

Joint Master's program Biomedical Engineering

Module X4M 1600: Electronics and Optics	
Aims:	<p>The students shall acquire consolidated knowledge of physical, electrical, and mechanical principles of medical products.</p> <p>The students shall be enabled to contribute to the development of medical products according to relevant standards.</p> <p>The students shall know about development processes in medical technology and manage these processes according to their professional experience.</p> <p>The students shall be able to present results of their work adequately.</p>
Workload:	<p>Lecture attendance: 120 h</p> <p>Self-study: 120 h</p>
Credit-points:	8
Person responsible for module:	Martin Ryschka
Courses (lecturer):	<p>Medical Electronics lecture (Ryschka)</p> <p>Medical Electronics project (Ryschka)</p> <p>Photonics I lecture (Reinholz)</p>
Language:	English
Curriculum:	Master's program Biomedical Engineering, 1st Semester
Medical Electronics	Lecture, 2 SWS
Prerequisites according to examination regulations	None
Recommended prerequisites:	Basic knowledge in engineering sciences and analog electronics
Learning outcomes:	Basic understanding of principles and tools applied in medical electronics
Content:	<ul style="list-style-type: none"> • Some tools: Electrical Impedance, Transfer Function, Bode Diagram, Common Mode vs. Differential Mode Voltages • Electrical Safety of Medical Electronic Devices • Registration of Bioelectrical Signals • Potential Separation • Power Supplies
Literature:	<p>Horowitz, P., Hill, W.: The Art of Electronics. Cambridge University Press, New York, 1999. ISBN: 0-521-37095-7</p> <p>Webster, J. G.: Medical Instrumentation. Application and Design. John Wiley and Sons, Inc., New York, 1998.</p> <p>Mancini, R.: Op Amps For Everyone. Texas Instruments</p>

Examination:	Written examination
Teaching methods:	Board, LCD-projector, simulation-software
Medical Electronics	Project, 4 SWS
Prerequisites according to examination regulations	None
Recommended prerequisites:	Basic knowledge in engineering sciences and analog electronics. Knowledge of the regulatory affairs for medical products and knowledge in project-management.
Learning outcomes:	The students shall understand the development process of medical electronic devices with special focus on electrical safety.
Content:	By group work the students design a medical electronic device and compile the necessary documentation.
Literature:	EN 60601-1 and related standards Specific literature about the chosen medical electronic device
Examination:	Graded lab-report, presentation
Teaching methods:	Students work in groups and are supported by lecturer
Photonics I	Lecture, 2 SWS
Prerequisites according to examination regulations	None
Recommended prerequisites:	Basic knowledge in mathematics, physics and optics
Learning outcomes:	The students should gain knowledge about the basic theoretical classical optic concepts. Students will learn about the modern devices and their implementation. Students will use the knowledge developed to solve concrete problems.
Content:	<ul style="list-style-type: none"> • Basics of optics (ray optics, wave optics) • Optical components (lenses, mirrors, fibres) • Radiation sources, detectors • Applications • Knowledge about lecturer's current research projects
Literature:	Hecht, E.: Optics. München: Oldenbourg Young, M.: Optics and Lasers: Including Fibers and Optical Waveguides. Berlin: Springer Pedrotti, F.L., Pedrotti, L.M., Pedrotti, L.S.: Introduction to Optics. Upper Saddle River, NJ B. Saleh, Teich: Fundamentals of Photonics, Wiley
Examination:	Written examination
Teaching methods:	Board, beamer, experiments