

Joint Master's program Biomedical Engineering

Module X4M 1100: Natural Sciences	
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>
Workload:	<p>Lecture attendance: 60 h</p> <p>Self-study: 120 h</p>
Credit-points:	8
Person responsible for module:	Bodo Nestler
Courses (lecturer):	<p>Biomechanics lecture (Wendlandt)</p> <p>Biophysics lecture (Nestler)</p>
Language:	English
Curriculum:	Master's program Biomedical Engineering, 1st Semester
Biomechanics	Lecture, 2 SWS
Prerequisites according to examination regulations	None
Recommended prerequisites:	
Learning outcomes:	The students shall get to know the materials, stresses and strains of the musculoskeletal system as well as the most important biomaterials in order to make engineering work on biomechanical problems possible.
Content:	<ul style="list-style-type: none"> • Basic static mechanics • Deformation behaviour of viscoelastic materials • Biomechanics of the human locomotive system: <ul style="list-style-type: none"> Mechanical behaviour of biological tissues (bone, tendons/ligaments, cartilage, synovial fluid) Loads acting in the locomotive system (forces/moments, stress/strain): hip joint, femur, knee joint, foot, spine) • Biomaterials: <ul style="list-style-type: none"> types, chemical composition, biocompatibility, corrosion resistance, mechanical properties • Artificial joints (endoprotheses): <ul style="list-style-type: none"> types, materials, laboratory testing, wear • Bone fractures (healing and fixation): <ul style="list-style-type: none"> types of fracture healing, internal fixation, external fixation
Literature:	Mow, V.C., R. Huiskes (Ed.): Basic orthopaedic biomechanics & mechano-biology. 3rd Edition.). Lippincott, Williams & Wilkins,

	Philadelphia, 2003 P. Brinckmann, W. Frobin, G. Leivseth, (Hrsg.): Orthopedic Biomechanics, Thieme, 2015
Examination:	Written examination
Teaching methods:	Board, LCD-projector, models
Biophysics	Lecture, 2 SWS
Prerequisites according to examination regulations	None
Recommended prerequisites:	Basic knowledge in physics und biology
Learning outcomes:	The students shall understand the basics of the application of physical/technical models to biological/ medical systems.
Content:	Physical principles and their application in: <ul style="list-style-type: none"> • Liquid and gas flow in the human body • Electrical and magnetic interactions with biological systems (cells) • HF surgery • EEG • EMG • MRI • Knowledge about lecturer's current research projects
Literature:	Thews et al.: Human Physiology. Springer (1989) Webster: Medical Instrumentation, 3rd edition, Wiley and Sons. Tritthart, H.: Medizinische Physik und Biophysik. Schattauer (2001) Hutten. H.: Biomedizinische Technik, 4. Aufl. Springer (1991) Kresse, H.: Kompendium Elektromedizin. Siemens (1978)
Examination:	Written examination
Teaching methods:	Board, transparencies, LCD-projector