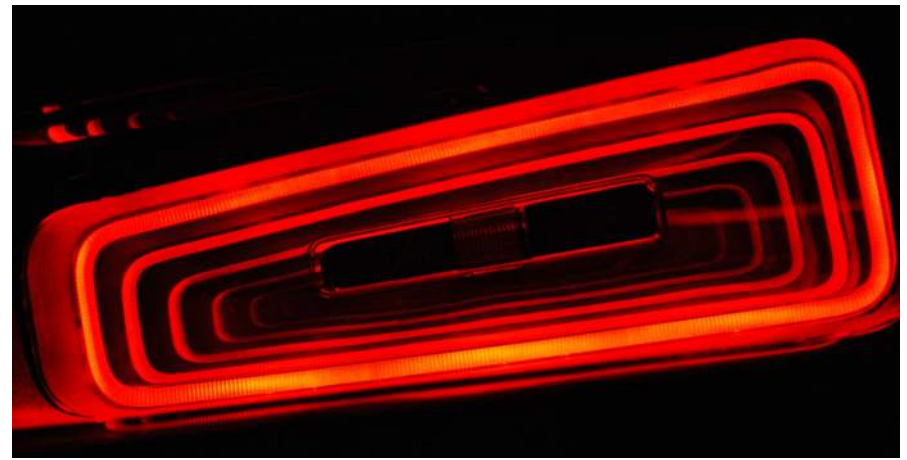


Advanced Master

**Build a bright career in the
challenging and quickly
evolving embedded lighting
field**

**Tuition
Language:
English**

**On Paris-
Saclay
Campus**



**Advanced Master by three
Major Engineering and Design
Schools**

Optics and Photonics



Embedded Systems



Design by





Advanced Master Programme in Embedded Lighting Systems

A high-level international innovative programme:

An integrated approach from design to production of embedded lighting systems including headlights and rear lamps for the automotive industry,

The programme's curriculum brings together:

- . Creative design,
- . Optical and mechanical system design,
- . Simulation and virtual prototyping,
- . Embedded power and intelligence, as well as certification of systems embedded in the connected or autonomous vehicles of tomorrow.

Oriented towards the industry needs:

- . A programme run by leading experts in the field of vehicle embedded lighting systems
- . A programme in close relation with its supporting industry
- . Interesting career prospects in a sector currently hiring highly

Embedded Lighting: a high-tech field

The vehicle lighting sector is currently undergoing major changes with the development of new technologies such as LED lights, as well as new and complex lighting systems functionalities. This changing landscape provides an opportunity to explore new avenues for innovation based on lasers, smart lighting solutions and new lighting functionalities.

Therefore, three major Engineering and design Schools in:

- Transportation Engineering (ESTACA),
- Optics & Photonics (IOGS - Institut d'Optique Graduate School)
- and Design (STRATE – Ecole de design)

join their experience in engineer training to develop a high-level international Advanced Master designed for training cross-skilled engineers for the field of vehicle embedded lighting systems actively supported by industrial players.

Strong connections to:

3 International class research

Laboratories of IOGS:

- . Laboratoire Charles Fabry (Palaiseau),
- . ERIS at laboratoire Hubert Curien (Saint Etienne),
- . Photonique-Numérique-Nanosciences (Bordeaux)

2 Laboratories of ESTACA:

- . Mechanics-Materials and environment
- . Embedded Systems and Energy in transport

4 Industrial founding Partners:

PSA, Renault, Automotive Lighting, Valeo

Associate partners:

Osram, Bertrandt, Mentor Graphics



A Higher Education and Research Institution in Photonics

Institut d'Optique Graduate School is a *grande école* and a founding member of ParisTech and Paris Saclay University. Its international reputation is built on the quality of the education it offers and the major scientific contributions of its research centre.

