LUNDS UNIVERSITET
Lunds Tekniska Högskola

Course syllabus

Transportfenomen i människokroppen
Transport Phenomena in the Human Body

MVKF20, 5 credits, G2 (First Cycle)

Valid for: 2023/24
Faculty: Faculty of Engineering, LTH
Decided by: PLED BME
Date of Decision: 2023-04-13

General Information

Main field: Technology.
Compulsory for: BME3
Language of instruction: The course will be given in Swedish

Aim

The course is aimed at providing the student with basic knowledge about some transport phenomena and how these control the functions of the human body.

Learning outcomes

Knowledge and understanding
For a passing grade the student must

- understand how the equations for conservation of mass, momentum and energy are expressed on integral and differential form
- understand which assumptions will lead to the Bernoulli equation
- understand the difference between laminar and turbulent flow and how deformable walls in combination with a pulsating pressure affects the flow
- understand how heat is generated and transported in the human body
- understand the difference between Newtonian and non-Newtonian fluids and how this affects flow in the human body

Competences and skills

For a passing grade the student must

- be able to describe how heat and mass is transported in the breathing cycle and in blood flow
- be able to analyze inner organs, for example kidneys, from a transport process perspective
- be able to actively participate in discussions concerning problems that are relevant to the subject

Judgement and approach
For a passing grade the student must

- be able to scrutinize and from given criteria estimate the credibility of heat and mass transfer calculations
- be able to interpret results of flow calculations and understand their importance for maintaining the homeostasis of the human body

Contents

The transport processes of the body are described using fluid mechanics concepts. Conservation of mass, momentum and energy in the human body are presented on integral and differential form using Reynolds' transport theorem, and from these the Bernoulli equation is derived. Criteria for and consequences of laminar and turbulent flow in the human body are discussed. Flows in the human body often occur on vessels with elastic walls and a pulsating driving force. Hence, the study of these flow situations is an important part of the course. Many bodily fluids exhibit complex rheology for which the Newtonian description is insufficient; the course therefore also includes description of the properties of non-Newtonian fluids. The course also includes heat generation, heat transfer phenomena that are important for the function of the human body.

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)
Assessment: Written exam and approved home work.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Admission

Assumed prior knowledge: TEK015, EXTG50, FMA430, FMAB30 och FHL055, FHLA05
The number of participants is limited to: No

Reading list

- Truskey G.A, Yuan F, Katz D.F: Transport Phenomena in Biological Systems. Pearson, ISBN: 978-0-13-513154-1.

Contact and other information

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Course homepage: http://www.fm.energy.lth.se/english/education/courses/transport