALUMNI WORK @

## PHD



CUDOS, Sydney



TU Wien



UGent

VUB

KUL



DTU



Paris-Sud



TU Berlin

Uni Koln

Max Planck



NUI Tyndall

NUI Galway



University of Naples



Twente

TU Eindhoven



Trondheim



UPM



KTH

Uppsala



EPFL



St Andrews University

ORC Southampton

Heriot-Watt



Stanford

Yale

Columbia University

MIT

## INDUSTRY



Barco

imec

Huawei

Melexis

Xenomatrix

Televic

Proximus

Nokia

Philips

Luceda Photonics

Larian Studios

Trinean

Accenture

Deloitte

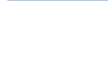
Ericsson



Alcatel-Lucent



ASML



TNO

Phoenix Software



Osram

Garmin



Acacia

Infinera

# ALUMNI TESTIMONIALS



## Didi Shi (China)

- Bachelor at Dalian University of Technology
- Master in photonics: 2018-2020
- R&D Engineering at **Huawei**: 2020 - ...

Watch



## Alvaro Casas Bedoya (Colombia)

- Master in photonics : 2007 - 2009  
Courses + Thesis at University of St Andrews (UK)
- PhD at **Sidney University** (Australia): 2009 - 2013
- Research Associate at **CUDOS** (Australia): 2013 - ...  
Cleanroom manager, OSA Ambassador

*Surprisingly for me, the researchers, who are writing the science right now, were my professors. This is surely one of the best options for any photonics aspirant...*



## Maria Anagnosti (Greece)

- Master in photonics : 2009 - 2011  
Internship at Xio Photonics (Netherlands)
- Internship at NTT (Japan)
- R&D at **Alcatel-Lucent** / Nokia (France): 2012 - 2015
- Hardware Engineer at **Infinera** (USA): 2016 - ...

*The MSc. in Photonics programme was a life-time opportunity for me to study and learn about High Technology Photonic sciences, experience different cultures and meet a lot of interesting people. The courses provided prepare the students for both an academic career and also an industrial position.*

# STUDENT LIFE



- **Photonics Society Ghent**

- SPIE Ghent chapter
- SID Lowlands Branch
- OSA Ghent chapter



- **SPIE/OSA B-Phot Chapter**

**SPIE.**

- **IEEE Photonics Benelux Student Chapter**

Both chapters/societies consist of researchers, PhD-students and master students. The master students actively participate in both societies.

Each semester a **Light Night** is organized by one of the chapters whereby a guest lecturer is invited (from industry or academics) or a workshop is organized or the students engage in a quiz or game-night.

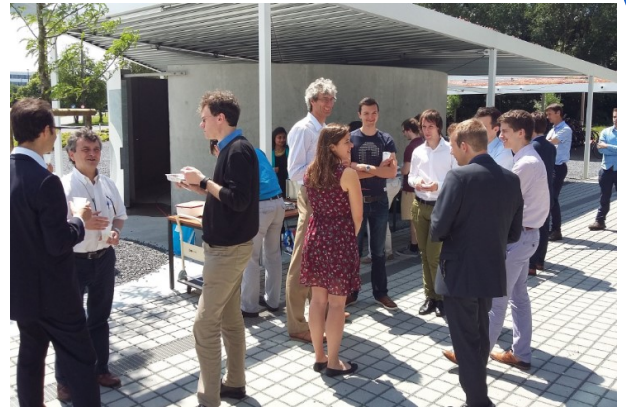


*Company visit to ASML  
(the Netherlands)*

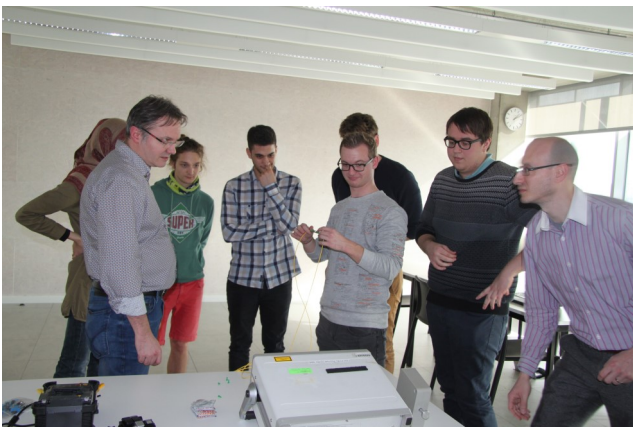
*Student chapter activity:  
Laser Game: Khet 2.0*



