PhD STUDIES COURSE UNIT DESCRIPTION

Name of subject	Scientific Course	Faculty	Center/Institute/ Department
UV Optoelectronic Devices (7,5 ECTS credits)	Materials Engineering (T 008)	Faculty of Physics	Institute of Photonics and Nanotechnology
Student's workload	ECTS credits	Student's workload	ECTS credits
Lectures		Consultations	up to 1
Individual study	7.5 without consultations; up to 6.5 with consultations	Seminars	

Course annotation

UV radiation in the nature. UV spectral regions and their influence on humans. Applications of UV radiation in technological processes, communication systems and medicine.

UV sources. Low- and high-pressure discharge lamps. Gas and solid-state lasers, conversion of their radiation to UV region. Sinchrotrone radiation. Excimer lasers. Semiconductor light emitting diodes (LEDs) and laser diodes (LDs), problems and prospects in their development and large-scale production.

Materials for UV LEDs and LDs.

Applications of UV sources. Photolithography, prospects and limitations for decreasing the size of photolithographically formed structures. UV for materials processing. Specific and general lighting lamps based on UV emitters.

UV sensors. Devices to convert UV radiation to visible range. Solar-blind photodetectors. Their military and civil applications in flame detection, non-line of site

Applications of UV optoelectronic systems. Detection of hazardous biological and chemical materials and contaminates. Disinfection of air and water. Exploitation of UV-induced photochemical reactions in industry and medicine, non-line-of-sight military communication systems, UV spectroscopy in astrophysics.

Reading list

1. Z. Mi, C. Jagadish, III-Nitride Semiconductor Optoelectronics, Academic Press (2017).
2. Handbook of Solid-State Lighting and LEDs (Series in Optics and Optoelectronics), 722 pages, Zhen Chuan Feng, Edt., CRS Press (2017),
3. III-Nitride Electronic Devices, R. Chu and K. Shinohara, Edt., Academic Press (2019).
4. Z. Mi, C. Jagadish, III-Nitride Semiconductor Optoelectronics, Academic Press (2017).

Evaluation

Essay on selected topic; evaluation criteria: outline, selection of the key issues on the topic, harmony of scope and depth, scientific accuracy of the content, right emphasis, evidence-based conclusions, technical quality of presentation. 40%.
Presentation in write and discussions on topics selected during the final exam out of the list presented in advance. 60%.

The names of consulting teachers	Science degree	Pedago-gical name	Main scientific works published in the scientific field in the last 5-year period
Gintautas Tamulaitis	habil. Dr.	Prof.	1. K. Nomeika, Ž. Podlipskas, M. Nikitina, S. Nargelas, G. Tamulaitis, R. Aleksiejunas, Impact of carrier diffusion on the internal quantum efficiency of InGaN

(gintautas.tamulaitis@ff.vu.lt)			quantum well structures, J. Materials Chemistry C, 10, 1735-1745 (2022). 2. D. Dobrovolskas, A. Kadys, A. Usikov, T. Malinauskas, K. Badokas, I. Ignatjev, S. Lebedev, A. Lebedev, Y. Makarov and G. Tamulaitis, Luminescence of structured InN deposited on graphene interlayer, J. Lumin. 232, 117878 (2021). 3. O. Kravcov, J. Mickevičius, G. Tamulaitis, Kinetic Monte Carlo simulations of the dynamics of a coupled system of free and localized carriers in AlGaN, Journal of Physics: Condensed Matter 32, 14 (2020). 4. M. Korzhik, G. Tamulaitis, A. Vasil'ev, Physics of Fast Processes in Scintillators, Springer, 262 pages, (2020). 5. T. Ceponis, K. Badokas, L. Deveikis, J. Pavlov, V. Rumbauskas, V. Kovalevskij, S. Stanionyte, G. Tamulaitis, E. Gaubas, Evolution of Scintillation and Electrical Characteristics of AlGaN Double-Response Sensors During Proton Irradiation, Sensors, 19, 3388 (2019).
Certified by the Doctoral Committee of Material Engineering (T 008) on 09/02/2023, protocol No. (7.17 E) 15600-KT-39			
Committee Chairman prof. habil. dr. Valdas Sirutkaitis			