



Course analysis template

After the course has ended, the course leader fills in this template. This is an important part of the quality assurance of the programme. The programme director decides whether the template should be supplemented with further information/questions.

Course code 4BP044	Course title Product Development in Life Sciences	Credits 11
Semester Spring	Period 15 th January – 18 th March 2024	

Course leader Caroline Dahl	Examiner Madelen Lek
Other participating teachers	Other participating teachers

Number of registered students 31	Number passed after regular session 0	Response rate for course survey (%) 64.52%
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Methods for student influence other than course survey

- 30 minute Drop-in Q&A each week (9 sessions in total)
- Meetings with individual Project teams in order to resolve issues and respond to team queries in a close-knit setting
- 1h scheduled Mid-Course Counsel, followed by a course information update session with immediate feedback on items brought up at Mid-Course Counsel, including edits to course content and structure
- Individuals chose which need to focus on and were grouped into teams accordingly
- Student teams chose their final need definition depending on team interest, background and economic outlook
- Students paired up with two choice course peers (excluding people on their own Project team) and together they chose top five Tech Case technologies that they wanted to investigate. The majority receiver their top ranked technology.
- Email correspondence with individual students

Note that...

This analysis shall (together with a summary of the quantitative results of the students course survey) be submitted to the LIME educational committee.

This analysis have been submitted to the LIME educational committee on this date: 240503



1. Description of any implemented changes since the previous course based on previous students' comments

Implemented changes based on 2023 students' comments (shown in italics)

Feature more stakeholder interviews.

Students were tasked to seek out as many stakeholders as possible and this was explicitly followed up throughout the course, and stakeholder opinion added to Project reports.

Combine Market Analysis and Product Development, both to allow time to visit hospitals ourselves and come up with needs of our own and in terms of teams – more time to develop a good need statement and a solution.

Team formations from MA were allowed and a few teams chose this option.

Observation/immersion would be a fantastic feature, but this requires extra time that is currently not available to these courses. The relevant MA report was appended to the ProDev Project report to combine learnings into the final business plan.

Allow team construction already during Market Analysis to focus the team and make use of time.

Team formations from MA were allowed.

Add one or two general medical doctors as course assistants or as panelists at presentations to ensure correct clinical background to solutions is presented.

Students were tasked to seek out expert clinical stakeholders to get necessary professional insight into their explicit clinical need, rather than general medical doctor input.

Have the ethics workshop in person

The ethics workshop was in person.

Time was too short at KTH for teams to get to work practically

Students were allowed use of the KTH Makerspace workshop in their Projects.

Each group could CAD and 3D-print a prototype

Students were allowed use of the KTH Makerspace workshop in their Projects.

The Tech Case showcase and ideation technology brief were very helpful but the written assignment should be reduced in size, possibly even to the slides used in the showcase.

The written assignment was reduced in size and the team setup was changed to include another person, thereby effectively reducing the text delivery per person.

Remove patentability as a requisite for the Project as our solution IP strategy did not revolve around patenting

Patentability requisite was removed in favour of real-life IP strategy.

Ability to read the literature prior to starting the course.



Canvas was set up and available a month before course start, alongside full reading instructions.

More focus on Need solution than the Project report requisites.

The written Project report was scaled down so that the solution featured more prominently.

Add an engineer to the Expert Panel

An engineer was added to the Expert Panel.

Provide some brief of our project before the Expert Panel consultation, to maximise expert time.

Project overviews that did not require signed NDAs were provided to experts prior to the Expert Panel.

More time per team with each expert during the Expert Panel.

More time per team with each expert during the Expert Panel was scheduled.

2. A brief summary of the students' evaluations of the course

(Based on the students' quantitative answers to the course evaluation and comments.

Quantitative compilation and possible graphs attached.)

Course in general – Qualitative results

The overall mean show that students strongly appreciate the course, and evaluated the 2024 rendition of the course as better than previous years. Marks were high across all questions posed, averaging at 4.59 out of a possible maximum score of 5.0. Grades ranged between 4.3 and 4.8. High-scores of 4.8 were awarded to:

- the teacher's openness to student ideas on course's structure and content
- the good atmosphere during the course
- the psychosocial environment during the course was good (psychosocial environment includes among other things well-being, support, stress, equal treatment and discrimination)

For exact marks per question, see Table 1, below.

