Reg. No.: HNT2015/51

Faculty of Health, Science and Technology

Curriculum for Third-Cycle Education in Biology

(Forskarutbildning i biologi)

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Curriculum Approval

The curriculum was approved by the Faculty of Social and Life Sciences 2007-10-24 (Dnr FAK_3 2007/355) and is effective from 2007-11-01.

Revised on 2011-09-07 by the Faculty of Social and Life Sciences.

Revised on 2015-04-24 by the Faculty Board of Health, Science and Technology and is effective from 2015-07-01.

General stipulations for third-cycle education are provided in the *Higher Education Act* and in the *Higher Education Ordinance*. The Licentiate/Doctoral program is offered to the extent permitted by available funding.

1. General Information

Biology is the study of life and involves all levels of organization, from molecular to the ecosystem level. Biology deals with organisms and their environment: their organization, their need and ability to assimilate energy, their ability to reproduce, genetics, growth and development, metabolism, and how organisms respond to their environment and to changes in their environment. Graduate studies in Biology at Karlstad University are primarily focused on ecology and physiology, particularly aquatic, but also include Biology Education.

2. Aims and Objectives

The general objectives of licentiate or doctoral studies in terms of knowledge and understanding, competence and skills, and judgement and approach are specified as follows in the *Higher Education Ordinance, Annex 2, SFS* 2006:1053):

Degree of Licentiate

Knowledge and understanding

*For a **Degree of Licentiate** the third-cycle student shall demonstrate knowledge and understanding in the field of research including current specialist knowledge in a limited area of this field as well as specialised knowledge of research methodology in general and the methods of the specific field of research in particular.*

Competence and skills

*For a **Degree of Licentiate** the third-cycle student shall*

- demonstrate the ability to identify and formulate issues with scholarly precision critically, independently and creatively, and to plan and use appropriate methods to undertake a limited piece of research and other qualified tasks within predetermined time frames in order to contribute to the formation of knowledge as well as to evaluate this work
- demonstrate the ability in both national and international contexts to present and discuss research and research findings in speech and writing and in dialogue with the academic community and society in general,

and
- demonstrate the skills required to participate independently in research and development work and to work autonomously in some other qualified capacity.

Judgement and approach
*For a **Degree of Licentiate** the third-cycle student shall*
- *demonstrate the ability to make assessments of ethical aspects of his or her own research*
- *demonstrate insight into the possibilities and limitations of research, its role in society and the responsibility of the individual for how it is used, and*
- *demonstrate the ability to identify the personal need for further knowledge and take responsibility for his or her ongoing learning.*

Degree of Doctor

Knowledge and understanding
*For a **Degree of Doctor** the third-cycle student shall*
- *demonstrate broad knowledge and systematic understanding of the research field as well as advanced and up-to-date specialised knowledge in a limited area of this field, and*
- *demonstrate familiarity with research methodology in general and the methods of the specific field of research in particular.*

Competence and skills
*For a **Degree of Doctor** the third-cycle student shall*
- *demonstrate the capacity for scholarly analysis and synthesis as well as to review and assess new and complex phenomena, issues and situations autonomously and critically*
- *demonstrate the ability to identify and formulate issues with scholarly precision critically, independently and creatively, and to plan and use appropriate methods to undertake research and other qualified tasks within predetermined time frames and to review and evaluate such work*
- *demonstrate through a dissertation the ability to make a significant contribution to the formation of knowledge through his or her own research*
- *demonstrate the ability in both national and international contexts to present and discuss research and research findings authoritatively in speech and writing and in dialogue with the academic community and society in general*
- *demonstrate the ability to identify the need for further knowledge and*
- *demonstrate the capacity to contribute to social development and support the learning of others both through research and education and in some other qualified professional capacity.*

Judgement and approach
*For a **Degree of Doctor** the third-cycle student shall*

- *demonstrate intellectual independence and disciplinary rectitude as well as the ability to make assessments of research ethics, and*
- *demonstrate specialised insight into the possibilities and limitations of research, its role in society and the responsibility of the individual for how it is used.*

3. Admission Requirements

A person who meets the general admission requirements as well as the specific admission requirements and is judged to have the ability otherwise required for pursuing the program successfully is eligible for admission.

3.1 General eligibility

A person who has earned a master's degree of at least 240 ECTS credits of which at least 60 ECTS credits are studies at master's level, or who in some other way in the country or abroad has acquired largely equivalent knowledge has general eligibility for admission. If there are special reasons for doing so, the faculty board may grant an individual applicant exemption from the general eligibility *(Higher Education Ordinance*, Ch.6).

3.2 Special eligibility

3.2a Special eligibility for admission to the graduate program in Biology

To be eligible for admission to graduate studies in Biology requires that one has at least 120 credits in Biology, including a 30 credit independent research course at the Magister or Master's level.

3.2b Special eligibility for admission to the graduate program in Biology with specialization in Biology Education

To be eligible for admission to graduate studies in Biology with a specialization in Biology Education requires that one has a degree at the advanced level, which consists of courses in natural sciences corresponding to at least 90 credits, including a 15 credit independent research course that is of direct relevance to the graduate program in biology, or has a teaching degree, or the equivalent according to older degree regulations, with at least two years of professional experience as a teacher in biology.

4. Admission Procedure

Applications for admission to doctoral studies are processed in accordance with the procedures prescribed by the Board of Karlstad University.

5. Selection

Candidates will be selected on the basis of their assessed capacity to successfully complete a program at the doctoral level.

