Course Guide 2021/2022 Thesis Bioprocess Engineering (BPE)

Course code	BSc thesis Biotechnology: YBT-80824
Credits	24
Weeks	16 weeks
Contact person	Giuseppe Olivieri Giuseppe.Olivieri@wur.nl tel: +31 317 483902
Examiners	Sarah D'Adamo, Maria Barbosa, Mark Bisschops, Iulian Boboesco, Rafael Cubero, Iago Dominguez Teles, Michel Eppink, Marcel Janssen, Antoinette Kazbar, Dirk Martens, Giuseppe Olivieri, Shirley Pomponi, Arjen Rinzema, Ruud Weusthuis, Rene Wijffels
Supervision	Staff, PhD students, Postdocs BPE
Period	All

Introduction

The thesis is an important 'course' in all BSc study programmes. The aim of the thesis is to learn how to perform academic research. An academic will, upon graduation, almost always carry out research regardless his/her profession. Research means the systematic investigation of materials, processes and sources in order to establish facts and reach new conclusions. During your thesis at BPE we will teach you how to do research in a structured way. In this course guide we give you some information on the content of the thesis work at BPE.

Learning outcomes:

After finalizing a thesis at BPE the student is able to:

- Analyse a biotechnological production process and/or the metabolism of a production microorganism
- Identify bottlenecks in the process and/or the metabolic pathways involved
- Perform a literature study on identified bottlenecks
- Formulate a solution strategy to deal with at least one particular bottleneck
- Formulate a hypothesis for the thesis research based on previous research and literature
- Formulate a clear objective for the thesis research
- Formulate the approach to test the hypothesis
- Set-up a work plan for the research and describe the experimental work involved
- Independently carry out the research and the experimental work in a safe way
- Analyse data and translate the data into concise figures and tables
- Critically reflect on the research performed and the data obtained
- Draw clear conclusions from the results obtained
- Formulate recommendations for further research and development
- Effectively discuss research results with supervisors and other experts and co-workers in the field
- Put the research in perspective of other research going on in the bioprocess engineering field.
- Write a clear and well-structured scientific report on the performed research
- Give a clear and well-structured presentation about the thesis research
- Defend the formulated research approach and the results and conclusions obtained

Assumed/prerequisite knowledge

To perform a BSc thesis at BPE, successful completion of BPE22306 Basic Cell Factory Design or BPE21306 Bioreactor Design or BPE20806 Separation Process Design is required prior to the start of the BSc Thesis.

Before starting your thesis project

One month before you intend to start the thesis, you and your supervisor will draw up a contract (thesis agreement form) to determine the content of your thesis, the time schedule, the supervisors, etc. This form needs to be signed by you, your supervisors and your study advisor (your study advisor should state that you are allowed to start your thesis at BPE).

You are also asked to fill out the BPE thesis entry form and send this with a copy of the signed thesis agreement form to the BPE secretary Miranda Berger (Miranda.Berger-at-wur.nl). Based on that she will arrange a workplace, a BPE account and access to the building, etc.

Start of your thesis project

On the first day of your thesis project, your supervisor will introduce you to the chair group. The BPE secretary Miranda Berger will inform you about the organized workplace, account and access to the building.

Normally you start your project by reading literature to increase your background knowledge about the subject. Within 3-4 weeks, you will write **a work-assignment** about the background and the goals of your research. After discussion and adjustment of this document and approval by your supervisor, the work-assignment is distributed among all BPE group members via e-mail. Make sure to include a picture of yourself in the document.

Together with your supervisor you will decide when to start with the actual research. Before you are allowed to enter one of the BPE laboratories, you are obliged to follow **a safety lecture** and to join **a lab tour**. The safety lecture makes you aware of the risks of your activities in the lab and teaches you the rules for safety (contact Sebastian Haemers for a date for this safety lecture and for the lab tour dealing with specific safety issues).

As a thesis student at BPE, you will be assigned to a theme group within the chair group of BPE. Theme group meetings are organized bi-weekly based by the theme leader. This will be announced by email. We expect all theme group members to attend the theme group meetings. You are encouraged to attend the other theme group meetings and be present during the presentations and colloquia of other theme groups.