Question	2024	2023
In my view, I have developed valuable expertise/skills during the course.	4,7	4,6
In my view, I have achieved all the intended learning outcomes of the course.	4,6	4,6
In my view, there was a common theme running throughout the course – from learning outcomes to examinations.	4,7	4,7
In my view, the course has promoted a scientific way of thinking and reasoning (e.g. analytical and critical thinking, independent search for and evaluation of information).	4,6	4,6
In my view, during the course, the teachers have been open to ideas and opinions about the course's structure and content.	4,8	4,8
I was given the opportunity to reflect on what I have learned during the course.	4,4	4,7
The course developed my ability to search for data and scientific evidence.	4,4	4,6
The course developed my ability to use scientific methods.	4,3	4,5

There was a good atmosphere during the course.	4,8	4,6
The psychosocial environment during the course was good (psychosocial environment includes among other things well-being, support, stress, equal treatment and discrimination)..	4,8	4,6
Relevant ethical issues were discussed during the course.	4,6	4,3
The course helped me prepare to deal with the ethical considerations I might face.	4,4	4,3
In my view, the industry expert feedback session was valuable for the Product Development Project.	4,6	4,2
TOTAL AVERAGE	4,59	4,55

Table 1. Quantitative Student responses to survey questions.

The arguably most general question posed in the course evaluation, “*In my view, I have developed valuable expertise/skills during the course*”, received on average 4.7 out of a maximum possible 5.0 grade, even better than the high score received in 2023. The marks suggest a very good track record for the course.

Course in general – Qualitative results

When asked to say **what they liked about the course**, students mention the range of new topics encountered (in particular the focus on IP and regulatory), the realism of the course (i.e. that it’s not a theoretical course), advice from professionals at the Expert panel, the course organization including its structure with thematic weeks and lastly inclusion of the BioDesign process. The course director also received praise by several students. A few student quotes from the anonymous evaluation are featured in italics below:

Conducting a “real” product development project, which really helps the learning process

To put things in practice! It is definitely not a mere theoretical course, and I would say that this is the best part of it.

The practical knowledge that I gained will be forever useful.

The professionalism, knowledge, support, guidance and organized nature of Caroline that helped us throughout the course.

The atmosphere was very excellent for learning. The lecturer was very supportive and encourage everyone to engage in discussion regardless of you opinion. No form of discrimination or shaming of anyone.

The course was very inclusive and interactive.

This course was the best one so far, program-, schedule-, theme-wise.

The diverse range of guest lectures and experts from various sectors within the field. These professionals not only shared their insights but also actively engaged with us, offering real-world scenarios that enriched our learning experience.



Themes that students mentioned **could be improved** include the brevity of the course, less lectures on Zoom, business lectures and expert panel late in the course, the in-depth nature of some lectures and that teams needed to come up with solutions alone without course-provided tech consultant guidance. Other comments concerned there being too much pharma-content (seemingly unrelated to product development), that some external lecturers from different institutions did not align their slide content better (or even disagreed on facts) or had poor slides, for the Sustainable Development Goals (SDGs) to be incorporated into the whole program, more time to develop the prototype, less time for prototyping, the struggle to find solutions, and concentration failure during full-day presentations.

Brief comments on the above: the course appears too short for its contents because it is, and sometimes that makes for the necessity for scheduling e.g. full days of class/presentations. Analysis was conducted after the end of the course which suggested that contents need to be cut significantly to fit the budgeted time allocated. This will be executed for 2025. Student feedback on topics and external lecturers will inform what is left after the course is reduced.

The majority of external lecturers teach pro bono and if these experts disagree, it's because reality can be complex. As is finding solutions to large global health problems; if it was an easy feat, solutions would exist and be implemented already. Seeing this complexity and difficulty for what it is, is part of learning Life science product development.

Lastly, it would indeed be interesting to see whether the SDGs could be incorporated into the MBE program as a whole – that should be brought up for discussion.

3. The course-responsible reflection on the course implementation and results

Students are generally very positive about the course. Students enjoyed the contents, structure and realism that come with working with real clinical needs, being encouraged to resolve those needs, and meeting the end users face to face. The most frequent negative comment is that the course can be stressful at times. From the course director's point of view, students were inquisitive, interested and well invested in the healthcare needs presented to them.

