Course Unit Descriptor

Study Programme: Physics

Course Unit Title: The Essential Physics of Ultrasound Imaging

Course Unit Code: M18FOUD

Name of Lecturer(s): dr Olivera Klisurić

Type and Level of Studies: Master Academic Degree

Course Status (compulsory/elective): elective

Semester (winter/summer): summer

Language of instruction: English

Mode of course unit delivery (face-to-face/distance learning): face-to-face

Number of ECTS Allocated: 8

Prerequisites:

Course Aims:

This module aims to introduce the the physics, mathematics, instrumentation and clinical applications of common ultrasound imaging.

Learning Outcomes:

The overall competence is acquiring knowledge and students' ability for individual and team scientific research work in the field of applying physical concepts to the the commonly used ultrasound imaging. The specific competences are, for example:

Knowledge and Understanding:

- develop basic knowledge of the medical ultrasound imaging modalities
- develop an understanding of general issues in ultrasound imaging modalities
- develop a competence in the fundamental analytical and computational tools used in ultrasound imaging

Skills:

- the intellectual skills associated with the assimilation of educational subject matter; preparation of notes, revision material, the ability to access and utilise information from a variety of sources
- ability to apply knowledge of math, science, engineering
- recognition of need for and ability to engage in life-long learning

knowledge of contemporary issues

Syllabus:

Theory

1. Introduction to ultrasound imaging
2. Physical characteristics, preparation, and focusing the ultrasonic beam
3. Ultrasound transducers
4. Ultrasonic field-type characteristics.
5. The interaction of ultrasound with biological materials.
6. Ultrasound diagnosis - Transmission and echo technique
7. A-, B- and M-mode
8. Doppler ultrasound (color Doppler ultrasonography, Power Doppler ultrasonography)
9. Image quality: spatial resolution
10. Image artefacts
11. The use of ultrasound in medical diagnostics: ultrasound in gastroenterology, obstetrics, cardiology,
12. Biological effects of ultrasound

Practice

Practical classes are held in the adequate clinics of Medical Faculty, University of Novi Sad (Cardiology, Gynecology, Neurology and Radiology), wherein students may be introduced to the practical application of ultrasound in medicine.

Required Reading:

1. Paul Suetens, Fundamentals of Medical Imaging, Cambridge University Press, 2009.
2. Nadine Barrie Smith, Andrew Webb, Introduction to Medical Imaging Physics: Engineering and Clinical Applications Cambridge University Press, 2011
3. Anthony B. Wolbarst, Patrizio Capasso, Andrew R. Wyant: Medical Imaging: Essentials for Physicians, John Wiley & Sons, Inc., Hoboken, New Jersey, 2013.
4. K. Kirk Shung: DIAGNOSTIC ULTRASOUND: Imaging and Blood Flow Measurements, Taylor & Francis Group, LLC, 2006

Weekly Contact Hours:	**Lectures:** 3	**Practical work:** 2

Teaching Methods:

Knowledge Assessment (maximum of 100 points):

Pre-exam obligations	points	**Final exam**	points
Active class participation		written exam	50
Practical work	10	oral exam	20
Preliminary exam(s)		…….	
Seminar(s)	20		

The methods of knowledge assessment may differ; the table presents only some of the options: written exam, oral exam, project presentation, seminars, etc.