Institut d'Optique Graduate School trains engineering physicists and Master's and PhD students who go on to become some of the most innovative members of business and academia. Education, Research and Innovation are deployed on 3 sites: Palaiseau (Paris-Saclay), Saint-Etienne, Bordeaux
www.institutoptique.fr



A major European actor in the field of transports and mobility

Founded in 1925, ESTACA Graduate School of Engineering is highly specialized in the fields of aeronautics, automotive, space and railway industries.

ESTACA is a member of ISAE group, 1st world cluster in aerospace training and research.

Through innovative pedagogy and with its rapidly developing research center, it trains industrial engineers known for their technological know-how. ESTACA's graduates undertake the design, development and production of transport systems and components. The industry has ranked ESTACA among the best engineering schools for its expertise in the transportation fields.

www.estaca.fr

2 campuses: ESTACA-Paris Saclay in Saint-Quentin-en Yvelines and ESTACA Campus-Ouest in Laval
280 graduates per year - 1500 students - 6000 alumni



One of the best transportation Design Schools in the world

Created in 1993, Strate - School of Design is one of the best Transportation design schools in the world. There is not a single car company without Strate alumni. Strate trains transportation designers for tomorrow, capable of developing a transversal and global vision of all mobility issues with a two fold objective of formal and conceptual excellence.



www.stratecollege.fr

This information is provided as a description of the programme at the present time. It may be upgraded to improve the adaptation of the programme to the need of the industry.

THE INTERNATIONAL POST GRADUATE PROGRAMME

The ELS training programme has been engineered and is delivered by academic and industrial faculty members selected for their know-how and expertise in the various domains identified by the industrial founders of the ELS Chair. It is organised as an academic semester followed by a 5-month internship and the writing of an industrial thesis in a company.

1ST SEMESTER. 400 hours of academic coursework (September 12th to December 16th 2016) 45 credits

Classes, conferences, tutored personal work, experimental work and projects are organised in 6 units consisting of modules of one week each and of a 12 weeks transverse project unit.

Unit 0—Embedded Lighting in the industry 32 hours - 2 credits:

Module 1: The automotive lighting industry introduction, Research & Development.

Coordinator : Jean-Paul RAVIER ELS Chairman

Presentation of the ELS Chair. Architecture of a vehicle in relation with lighting. Presentations of embedded lighting systems by industry specialists, visits to R&D facilities, design centres and research laboratories.

Unit 1 - Fundamentals of Embedded Lighting 117 hours - 12 credits:

Module 1: Fundamentals of optics for lighting

Coordinator: Guillaume GRACIANI - IOGS

Learning outcomes: Description and analysis of optical lighting systems using ray optics, physical optics and basic notions on light sources.

Module 2: Fundamentals of photometry for lighting

Coordinator: Isabelle RIBET - IOGS

Learning outcomes: Photometry of optical lighting system; Photometric measurement equipment.

Module 3: Systems Engineering: models and functional security

Coordinator: Patrick LESERF - ESTACA

Learning outcomes: System in the automotive context, including modelling and functional reliability according to the ISO 26262 standards.

Module 4: Fundamentals of mechatronic modelling of lighting systems

Coordinator : Bertrand BARBEDETTE
ESTACA

Learning outcomes: Mechatronic system: Description with the industrial modelling tools. Ability to make and describe the assumptions of the model, to programme it, to validate it, to give a physical interpretation of its results.

Module 5: Creative Design of optical systems for the car industry

Coordinator : Mike LEVY - STRATE

Learning outcomes: Ability to relate the imperatives of both design and technology, to understand the point of view of the designer, to understand the origins of the constraints generated by the design and to be able to propose technical recommendations to meet the design specifications.

Unit 2- Advanced optical design of lighting systems. 48 hours - 6 credits

Module 1: Light sources : properties & performances, integration, reliability

Coordinator : Gaelle LUCAS-LECLIN - IOGS

Learning outcomes: Light sources selection according to technical specifications under constraints.