Course strengths:

Programme course inter-linkage

Creating links to Market Analysis – both in terms of teams and topics – has been vital for students to develop the in-depth knowledge needed to pursue sustainable and relevant solutions. Product Development projects are now also pursued in subsequent economics classes, which has been a success. Programme course linkage is continuously increased and improved.

The course schedule structure where theory is learnt one week and this knowledge is applied to the Project the week after (thus allowing for immediate



applied and deep learning) has been a success. Students comment very positively on this each year.

Projects beyond theory. Sustainable solutions are sought to big global health needs. In concrete terms, need-relevant clinical expertise is sought by students, IP strategy was tackled and scrutinized down to competing claim level, students were encouraged to take course solutions forward professionally, industry professionals gave custom, in-person advice to team solutions with regards to electrical engineering and manufacturing, IP, business as well as regulatory.

Healthcare equality. Health needs that primarily affect women and girls were part of the clinical needs addressed by 2024 teams. The focus on the global SDGs and ethics related to technologies employed in life science also help ensure a broader perspective.

Communication. The course prides itself with excellent communication with participating students. It offers numerous ways to counter course issues and knowledge gaps: publicly in the classroom, in smaller student groups all the way down to communication on an individual basis. Support is offered in person, online and in writing.

Many modes of learning available. Students have access to live lectures, reading materials, slide decks, workshops, project assignments that apply learnt materials, practical prototyping facilities and expert in-person custom feedback and advice.

Relevant guest lecturers. Government bodies, Life Science industry and SMEs all lectured to students. For example, the software director of the Stanford Biodesign author's own spinout spoke to the class from California for the third year in a row, adding global perspective.

Course weaknesses:

Much course material is covered over a relatively short period of time. Students would like to see the course run for longer, giving the students more time to develop sustainable life science solutions to real-life healthcare issues. This is difficult because of Master Program scheduling, where teacher availability, course goals and structure is set in advance by teacher and student representatives, and even other universities' participation come into play.

4. Other comments

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5. The course-responsible conclusions and any proposals for changes

(If any changes are proposed, please specify who is responsible for implementing these and a time schedule.)

The course is highly appreciated by students, but intense, covering a lot of ground. The quantitative feedback suggests that the course improves for each year it's given, and the average course mark – 4,59 out of 5,0 – is up from 4,55 since last year.



Students tackle real-life healthcare needs and are supported in the process by relevant industry, government bodies, SMEs and product development experts from both Europe and the US, plus KI and KS clinical experts and researchers. Students have opportunity to influence the course both during and after the course ended, and are offered help and tuition both on- and offline, in lectures, workshops and during weekly regular Q&A sessions.

Proposals for changes

The 2024 focus is on fitting the course into the allocated MBE program budget.

- **Cut significant parts of the course.** This will be implemented in time for the 2025 course. Proposed changes include:
 - **Scale down the TechCase** hand-in.
 - **Remove the Reflection** assignment.
 - **Remove approximately half of the external lecturers.** Content related to course aims and set examination modules must have priority over inspirational lectures.
 - **Remove the medtech regulatory lecture** and make students read about this topic instead
 - **Only one written exam**, expanded to include both pass and pass with distinction level questions.
 - Also consider...
 - **removing prototyping**
 - **removing learning about big/small molecule distinction** in pharma as this verges on molecular biology rather than product development, as pointed out by a student
 - **removing the patient perspective**
 - **removing *Ethics or Reimbursement*** as not all topics can be tackled if teaching depth is to be allowed elsewhere, e.g. IP and Regulatory. Reimbursement could possibly be tackled in subsequent Economics classes on the program.
- **Look into alternative business plans to allow more diverse, yet economically viable solutions.** Economically sustainable alternatives are needed that allow a full range of student solutions to prosper. This proposal for change is not prioritised due to budget reasons, but a slow course evolution could allow alteration further down the line.
- **Continue increasing the appreciated intra-program course linkage.** As described earlier.
- **Possibility to use Industry need(s)** alongside clinical needs. This would add a sustainability dimension to Product Development since an Industry partner might consider implementing team solutions if they are sufficiently good. This is in discussion with UBE faculty but unlikely to be implemented soon.