Project - Biomedical Engineering

Programme course

16 credits
Projekt i medicinsk teknik
TBMT41
Valid from: 2019 Spring semester

Determined by
Board of Studies for Electrical Engineering,
Physics and Mathematics

Date determined
2018-08-31
Main field of study
Biomedical Engineering

Course level
First cycle

Advancement level
G2X

Course offered for
- Biomedical Engineering, M Sc in Engineering

Entry requirements
For admission to the course, see tab Common rules, headline Commencing a degree project.
Anatomy and Physiology, Engineering project, Basic knowledge in programming - abstraction and modelling. Basic knowledge in biomedical engineering, mathematics, physics, electronics, computer science and control engineering.
Note: Admission requirements for non-programme students usually also include admission requirements for the programme and threshold requirements for progression within the programme, or corresponding.

Intended learning outcomes
After the project work the student in the main subject should be able to
- identify the needs of engineering solutions in medicine
- apply methodological knowledge, models and subject-specific knowledge in biomedical engineering
- use and synthesize knowledge from previous courses and to seek information outside the area of biomedical engineering which can be applied to new areas
- make engineering judgments with regard to the work of relevant scientific, social and ethical aspects
- show the ability to plan, implement and report a thesis work
- implement a project charter to a specification
- plan, document and execute a project with efficient use of material and human resources
- professionally present results orally and in writing within specified time and project frameworks
- critically examine and discuss the writing and orally presented work in the candidate's work
- reflect on a project work and suggest improvements
- actively contribute to well organized project teams
- describe and explain the ethical challenges related to the engineering profession and to technological development.
- apply basic normative ethical theories, principles and concepts to concrete cases and situations.

Course content

Projects: The project may cover areas such as medicine, material science, construction theory, physics, optics, electronics, signals, systems and models etc. The customer initiate the projects. The project group follows the project model CDIO. Independent thesis work established in parallel to the project as a resource.

Teaching and working methods

The course consists of lectures, seminars, project work, written and oral reporting. The project work is done in groups of 5-6 students. The project group will have a supervisor during the project and together with the domain experts in the field act as support. Each group is assigned to a specific project task and a teacher acting as a customer. The customer presents a specification of the project task to the project group. From this specification the group will make a project plan and perform a project work according to the project model LIPS. The work is well documented in a written report and presented orally to the customer. At the end of the course the work is also presented for the other students at a project conference. An independent thesis work is implemented in parallel with the project and this is provided to the project as a project resource.

The course runs the entire spring semester.

Examination

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Type</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRA1</td>
<td>Project assignment</td>
<td>U, G</td>
<td>11 credits</td>
</tr>
<tr>
<td>UPG1</td>
<td>Written Report</td>
<td>U, G</td>
<td>2 credits</td>
</tr>
<tr>
<td>UPG2</td>
<td>Ethics</td>
<td>U, G</td>
<td>1.5 credits</td>
</tr>
<tr>
<td>UPG3</td>
<td>Presentation and Opposition</td>
<td>U, G</td>
<td>1.5 credits</td>
</tr>
</tbody>
</table>

Grades are given as 'Fail' or 'Pass'.
Grades
UG-two grade scale, U, G

Other information

Supplementary courses
Biomedical Engineering - Project Course

Subject area
Other Subjects within Technology

Department
Institutionen för medicinsk teknik

Director of Studies or equivalent
Marcus Larsson

Examiner
Göran Salerud

Course website and other links
https://www.imt.liu.se/edu/courses/TBMT41/

Education components
Preliminary scheduled hours: 128 h
Recommended self-study hours: 299 h

Course literature
Books

ISBN: 9789147089826
Common rules

Course syllabus

A syllabus has been established for each course. The syllabus specifies the aim and contents of the course, and the prior knowledge that a student must have in order to be able to benefit from the course.

Timetabling

Courses are timetabled after a decision has been made for this course concerning its assignment to a timetable module. A central timetable is not drawn up for courses with fewer than five participants. Most project courses do not have a central timetable.

Interrupting a course

The vice-chancellor’s decision concerning regulations for registration, deregistration and reporting results (Dnr LiU-2015-01241) states that interruptions in study are to be recorded in Ladok. Thus, all students who do not participate in a course for which they have registered must record the interruption, such that the registration on the course can be removed. Deregistration from a course is carried out using a web-based form: www.lith.liu.se/for-studenter/kurskomplettering?l=sv.

Cancelled courses

Courses with few participants (fewer than 10) may be cancelled or organised in a manner that differs from that stated in the course syllabus. The board of studies is to deliberate and decide whether a course is to be cancelled or changed from the course syllabus.

