HL2010 Ultraljud 6,0 hp

Ultrasound

När kurs inte längre ges har student möjlighet att examineras under ytterligare två läsår.

Fastställande

Kursplan för HL2010 gäller från och med VT14

Betygsskala

A, B, C, D, E, FX, F

Utbildningsnivå

Avancerad nivå

Huvudområden

Elektroteknik

Särskild behörighet

Bachelor's degree in Applied or Theoretical Physics, Electrical Engineering or equivalent. Knowledge of anatomy and physiology is recommended.

Undervisningsspråk

Undervisningsspråk anges i kurstillfällesinformationen i kurs- och programkatalogen.

Lärandemål

After the course is successfully completed, student will acquire the theoretical and practical knowledge and will be able to:

1. Discuss and perform calculations related to propagation of the acoustical waves in homogeneous media, i.e. gasses, liquids or solids; and in complex media, i.e. biological tissue.
2. Based on the medical requirements design and optimize characteristics of the ultrasound transducer and emitted acoustic wave.
3. Discuss the fundamental physical principles, biological effects and safety issues related to the application of ultrasound in connection with harmonic imaging, acoustic streaming, cavitation and sonoporation; and exemplify different practical applications of each process.
4. Discuss clinically approved and routinely used ultrasound techniques such as Doppler, speckle tracking and more recent advanced modalities such as 4D ultrasound, shear wave elastography and contrast enhanced ultrasound.
5. Identify strengths and weaknesses of the modalities for evaluation of various tissue types such as cardiac, vascular and fetus.

Kursinnehåll

- Lecture sessions in the course are dedicated to cover following topics: 1. Propagation of the acoustic waves through different media: gas, liquids, solids; at normal and oblique incident. Specific characteristic parameters and governing equations. 2. Design of ultrasound transducers and their key elements. 3. Biological effects of ultrasound: harmonic imaging, acoustic streaming, cavitation, sonoporation. 4. Application of ultrasound in clinical practice. Visualization and quantification of the diagnostic data by Doppler, speckle tracking, 3D-4D ultrasound and shear wave elastography. 5. Basic principles and resent advancements in ultrasound contrast agents: from manufacturing, through testing to visualization. 6. Ultrasound safety 7. Standards for digital image acquisition, archiving and communication. Clinical practice and risk management.Laboratory works in a course are dedicated to provide hands on experience on: 1. Basic principles of ultrasound physics and discussion on propagation of the acoustical waves in different mediums and accompanied effects. 2. Calibration and performance testing of the clinical ultrasound. 3. Clinical protocol in handling patients.Demonstrationin a course is designed to appreciate and assess the biological effect of ultrasound on living cells on an example of cavitation.One written assignment complements the laboratory works and allows correlating experimental finding with theoretical calculations.

Kurslitteratur

1. Hand-out material
2. Hoskins PR, Martin K, Thrush A, "Diagnostic Ultrasound: Physics and Equipment" Cambridge Medicine, Second edition, 2010

Examination

- LAB1 - Laborationer, 1,5 hp, betygsskala: P, F
- TEN1 - Tentamen, 4,5 hp, betygsskala: A, B, C, D, E, FX, F

Examinator beslutar, baserat på rekommendation från KTH:s handläggare av stöd till studenter med funktionsnedsättning, om eventuell anpassad examination för studenter med dokumenterad, varaktig funktionsnedsättning.

Examinator får medge annan examinationsform vid omexamination av enstaka studenter.

Övriga krav för slutbetyg

Passed written exam (TEN1; 4.5 cr.) grading A-F.
Passed lab work (LAB1; 1.5 cr.) grading P/F.

Etiskt förhållningssätt

- Vid grupparbete har alla i gruppen ansvar för gruppens arbete.
- Vid examination ska varje student ärligt redovisa hjälp som erhållits och källor som använts.
- Vid muntlig examination ska varje student kunna redogöra för hela uppgiften och hela lösningen.