Imperial College London

Module Specification (Curriculum Review)

Basic details

UID		Cohorts covered	Earliest cohort: 2024-25; Latest cohort:
Long title	Opto-electronic Devices		
New code	PHYS70032	New short title	

Brief description of module *(approx. 600 chars.)*

An introduction to the most important device components from the worlds of optical telecommunication, space lighting, optical displays and sustainable energy production. You will acquire advanced mastery of the principles of diode laser action and design, and you will explore how quantum theory can be harnessed to improve performance in nano-scale devices. You will also consider the key factors affecting the use of photovoltaics and LED lighting as part of a sustainable energy future. You will examine the operation of optical displays, how the human visual system works and the way in which it perceives light and colour, and the operating principles behind many displays and their development.

701 characters

Available as a standalone module/ short course? N

Statutory details

	ECTS	CATS	Non-credit	
Credit value	5	10	N	HECOS codes
FHEQ level	Level 7			

Allocation of study hours

	Hours	
Lectures	15	
Group teaching	5	*Incl. seminars, tutorials, problem classes.*
Lab/ practical		
Other scheduled	10	*Incl. project supervision, fieldwork, external visits.*
Independent study	95	*Incl. wider reading/ practice, follow-up work, completion of assessments, revisions.*
Placement		*Incl. work-based learning and study that occurs overseas.*
Total hours	125	
ECTS ratio	25.00	

Project/placement activity

Is placement activity allowed? No

Module delivery

Delivery mode	Taught/ Campus	Other	
Delivery term	Term 2	Other	

Ownership

Primary department	Physics
Additional teaching departments	
Delivery campus	South Kensington

Collaborative delivery

Collaborative delivery?	N

External institution	N/A
External department	N/A
External campus	N/A

Associated staff

Role	CID	Given name	Surname
Module Leader		Chris	Phillips

Learning and teaching

Module description

Learning outcomes	On completion of this module students will be able to: - compute the effect of band structure and carrier statistics in determining the characteristics of p-n junctions, and the operation of associated lasers, LEDs and detectors - model the way light interacts with electrons in crystalline materials - use photometric units and chromaticity diagrams to characterise the human visual perception of light and colour - critique the key performance characteristics of optical displays and their impact on displays' applications
Module content	Semiconductor Crystals, doping, law of Mass Action. P-N junctions.LEDs. LEDs for space lighting. Diode Lasers. Diode Lasers for telecommunications, data and research. Photovoltaics, 1st, 2nd and 3rd generation ideas and key performance limits. Low dimensional systems, basic quantum theory and how it impacts on device performance in Quantum Well lasers. Intersubband devices for emission and detection in the mid-infrared. Optical Display Characteristics (Brightness, Colour hue and saturation, Contrast, Viewing angle, Efficiency, Response time, Memory, Resolution, Durability); Visual perception; Colour charts; Display Devices: Emissive (Thin film electroluminescence, Field emission, Organic LED, Inorganic LED, Fluorescent liquid crystal) and Non-emissive (Liquid crystal, Micromirror, Electrochromic, Electrophoretic)
Learning and Teaching Approach	Students will be taught through a combination of lectures and classworks (where a timetabled session is used for a group problem solving exercise) supported by problem sheets and office hours.
Assessment Strategy	A 2 hour written examination provides 100% summative assessment. Examination questions are designed to assess across all of the learning outcomes. Formative assessment is provided through the problem sheets and classworks.
Feedback	Problem sheets are provided and model solutions are provided. An office hour is provided each week during the module to allow for feedback and direct interaction between students and lecturers. Classworks provide an opportunity for group discussion and for students to receive feedback on the classwork exercises.
Reading list	The material is contemporary and fluid to have appeared in a text book, and the key resources are widely distributed online for students to access in a way that best suits their needs.

Quality assurance

Date of first approval	
Date of last revision	
Date of this approval	

Office use only

QA Lead	
Department staff	
Date of collection	

Module leader	Chris Phillips	Date exported Date imported	

Notes/ comments

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