6. Content and Outline

The doctoral program can lead to a doctoral or licentiate degree. The licentiate degree requires two years of study, the equivalent of 120 ECTS cr. The doctoral degree requires four years of study, the equivalent of 240 ECTS cr. The studies include coursework and an independent project (licentiate thesis or doctoral thesis).

To earn a licentiate degree, the student is required to complete coursework of at least 30 credits and a thesis of at least 90 credits.

To earn a doctoral degree, the student is required to complete coursework of at least 60 credits and a thesis of at least 180 credits.

6.1 Courses

General university-wide courses shall be included to the extent indicated by local regulations for graduate studies.

General university-wide mandatory courses

För the **licentiate degree**
- The philosophy and history of science, 7,5 hp

För the **doctoral degree (Ph. D.)**
- The philosophy and history of science, 7,5 hp
- Communicating science 4,5 hp

Subject-specific courses

Subject-specific courses for the licentiate degree must include 30 credits and for the Ph.D. 60 credits. The introductory essay and literature course are mandatory courses for the licentiate degree and the Ph.D.

För **the licentiate degree**

The following is required for a licentiate degree in Biology: Introductory essay (7.5 credits) and Literature course (7.5 credits). Credits are also given for courses and participation in conferences, symposia, etc. (7.5 credits). The non-mandatory subject-specific courses (7.5 credits) are chosen in consultation with the examiner and major advisor, based on the graduate student's need for theoretical and practical breadth and depth.

För **the doctoral degree**

The following is required for a Ph. D. in Biology: Introductory essay (7.5 credits) and Literature course (12 credits). Credits are also given for courses and participation in conferences, symposia, etc. (28.5 hp). The non-mandatory subject-specific courses (28.5 credits) are chosen in consultation with the examiner and major advisor, based on the graduate student's need for theoretical and practical breadth and depth.

Description of credit-bearing activities

The *Introductory essay* serves as an introduction to the thesis, and shall be written during the first year of graduate studies. The students summarize and

analyze literature related to their thesis work, thereby gaining an overview of the general state of knowledge within their field of research, and training in critical thinking. The essay can be written in Swedish or English. The essay should be completed during the first year of graduate studies.

The *Literature course* is individually drawn up in consultation with the examiner and major advisor. Normally, the student reads scientific literature, an amount equivalent to three books, and one of these books or its equivalent must include evolution, unless the student has taken a course in evolution during his/her undergraduate education (evolution requirement does not apply to biology education). The aim of the course is to broaden and deepen the student's knowledge in related and relevant subject areas that are outside of the student's thesis area.

The *non-compulsory subject-specific activities* include courses, seminars, conferences, symposia, excursions, etc. Courses at Karlstad University and at other universities, both nationally and internationally, and in other subjects may be appropriate to include in the student's graduate education program. The number of credits is decided by the examiner in consultation with the student and the major advisor. Active participation (presentation or poster) at conferences and symposia lasting two or more days, can after approval by the examiner, be awarded 1.5 credits per conference or symposium, with a maximum total of 4.5 credits for the doctoral degree and 3 credits for the licentiate degree.

The examiner will determine if any of the general university-wide mandatory courses or subject-specific courses can be exchanged for an equivalent course for the licentiate and doctoral degree. Relevant electives are chosen in consultation with the major advisor and examiner

Research seminars are regularly held, and at these seminars the graduate students have opportunities to present, for example, planned experiments for their thesis and articles ready for submission. The students shall give two (licentiate) to four (PhD) presentations and actively participate in discussions at the seminars throughout their graduate studies. Participation in seminars can be awarded with up to 1.5 credits per academic year, with a maximum of three credits in total for a licentiate degree and 6 credits for a Ph. D.

6.2 Licentiate and Doctoral Theses

Third-cycle students are required to write a thesis for a licentiate or a doctoral degree, which must be a compilation (article-based) thesis. The licentiate thesis is to be defended at a licentiate seminar and the doctoral thesis at a public examination. Further information is provided in the policy documents Regulations on the Licentiate Thesis and Regulations on Doctoral Thesis and Public Defence Procedures. The thesis topic for either degree is chosen in consultation with the major advisor and examiner. The thesis and the thesis summary must be written in English.

6.3 Supervision
Admitted students are entitled to advisors in accordance with the principles stated in the current policy document at Karlstad University.

6.4 Individual Study Plan
At the start of the studies, the student shall draw up an individual study plan (ISP) in consultation with the advisors. The plan shall include a realistic estimate of time for course work, thesis work and supervision. The plan shall also include a project description and relevant ethical considerations.

The ISP is drawn up according to the form or system devised by the university.

The individual study plan is subject to continual revision (at least once a year) and shall be revised if changes in time or project plan are required.

Goal attainment in licentiate/doctoral studies shall be monitored on occasions in the course of studies. After one year, an individual qualifications matrix is formulated and attached to the student's individual study plan.

One year before the preliminary date of licentiate degree completion and two years before the preliminary date doctoral degree completion the outcome of the individual qualifications matrix is evaluated when the ISP is followed up. If the evaluation indicates that the goal attainment is not satisfactory, the study plan is revised to ensure that the national requirements are met at the time of the final examination. The revised qualifications matrix is attached to the individual study plan.

6.5 Examination
Licentiate/doctoral students are examined in accordance with the requirements of each individual course syllabus. Doctoral or licentiate theses are examined in accordance with the *Higher Education Ordinance* (Ch.6, sections 40-47) and Karlstad University's current policy document.