Oral presentations

After 3-4 weeks, you will give a short introductory presentation (10 mins presentation plus 5 mins for questions) to introduce your research and how you are going to deal with it. At the end of your thesis period, you will give your final presentation, the colloquium (20 mins presentation plus 10 mins for questions) about the final results of your thesis project. Both presentations should be scheduled on Monday afternoon or Tuesday morning and announced at least one week in advance to all BPE members by e-mail.
Your presentations are always reviewed with focus on the content and the presentation technique. Moreover, these presentations are useful for feedback and tips from the audience.

Progress evaluation

Approximately half-way the project, the progress is evaluated by you and the supervisor(s). All aspects of the thesis project (project plan, supervision, performance) are considered. For this the progress evaluation form (which can be found online) is used. The supervisor has to register the outcome (pass or fail) in Osiris. In case of a “fail”, you will have to look for another project and start again. If progress has not been achieved as planned due to other reasons (e.g., illness, problems in supervision), the planning of the rest of the project may need to be adjusted, and new feasible end goals defined.
The progress evaluation is also a good moment to *provide* feedback to your supervisors, for example to discuss any shortcomings in your supervision and agree on improvement.

Assessment strategy

Your thesis will be assessed using a standard thesis assessment form and the standard qualification criteria for a thesis at the BPE department of Wageningen University will be used for the final evaluation.
These can be found at:
http://www.wageningenur.nl/en/Expertise-Services/Chair-groups/Agrotechnology-and-Food-Sciences/Bioprocess-Engineering/Education/BSc-and-MSc-Thesis/Guidelines.htm

Intellectual property right and confidentiality

The intellectual property rights (IPR) of your work belong to the university. If a publication is largely based on your work, you may be involved as author of a paper. If a paper is only partly based on your work, you may be acknowledged in the paper or not, depending on the importance of your contribution. How, when and who publishes, is decided upon by the Bioprocess Engineering group.
You are not allowed to make the results of the thesis public, e.g., on internet (including social media such as Facebook or Linkedin) or by showing the report to potential employers, without prior consent of the staff or supervisor at BPE.

Ethical behaviour

Paying attention to ethics is an important aspect of your academic education, including the various aspects that are relevant for an academic researcher. You always have to be aware that you could run into an ethical dilemma and you be prepared to deal with such a situation. We refer to the Wageningen Code of Conduct for Scientific Practice for guidance. A summary is given in the Appendix.

Appendix: Summary of "The Wageningen Code of Conduct for Scientific Practice"

Principles of good scientific teaching and research

Containing the Netherlands Code of Conduct for Scientific Practice

See also: http://documents.plant.wur.nl/wur/wageningen-code-of-conduct-scientific-practice.pdf

The main aspects described in this code concern: Scrupulousness, Reliability, Verifiability, Impartiality, and Independence

Scrupulousness: Scientific activities are performed scrupulously, unaffected by mounting pressure to achieve.

• Scrupulousness is expressed through precision and nuance in providing scientific instruction and conducting scientific research and the publishing of results thereof.

• Every scientific practitioner demonstrates respect for the people and animals involved in scientific teaching and research.

• Accurate source references serve to ensure that credit is awarded where credit is deserved. This also applies to information gathered via the Internet.

• Authorship is acknowledged. Rules common to the scientific discipline are observed.

• Scrupulousness is not restricted to the transfer of information, but also applies to relations among scientific practitioners and with students.

• Good mentorship is essential: a student and junior staff member are in a position of dependency. The responsibilities of persons involved in teaching and research are clearly defined and observed at all times.

• A scientific practitioner avoids personal relationships that may give rise to reasonable doubt concerning the objectivity of his decisions, or that may result in any form of coercion or exploitation of a hierarchically subordinate person.

• The assessment of study performance is based on explicit criteria that have been announced in advance. Teachers are prepared to explain every assessment, while students are sufficiently aware of the matter on which they will be assessed.

• A scientific practitioner ensures that he maintains the level of expertise required to exercise his duties. He does not accept duties for which he lacks the necessary expertise. If necessary, he actively indicates the limits of his competence

• Damages as a result of errors or negligence are repaired to the best of one's ability.

