

Course Specifications

Valid as from the academic year 2024-2025

Solid State and Nano Physics (CO01213)

Course size	(nominal values; actual val	ues may depend on pro	igramme)		
Credits 6.0	Study time 180 h				
Course offerings in ac	ademic year 2024-2025				
A (semester 1)	Dutch	Gent			
Lecturers in academic	year 2024-2025				
Detavernier, Christophe			WE04	lecturer-in-charge co-lecturer	
Vrielinck, Henk WEO4			WE04		
Offered in the followi	ng programmes in 2024-2025			crdts	offering
Master of Science in Teaching in Science and Technology(main subject Physics ar Astronomy)			Physics and	6	А
Master of Science	in Physics and Astronomy			6	A
Teaching languages					
Dutch					
Keywords					
Solid state physic	s, optics, transport, nano physic	S			
Position of the course					
The content from solid state nano s familiar with pres	the bachelor course on basic so tructures. A second objective of sent-day research in this domain	olid state physics is ext f this course is to make n.	ented to students		
Contents					
Theory of bulk se	miconductors :				
· Band structure					
· Band-to-band tr	ansitions, optical absorption				
• Effective mass t	neory, excitons, donors and acce	eptors			
LUMINESCENCE Classical transpo	ort (drift and diffusion)				
Classical indispu- Denletion layers					
· Applications					
Solid state nano s	structures				
 Energy levels an 	d density of states in 0-2 dimer	nsions			
• Optical propertie	2S				
· 2D systems : qua	intum wells, heterostructures				
• ID SYSTEMS : nan	OWIFES, CAFDON NANOTUDES				
· Landauer formal	ism for conduction - hallistic tr	ansnort			
· Tunneling, Coulo	mb blockade				
· Quantization of	electrical conductance - quantu	m point contacts			
Seminars					
Current topics in s applications	solid state science : synthesis ar	nd characterization tec	hniques,		
Initial competences					
Succeeded in the	following bachelor courses (or t	their equivalent) :			
"Vastestoffysica",	"Kwantummechanica" and "Ato	oom- en molecuulfysica	I".		

Final competences

1 Using the band model to explain the operation of electronic and opto-electronic

devices.

- 2 Calculating transition probabilities for optical transitions.
- 3 Calculating transport properties of low dimensional structures.
- 4 Understanding the influence of low dimensionality on the band structure of materials.
- 5 Knowledge of and critical attitude against current research topics in solid state physics.

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Lecture

Study material

Type: Syllabus

Name: Vastestof- en nanofysica Indicative price: Free or paid by faculty Optional: no Language : Dutch Number of Pages : 286 Oldest Usable Edition : 2023 Available on Ufora : Yes Online Available : No Available in the Library : No Available through Student Association : No

References

M. Fox, "Optical properties of solids", Oxford University Press, 2001 P. K. Basu, "Theory of optical processes in semiconductors", Oxford University Press, 1997 David Ferry, "Transport in Nanostructures", Cambridge University Press, 2000 T. Heinzel, "Mesoscopic electronics in Solid State Nanostructures", Wiley-VCH, 2007

Course content-related study coaching

E-learning on Ufora, possibility for contacting the lecturers by appointment.

Assessment moments

end-of-term assessment

Examination methods in case of periodic assessment during the first examination period

Oral assessment

Examination methods in case of periodic assessment during the second examination period

Oral assessment

Examination methods in case of permanent assessment

Possibilities of retake in case of permanent assessment

not applicable

Extra information on the examination methods

Oral exam with written preparation

Calculation of the examination mark

100% periodic evaluation