

**Title: Optoelectronics**

**Lecturer:** Assoc. Prof. Dr. Janez Krč

**Aim of the course:**

To acquire and deepen the knowledge of optoelectronic and photovoltaic devices and technologies

**Required (pre)knowledge:**

Principles of semiconductor devices, physics, linear electronics

**Contents:**

- Recent highlights in optoelectronics and photonics
- Light (wave and photon model, optical properties of materials, reflection and refraction, diffraction, ray optics, radiometry and photometry, colours)
- Light sources (types, principle of light generation, spontaneous and stimulated emission)
- Light emitting diodes (principle of operation, structures, materials, fabrication, light outcoupling, efficiency and efficacy, schemes of drivers, applications)
- Lasers (principle of operation, gain, feedback loop, resonator, losses, examples of gas and solid state lasers)
- Laser diodes (operational principle, structures, applications, schemes of drivers)
- Displays (LCD, LED, OLED, plasma)
- Semiconductor photodetectors and arrays (absorption, PN, PIN, APD, CCD, CMOS, a-Si:H based large area arrays)
- Optical fibers (single, multimode, photonic crystal based, losses, dispersions)
- Photovoltaics (principle of solar cell operation, parameters, technologies of solar cells and PV modules, inverters and regulators, PV system design)

**References:**

B. E. A. Saleh and M. C. Teich, Fundamentals of photonics, 2<sup>nd</sup> Ed., John Wiley & Sons Ltd., 2007.

S. O. Kasap, Optoelectronics and Photonics: Principles and Practices, Prentice Hall, 2001.

J. P. Dakin and R. G. W. Brown, Handbook of optoelectronics, Vol I and II, Taylor and Francis, 2006.

A. Luque, S. Hegedus, Handbook of Photovoltaic Science and Engineering 2<sup>nd</sup> Ed., John Wiley & Sons Ltd., 2011.