• A scientific practitioner is co-responsible for the quality of the educational programme in which he provides instruction, and for the scientific and societal value of the research programmes in which he participates. He acts according to his own preferences only insofar as this is reconcilable with this responsibility.

Reliability: Science's reputation of reliability is confirmed and enhanced through the conduct of every scientific practitioner. A scientific practitioner is reliable in the performance of his research and in the reporting, and equally in the transfer of knowledge through teaching and publication.

• The selective omission of research results is reported and justified. The data has indeed been collected. The statistical methods employed are pertinent to the acquired data.

• Speculation spurred by results of scientific research is recognizably presented as such. This does not include conclusions on the basis of the presented results. Suggestions for follow-up research may rest on speculation, in the form of an interpretation of the acquired results.

• The system of peer review can only function on the assumption that intellectual property is recognized and respected.

• A scientific practitioner provides a complete and honest overview of his skills whenever a decision concerning his career or duties is pending.

• In transferring information in education, a selective representation of available knowledge is either avoided or justified. A clear distinction is made between transferred knowledge and personal opinion or related speculation.

Verifiability: Presented information is verifiable. Whenever research results are publicized, it is made clear what the data and the conclusions are based on, where they were derived from and how they can be verified.
• Research must be replicable in order to verify its accuracy. The choice of research question, the research set-up, the choice of method and the reference to sources studied is accurately documented.
• The quality of data collection, data input, data storage and data processing is guarded closely. All steps taken must be properly reported and their execution must be properly monitored (lab journals, progress reports, documentation of arrangements and decisions, etc.).
• Raw research data are stored for at least five years. These data are made available to other scientific practitioners at request.
• Raw research data are archived in such a way that they can be consulted at a minimum expense of time and effort.
• The source of all educational material, including oral information transfer, is stated.

Impartiality: In his scientific activities, the scientific practitioner needs no other interest than the scientific interest. In this respect, he is always prepared to account for his actions.
• Scientific practitioners give others room to take their own intellectual stance. This applies particularly in case of a hierarchical relation, like the relation between a teacher and a student or a tutor and a PhD student.
• The choice of methods and criteria is guided solely by the goal of truth-finding, and not by external goals such as commercial success or political influence.
• A reviewer consults his conscience as to whether he can offer an impartial assessment of a manuscript, for instance when it concerns a competing research group.
• In assessing the performance of others (peer review in education, research and manuscripts), a scientific practitioner heeds arguments of scientific substance. He refrains from assessing a manuscript if he is in any way involved in the education or research concerned.
• A scientific practitioner only defends a certain scientific viewpoint if that viewpoint is based on sufficient scientific grounds. Competing viewpoints must be mentioned and explained.
• Exclusively assigning one's own study books in education is avoided, in any case at undergraduate level.
• In its annual report, every university reports on its registration of sideline activities by its staff. Every university registers the sideline activities relevant to scientific practice. Preferably, this register is made publicly accessible.
• Every scientific practitioner allied with a university provides the institution with an up-to-date overview of his sideline activities for registration purposes.

Independence: Scientific practitioners operate in a context of academic liberty and independence. Insofar as restrictions of that liberty are inevitable, these are clearly stated.
• Whenever a scientific practitioner is commissioned to provide instruction or conduct research, he is allowed - once the parameters have been defined - to execute the assignment without interference by the commissioning party. The research question is of interest to science, aside from the commissioning party's particular concern. The method employed is scientifically valid. The commissioning party has no influence on the research results.
• Commissioned assignments demonstrably contribute to scientific teaching or research.
• There is no unclarity as to the identity of the commissioning party of a certain scientific activity, the relation between the commissioning party and the executing party, the existence of consultancy relations or other connections, etc.
• The publication of scientific research results is guaranteed. Arrangements with an external financier always stipulate that the scientific practitioner is at liberty to publish the results within a specified, reasonable period.
• External financiers of executed projects are identified by name. For research this means that their names are stated in the publication; for education this means that they are referred to in the course announcement and teaching material