Regulations relating to examinations and examiners

Details are given in a decision in the university’s rule book: http://styrdokument.liu.se/Regelsamling/VisaBeslut/622678.
Forms of examination

Examination

Written and oral examinations are held at least three times a year: once immediately after the end of the course, once in August, and once (usually) in one of the re-examination periods. Examinations held at other times are to follow a decision of the board of studies.

Principles for examination scheduling for courses that follow the study periods:

- courses given in VT1 are examined for the first time in March, with re-examination in June and August
- courses given in VT2 are examined for the first time in May, with re-examination in August and October
- courses given in HT1 are examined for the first time in October, with re-examination in January and August
- courses given in HT2 are examined for the first time in January, with re-examination at Easter and in August.

The examination schedule is based on the structure of timetable modules, but there may be deviations from this, mainly in the case of courses that are studied and examined for several programmes and in lower grades (i.e. 1 and 2).

- Examinations for courses that the board of studies has decided are to be held in alternate years are held only three times during the year in which the course is given.
- Examinations for courses that are cancelled or rescheduled such that they are not given in one or several years are held three times during the year that immediately follows the course, with examination scheduling that corresponds to the scheduling that was in force before the course was cancelled or rescheduled.
- If teaching is no longer given for a course, three examination occurrences are held during the immediately subsequent year, while examinations are at the same time held for any replacement course that is given, or alternatively in association with other re-examination opportunities. Furthermore, an examination is held on one further occasion during the next subsequent year, unless the board of studies determines otherwise.
- If a course is given during several periods of the year (for programmes, or on
different occasions for different programmes) the board or boards of studies determine together the scheduling and frequency of re-examination occasions.

Registration for examination

In order to take an examination, a student must register in advance at the Student Portal during the registration period, which opens 30 days before the date of the examination and closes 10 days before it. Candidates are informed of the location of the examination by email, four days in advance. Students who have not registered for an examination run the risk of being refused admittance to the examination, if space is not available.

Symbols used in the examination registration system:

** denotes that the examination is being given for the penultimate time.

* denotes that the examination is being given for the last time.

Code of conduct for students during examinations

Details are given in a decision in the university’s rule book: http://styrdokument.liu.se/Regelsamling/VisaBeslut/622682.

Retakes for higher grade

Students at the Institute of Technology at LiU have the right to retake written examinations and computer-based examinations in an attempt to achieve a higher grade. This is valid for all examination components with code “TEN” and "DAT". The same right may not be exercised for other examination components, unless otherwise specified in the course syllabus.

Retakes of other forms of examination

Regulations concerning retakes of other forms of examination than written examinations and computer-based examinations are given in the LiU regulations for examinations and examiners, http://styrdokument.liu.se/Regelsamling/VisaBeslut/622678.

Plagiarism
For examinations that involve the writing of reports, in cases in which it can be assumed that the student has had access to other sources (such as during project work, writing essays, etc.), the material submitted must be prepared in accordance with principles for acceptable practice when referring to sources (references or quotations for which the source is specified) when the text, images, ideas, data, etc. of other people are used. It is also to be made clear whether the author has reused his or her own text, images, ideas, data, etc. from previous examinations.

A failure to specify such sources may be regarded as attempted deception during examination.

**Attempts to cheat**

In the event of a suspected attempt by a student to cheat during an examination, or when study performance is to be assessed as specified in Chapter 10 of the Higher Education Ordinance, the examiner is to report this to the disciplinary board of the university. Possible consequences for the student are suspension from study and a formal warning. More information is available at https://www.student.liu.se/studenttjanster/lagar-regler-rattigheter?l=sv.

**Grades**

The grades that are preferably to be used are Fail (U), Pass (3), Pass not without distinction (4) and Pass with distinction (5). Courses under the auspices of the faculty board of the Faculty of Science and Engineering (Institute of Technology) are to be given special attention in this regard.

1. Grades U, 3, 4, 5 are to be awarded for courses that have written examinations.
2. Grades Fail (U) and Pass (G) may be awarded for courses with a large degree of practical components such as laboratory work, project work and group work.

**Examination components**

1. Grades U, 3, 4, 5 are to be awarded for written examinations (TEN).
2. Grades Fail (U) and Pass (G) are to be used for undergraduate projects and other independent work.
3. Examination components for which the grades Fail (U) and Pass (G) may be awarded are laboratory work (LAB), project work (PRA), preparatory...
written examination (KTR), oral examination (MUN), computer-based examination (DAT), home assignment (HEM), and assignment (UPG).

