UNIVERSITÄT ZU LÜBECK

TECHNISCHE HOCHSCHULE LÜBECK

Joint Master´s program Biomedical Engineering

Module X4M 1700: Design Engineering	
Aims:	The students shall acquire consolidated knowledge of physical, electrical, and mechanical principles of medical products. The students shall independently cope with a defined problem in medical technology. The students shall be enabled to contribute to the development of medical products according to relevant standards. The students shall know about development processes in medical technology and manage these processes according to their professional experience. The students shall be able to present results of their work adequately.
Workload:	Lecture attendance: 120 h Self-study: 120 h
Credit-points:	8
Person responsible for module:	Stephan Klein
Courses (lecturer):	Design Methodology lecture (Klein) Design Methodology project (Klein) Materials Sciences lecture (Damiani)
Language:	English
Curriculum:	Master`s program Biomedical Engineering, 1st Semester
Design Methodology	**Lecture, 2 SWS**
Prerequisites according to examination regulations	None
Recommended prerequisites:	Knowledge in machine elements and mechanical design
Learning outcomes:	The students know about the phases of product development considering the mechanical construction. They can structure a development process according to VDI guidelines and can apply the most important methods of problem solving. Knowledge about lecturer´s current research projects
Content:	• Introduction (mechanical design in medical technology, importance of development for quality of products) • The design process (VDI-guideline 2221, phases in the process, methods of problem solving, development of concepts, selection and

	evaluation of solutions) • The designer (characteristics of good problem solvers, presenting, sketching) • Embodiment design (basic principles “simple, clear and save”, stiffness in design, design of bearings, design for primary shaping manufacturing, rapid prototyping • Tolerances (ISO-tolerancing system)
Literature:	Pahl, G., Beitz, W., Feldhusen, J., Grote, K.-H.: Engineering Design: A systematic approach. 3rd ed. Springer 2007 Hales, Chr., Shayne, G.: Managing Engineering Design. 2nd ed. Springer 2004 Ullmann, D.: The Mechanical Design Process. 3rd ed. McGraw Hill Zenios, St., Makower, J., Yock, P.: Biodesign. Cambridge University Press 2010 Hand-out from lecturer
Examination:	Oral examination
Teaching methods:	Board, transparencies, LCD-projector, models
Design Methodology	**Project, 2 SWS**
Prerequisites according to examination regulations	None
Recommended prerequisites:	Lecture attendance
Learning outcomes:	The activities and methods presented in the lecture shall be trained and applied to real research projects. The students can apply the presented methods and evaluate their benefits and limits.
Content:	The students work in groups of four to six on tasks coming from research projects in the lab. Other projects are formulated by external partners, usually companies. The students can use a CAD-System (solid works, solid edge) for doing the design. Tasks are taken from lecturer´s current research projects.
Literature:	see lecture
Examination:	Graded project-report and presentation
Teaching methods:	Group work, discussions
Materials Science	**Lecture, 4 SWS**
Prerequisites according to examination regulations	None
Recommended prerequisites:	Basic knowledge in mathematics and physics

Learning outcomes:	The students know about the most important mechanical and thermodynamical characters of metal, polymers, synthetics, and the most common materials in the area of medical technology. Knowledge about lecturer´s current research projects
Content:	• Introduction to materials and matter • Atomic bonds and structures • Defects in crystals • Diffusion in solids, solidification • Phase diagrams • Thermal treatments of materials • Mechanical Properties of solids • Fracture, fatigue, creep • Wear and abrasion, corrosion • Overview metals, metals in medical technology • Overview polymers, polymers in medical technology • Overview ceramics, ceramics in medical technology
Literature:	W.D. Callister, Jr.: Material Science and Engineering, an Introduction. 7th edition, John Wiley and Sons, Inc. (2007). Askeland, D.: The Science and Engineering of Materials. Thomson Learning (2006) Schackelford, J., F.: Introduction to Material Science for Engineering, Prentice Hall (1996)
Examination:	Written examination (Portfolio) Students have to do a project during class
Teaching methods:	Board, transparencies, LCD-projector