Module 2: Computer aided photometric design of illumination systems

Coordinator : Lionel JACUBOWIEZ - IOGS

Learning outcomes: Broad knowledge of the main optical components and sub systems used in lighting and signalling. Ability to design and optimise the photometry of a lighting systems using a dedicated software.

and with leading industrial partners PSA, Renault Automotive Lighting, Valeo

Unit 3- Advanced engineering and integration of lighting systems 76 hours - 9 credits:

Module 1: Integration of the physical system environment and production constraints

Coordinator : Bertrand BARBEDETTE—ESTACA

Learning outcomes: Ability to understand the diverse technical environments, to size the system with the fabrication process constraints.

Module 2: Mechatronic modelling and simulation of an embedded lighting systems

Coordinator : Rabia SEHAB - ESTACA

Learning outcomes: Ability to model the mechatronic systems, to program them and to validate them with simulations or prototypes.

Module 3: Embedded information systems

Coordinator : Sébastien SAUDRAIS - ESTACA

Learning outcomes: Ability to program an electronic board, to describe the information path necessary for its control, to correctly send and receive a network message.

Unit 4– Visual aspects and cognitive vision with advanced simulations

48 hours - 6 credits

Module 1: characterisation of surfaces and of their aspect, advanced photometric simulation of surfaces

Coordinator : Xavier GRANIER - IOGS

Learning outcomes: Ability to use advanced tools for realistic simulation of photometry, and visual aspect of a lighting system. Ability to relate the characteristics of surfaces to their expected and observed visual aspect and to use the relevant characterisation tools.

Module 2: Physically realistic and real time rendering of appearance, visual and cognitive aspects in relation with design

Coordinator : Mathieu HEBERT - IOGS

Learning outcomes: Understanding of the relationship between the physical reality and the perceived aspect . Ability to specify the needs in terms of real time rendering by virtual or augmented reality as well as by valid images through the filters of vision and cognition .

Unit 5- Transverse project 80 hours-10 credits

Coordinator : Sébastien SAUDRAIS - ESTACA

One day per week, on a project using the diversity of the studied fields

UNIT 6 - Internship Semester - 30 credits

Coordinator : Bertrand BARBEDETTE - ESTACA

Practice of the outcomes on an industrial project in a professional environment from January to June

The Chair Manager processes internship proposals from the companies. Student may then apply and an internship agreement is signed between the company, the student and one of the academic partners of the ELS Chair.

The intern is tutored internally by a company representative and coached by an academic tutor from the ELS chair.

The evaluation of the internship is done on the basis of an evaluation by the company tutor (50%), the evaluation of the written internship thesis (25%) and an oral defence (25%).



Advanced Master ELS Practical information

Eligibility:

- This programme is open to all foreign and French students with a Master of Science level .
- Applicants must hold a 4/5 –year higher education diploma (4 years with professional experience):
 - An engineering degree recognized by the Commission des Titres d'Ingénieurs (Commission for Engineering Degrees),
 - A Master degree or equivalent, (preferably in relevant scientific fields)
 - A foreign degree equivalent to one of these.
 - Applicants should have English language proficiency at the B2 level (minimum paper based TOEFL: 575 or TOEIC: 785
- A limited number of applications, not fulfilling the degree criteria but with outstanding credentials.

Language of tuition:

- Fully in English

Information and application form:

www.embedded-lighting.com

Email: admissions@embedded-lighting.com

Address: Admissions – ELS,
Institut d'Optique Graduate School
2, Avenue Augustin Fresnel
91127 Palaiseau France

Tuition fees:

- 13 000 Euros : full fee
- 11 000 Euros : reduced fee for recently graduated students

Tuition waivers:

- Waivers for half or 100% of the tuition fees are possible for a limited number of self-sustained students

Admission process:

- Admission upon application files to be downloaded from: <http://embedded-lighting.com/admissions/> followed by an interview.

Timetable:

- Application period: From February 15th to July 15th
- Course: in 2016, September 12th to December 16th
400h - 12 modules - 45 ECTS
- Internship: January–June- 30 ECTS

Locations in Paris area France



Supported by