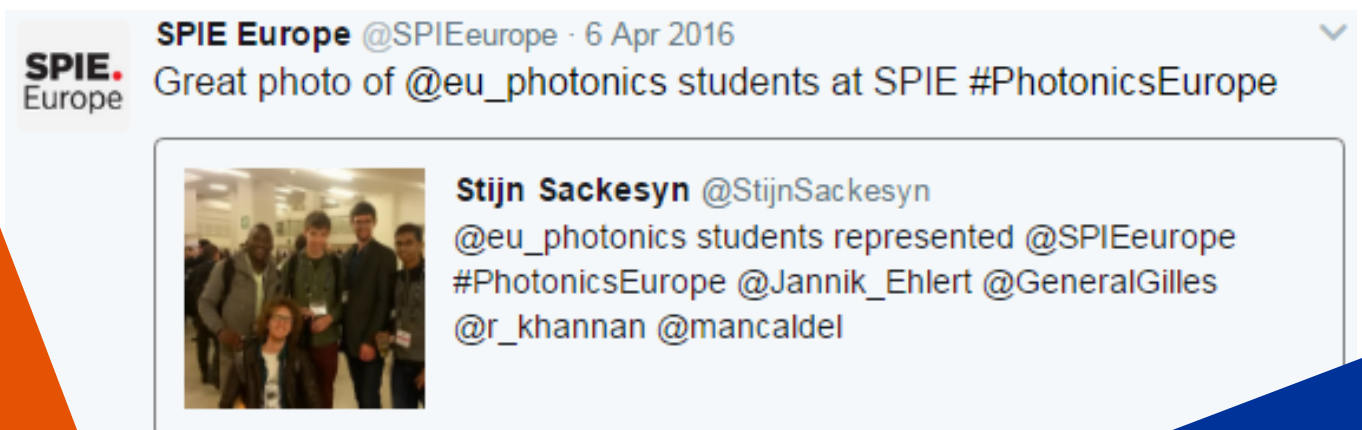
During the two-day **Photonics Summer Symposium** the final year students defend their master thesis dissertation and some international speakers are invited to give a talk.



During the annual **Photonics Event** companies come to present themselves to the students and researchers. Last year imec, Luceda Photonics, Commscope, Huawei and Trinean organized a hands-on workshop whereby students could interact with the companies.



Students have the opportunity to attend **conferences** or participate in **summer schools** or **workshops**. In 2016 students attended SPIE Photonics Europe (conference), the IEEE Photonics Benelux Annual Symposium and the ePIXfab Silicon Photonics Summer School.



# FEES & SCHOLARSHIPS

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## TUITION FEES

Students in the Master of Science in Photonics Engineering pay a reduced\* annual tuition fee of **980 Euro**.

\* The regular fee for other Master programs at the Faculty of Engineering is 5744 Euro.

## GRANTS & SCHOLARSHIPS

**UGent Photonics Excellence Grant** consists of:

- Study Grants of **5000 Euro** per academic year

**VUB Scholarships** consists of :

- Full tuition fee waiver + Insurance
- **Annual amount of 10000 Euro**

**B-PHOT VUB Excellence Scholarships** consists of:

- Study Grants of **5000 Euro** per academic year

## OTHER SCHOLARSHIP OPPORTUNITIES

- UGent Master Grants
- UGent Top-Up Grants
- Flemish Master Mind Scholarships
- CSC (China)
- Science Without Borders (Brazil)
- SPIE

...

# APPLICATION

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## 1<sup>ST</sup> STEP

online application @ [www.studyphotonics.com](http://www.studyphotonics.com)

**DEADLINE:** before April 1 (EU & non-EU Students)  
@UGent before June 1 (for EU-students only)  
before September 30 (for Belgian students only)

In parallel: online application

@ [ugent.be/prospect/en/administration/application](http://ugent.be/prospect/en/administration/application)

## 2<sup>ND</sup> STEP

interview with a UGent or VUB professor

## LANGUAGE REQUIREMENTS

TOEFL or IELTS test needed at time of enrollment

(minimum marks: IELTS 6.5 overall, TOEFL iBT 87)



# CONTACT

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**WWW.STUDYPHOTONICS.COM**



**SECRETARIAT@STUDYPHOTONICS.COM**



**FACEBOOK.COM/MASTERPHOTONICS**



**TWITTER.COM/MASTERPHOTONICS**



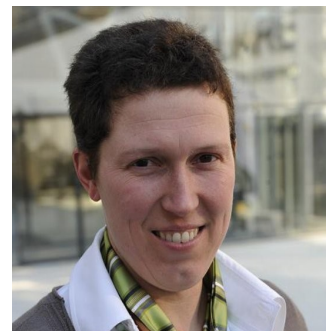
**INSTAGRAM.COM/MASTERPHOTONICS**

## *Chairs of the Program Board:*



Prof. Peter Bienstman  
(peter.bienstman@ugent.be)

