



Polymeric Fibres and Nanofibres in Medical and Tissue Engineering Applications

Polymera fibrer och nanofibrer för användning i medicinska tillämpningar och vävnadsteknik

5 credits

5 högskolepoäng

Ladok Code: FRRPT02

Version: 1.0

Established by: The Research education committee in Resource Recovery 2022-12-14

Valid from: Spring 2023

Education Cycle: Third cycle

Research Subject: Resource Recovery

Prerequisites: The student should be admitted to a doctoral programme. The examiner may make exceptions to this rule.

Grading Scale: Fail (U) or Pass (G)

Content

Polymeric medical textiles are an emerging research area and the development of textile fibres for medical applications has also been significant in the industry over the past 15 years. Polymeric fibres and textiles (synthetic or natural) are used in wound care and as protection of skin and tissues - as sutures, for the manufacture of blood vessels, as well as also as surgical implants. The textile materials can also be modified so that they release drugs, have antibacterial properties and also act as a cell growth substrate. The biodegradability of materials in the physiological environment can also be regulated. When polymer fibres are used in medical applications, the fibre must meet certain basic requirements such as biocompatibility, blood compatibility, surface properties and morphology, biodegradability and mechanical properties. They must not have toxic properties or adversely affect tissues.

The course aims to provide doctoral students with knowledge about different types of polymer fibres used as material components in textile materials for medical applications, including their composition, manufacturing, material properties and their medical uses. The course also discusses ongoing research on medical textile fibres and materials.

The course will cover the following topics:

- Medical fibre standards on biocompatibility, blood compatibility and surface properties of fibres and nanofibres.
- Sterilisation techniques for medical polymer fibres, nanofibres and textiles.
- Types and qualities of polymer fibres in medical applications - both degradable, non-degradable, synthetic and natural (PE, PTFE, PET, PLA, PGA, PCL,...)
- Use of polymeric fibres and textiles in the following areas of medicine and tissue engineering (topical and percutaneous applications, cardiovascular devices, general surgery, orthopaedics, sutures, and medication-releasing fibres).
- Polymeric optical fibres (POFs) in medical applications
- Hydrogel-based fibres in medical applications

Learning Outcomes

Knowledge and understanding

1.1 Describe the types of polymeric fibres and textile materials used in medical applications and in tissue engineering

1.2 Describe the requirements for polymeric fibres and textile materials used in medical applications and in tissue engineering

1.3 Report on the research in the field

Skills and abilities

2.1 To be able to discuss the methods for assessment of biocompatibility, blood compatibility and surface properties of polymers used in medical polymeric fibres and textile materials

2.2. To be able to discuss methods for sterilisation of polymeric fibres and textile materials used in medical applications

Valuation and approach

3.1 Analyse and evaluate the relationship between the students' own research project and the current research field

Forms of Teaching

The teaching consists of lectures, project work and seminars. Teaching is conducted in English.

The language of instruction is English.

Forms of Examination

The course will be examined through the following examination elements:

Individual examination

Learning outcomes: 1.1-1.3, 2.1-2.2

Credits: 4

Grading scale: Fail (U) or Pass (G)

Written assignment: report with oral presentation

Learning outcomes: 3.1

Credits: 1

Grading scale: Fail (U) or Pass (G)

The course is examined through the following examination components:

Individual exam

Learning outcomes 1.1-1.3, 2.1-2.2

Credits: 4

Grading scale: Fail or Pass

Submission: written report with oral presentation

Learning outcome 3.1

Credits: 1

Grading scale: Fail or Pass

If the student has a decision/recommendation regarding special pedagogical support from the University of Borås due to disability, the examiner has the right to adapt examinations. The examiner has to decide based on the syllabus's objectives whether the examinations can be adapted in accordance with the decision/recommendation.

The student's rights and obligations regarding examination are in accordance with guidelines and regulations in place at the University of Borås.

If the student has received a decision/recommendation regarding special pedagogical support from the University of Borås due to disability or special needs, the examiner has the right to make accommodations when it comes to examination. The examiner must, based on the objectives of the course syllabus, determine whether the examination can be adapted in accordance with the decision/recommendation.

Student rights and obligations at examination are in accordance with guidelines and rules for the University of Borås.

Literature and Other Teaching Methods

Medical Textiles, Holly Morris and Richard Murray, CRC Press: 2022

Research articles distributed by teachers.

Student Influence and Evaluation

The course is evaluated in accordance with current guidelines for course evaluations at the University of Borås in which students' views are to be gathered. The course evaluation report is published and returned to participating and prospective students in accordance with the above-mentioned guidelines, and will be taken into consideration in the future development of courses and education programmes. Course coordinators are responsible for ensuring that the evaluations are conducted as described above.

Miscellaneous