4. Students receive grades either Fail (U) or Pass (G) for other examination components in which the examination criteria are satisfied principally through active attendance such as other examination (ANN), tutorial group (BAS) or examination item (MOM).

The examination results for a student are reported at the relevant department.

Regulations (apply to LiU in its entirety)

The university is a government agency whose operations are regulated by legislation and ordinances, which include the Higher Education Act and the Higher Education Ordinance. In addition to legislation and ordinances, operations are subject to several policy documents. The Linköping University rule book collects currently valid decisions of a regulatory nature taken by the university board, the vice-chancellor and faculty/department boards.

LiU’s rule book for education at first-cycle and second-cycle levels is available at http://styrdokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva.

Degree projects (included in Term 6 of study programmes in engineering)

General provisions

All study programmes in engineering (with the exception of the programme in Industrial Engineering and Management – International and the programme in Applied Physics and Electrical Engineering – International) have since 2014 included an obligatory degree project. The project undertaken may also be included as part of the Bachelor of Science (Technology). During Term 6 of each programme, one or several special courses are given that constitute degree projects. The syllabuses of these courses contain course-specific provisions, which are supplemented with the general provisions given below.

Aim

The degree project is to contribute to general and programme-specific objectives of
the study programmes in engineering being achieved. Specific learning outcomes are given in the relevant course syllabus. In addition, the degree project has also the following learning outcomes, which are common to all degree project-based courses at LiTH:

- **Knowledge of the subject**
  After carrying out the degree project, the student is expected to master the following:
  - integrating in a systematic manner the knowledge gained during the period of study
  - applying methodological knowledge and subject-specific knowledge within the main subject area
  - assimilating the contents of relevant technical publications and relating the study to such contents.

- **Personal and professional skills**
  After carrying out the degree project, the student is expected to possess the following skills:
  - formulating research questions and limiting the same, within a specified time schedule
  - seeking and evaluating scientific literature.

- **Working and communicating in a group**
  After carrying out the degree project, the student is expected to possess the following skills:
  - planning, executing and presenting independent work in the form of a project carried out in a group
  - expressing oneself professionally, in writing and orally
  - critically examining and discussing independent work presented in speech and in writing.

- **CDIO engineering fundamentals**
  After carrying out the degree project, the student is expected to master the following:
  - creating, analysing and/or evaluating technical solutions
  - making assessments that consider relevant scientific, societal and ethical aspects.

**Degree projects undertaken while studying abroad**

During study abroad, an individual plan is to be drawn up together with the faculty programme director to determine how the requirements for a degree project in
Commencing a degree project

Before a student commences a degree project, the following requirements must be satisfied:

- The student must have a minimum of 90 credits obtained from courses from Terms 1-4 of the programme (courses taken voluntarily are not counted). This requirement must be satisfied before the end of the third week of study period 2 of the autumn term before the degree project is to be carried out.
- The student must have completed the subject-specific courses listed in the course syllabus for the relevant degree project course. This requirement must be satisfied before the end of the third week of study period 2 of the autumn term before the degree project is to be carried out.
- When assessing whether the requirements have been satisfied, individual decisions (such as those taken in association with admission to subsequent parts of the programme) are to be considered.

Registration for a degree project is carried out during the course registration period 1-10 October in the autumn before the degree project is to be undertaken. Registration is to be made using a special web-based form: www.lth.liu.se/for-studenter/anmalan-till-kandidatprojekt?l=sv.

Forms of examination

The examiner for the degree project is responsible for ensuring that examination takes place as specified by the course syllabus, and, where appropriate, carries out the duties of an examiner for degree projects.

The written report of the degree project corresponds to a degree project for a bachelor's degree. This means that it is to be managed in an equivalent manner with respect to publication, unless special circumstances apply.

The report must be prepared in accordance with principles for acceptable practice when referring to sources (references or quotations for which the source is specified) when the text, images, ideas, data, etc., of other people are used. It is also to be made clear whether the author has reused his or her own text, images, ideas, data, etc. from previous examinations, such as undergraduate work, project reports, etc. (This is sometimes known as “self-plagiarism”.) A failure to specify such sources may
be regarded as attempted deception during examination.

In cases in which several students carry out a degree project together, the contribution of each student is to be specified. The extent of the work for each student is to correspond to that of a degree project. The examiner is to ensure that each student has contributed in a satisfactory manner to the work, and that each student satisfies the requirements for achieving a Pass grade for the degree project.