Prof. Heidi Ottevaere  
(heidi.ottevaere@vub.be)



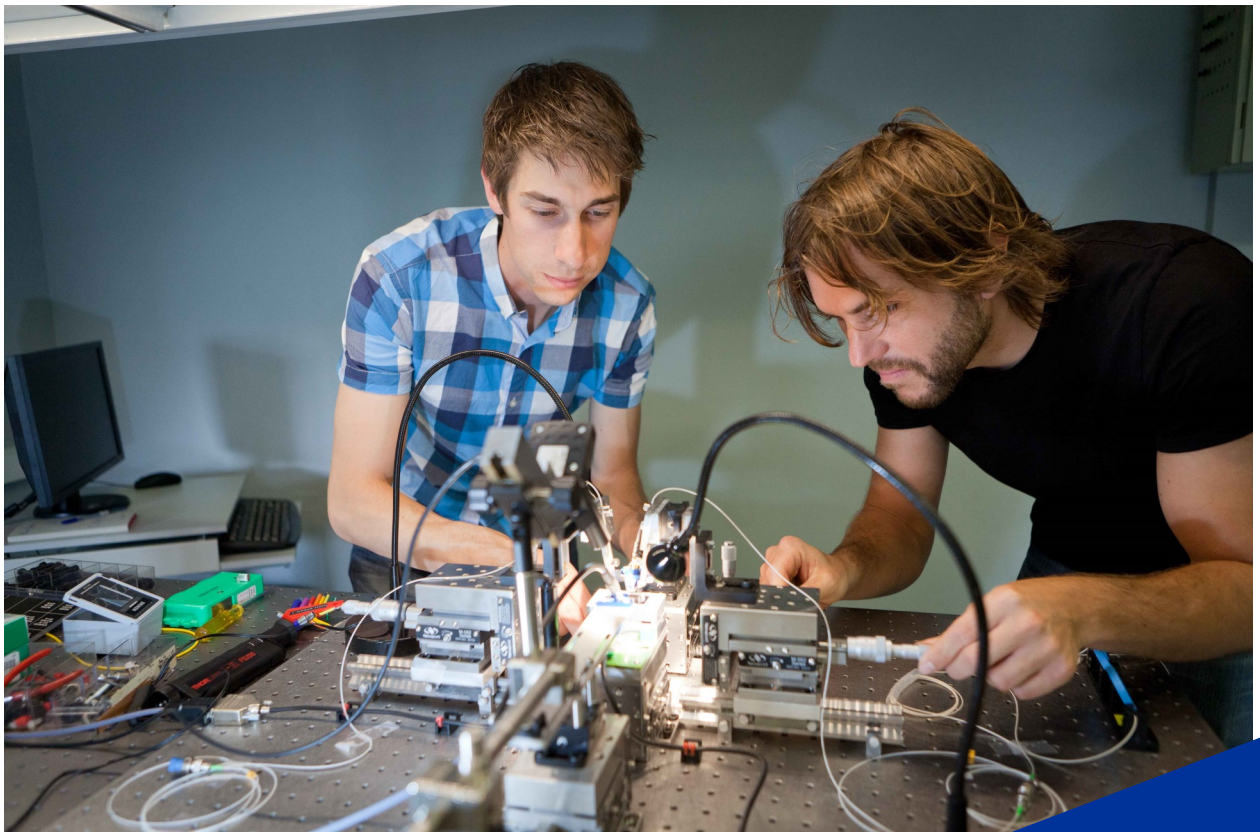
# OTHER ENGINEERING PROGRAMS

At Ghent University, we offer most of our Master of Science in Engineering programs in English. These students are also open for EU and non-EU students:

- **[Master of Science in Engineering Physics](#)**
- **[Master of Science in Electrical Engineering](#)**
  - Option: Communication and Information Technology
  - Option: Electronic Circuits and Systems
- **[Master of Science in Biomedical Engineering](#)**

But also in the field of Computer Science Engineering, Civil Engineering, Nuclear Fusion, Textile Engineering, Chemical Engineering, Electromechanical Engineering, Industrial Engineering & Operations Research, Sustainable Materials Engineering and Fire Safety Engineering.

→ All details: [www.ugent.be/prospect/en](http://www.ugent.be/prospect/en)





# GHENT UNIVERSITY



# PHOTONICS

MASTER OF SCIENCE

# ENGINEERING