

PHOTONIC MICROSYSTEMS

1. KEY INDICATORS

CFU/ECTS: 6

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2. OBJECTIVES OF THE COURSE

The course intends to provide to the student the tools for the understanding, the manufacturing techniques and the performance of systems and microsystems based on optoelectronic and photonic components.

3. ACQUIRED ABILITIES

Students who have passed the exam will have acquired a thorough knowledge of the main systems built with opto-electronic and photonic components, with particular reference to the physical principles of operation of the single components and the manufacturing techniques. Moreover students will be able to analyze and compare the up to date photonic microsystems design and their use in sensor's application and image processing.

4. PROGRAM OF THE COURSE

Photometry and colorimetry concepts. Light polarization. Liquid crystals: structure and properties. Liquid crystal displays and microdisplays. Micro-opto electromechanical systems: Digital Micromirror Devices and Digital Light Processing. Photovoltaic cells. Organic light emitting diodes (OLED). Silicon integrated photonic microsystems. Optical interconnections, packaging and assembling techniques in photonic microsystems.

Laboratory experiences: optoelectronic instrumentation, CAD numerical techniques for simulation and design of optophotonic devices, realization technologies of optical waveguides: ion-exchange in glass substrates and silicon V-grooves. Optical characterisation of waveguides by prism and fiber butt-coupling techniques.

Guided tour to the ENEA Casaccia Laboratories for the realization of photovoltaic systems.

5. REFERENCES

O. Solgaard, "Photonic Microsystems: Micro and Nanotechnology Applied to Optical Devices and Systems", Springer 2009.

M.E. Motamedi, "MOEMS: micro-opto-electro-mechanical systems", SPIE The International Society for Optical Engineering, 2005.

I.C. Khoo, "Liquid Crystals", 2nd Edition, Wiley, 2007.

D.K. Yang and S.T. Wu, "Fundamentals of Liquid Crystal Devices", Wiley, 2006.

I.C. Khoo, "Liquid Crystals", Wiley, 2007.

J.H. Lee, D.N. Liu, S.T. Wu, "Introduction to Flat Panel Displays", Wiley, 2008.

P. Yeh and C. Gu, "Optics of liquid crystal displays", 2nd Edition, Wiley, 2009.

L. Pavesi, G. Guillot, "Optical Interconnects. The Silicon Approach.", Springer-Verlag Berlin Heidelberg, 2006.

Handouts distributed in class.

6. COURSE WEBSITE

<http://elearning.uniroma1.it/>