Graduate Studies
in
Animal Sciences

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GUIDELINES

GRADUATE STUDY IN ANIMAL SCIENCES

I. OVERVIEW:

The Animal Sciences Department of North Dakota State University offers post-graduate degree programs at the Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) levels. Advanced degrees can be obtained with major emphases in Animal Breeding and Molecular Genetics, Animal Nutrition, Physiology of Reproduction, Nutritional Physiology and Meats. A principle objective of the Animal Sciences Department (referred to as the department herein) is to offer candidates for advanced degrees an opportunity to conduct research and gain the experience needed to complete a discipline-oriented comprehensive academic program. Faculty members of the department are available to assist each graduate student within the department toward the completion of her/his degree. Completion of the Plan of Study, development of the thesis or dissertation problem, and completion of the degree requires interaction between the major advisor and candidate.

Details on the policies, rules, and regulations of the Graduate School are in the NDSU Bulletin Online (https://bulletin.ndsu.edu/graduate/).

II. SELECTION OF AN ADVISOR:

Assignment of a major advisor follows discussion among the graduate student, faculty members in the area of interest, and the department head.

III. RESPONSIBILITIES OF THE MAJOR ADVISOR:

The major advisor will assist the candidate in the selection of a graduate advisory committee and in the formulation of a Plan of Study (list of courses to be taken and when) to best prepare the student for professional situations and opportunities that may arise in the future. Course requirements for graduate students obtaining a degree under the thesis option are listed in the section of "Required, Recommended, and Elective Courses for Animal Sciences Graduate Students under the Thesis Option."

The advisory committee should consist of at least three members for M.S. and four members for Ph.D. degree. At least one member must be a graduate faculty (assistant, associate or full professor) from the Department of Animal Sciences, and one of the members must be appointee of the Graduate School.

For an M.S. degree, the advisory committee should be formed during the term immediately after the major adviser is identified for the student, and members should be identified before the Plan of Study is formulated so all committee members have a chance to contribute to the Plan of Study.
The advisory committee will have at least three members. The members consist of:

1. The major adviser, who must be a full or associate member of the graduate faculty. The student selects the adviser with approval of the program administrator and the Dean of the Graduate School. The major adviser-student relationship must be a mutually acceptable one. The major adviser will act as the chair of the student's advisory committee and will be in charge of the Plan of Study. The remaining members of the committee must be agreed upon by the student, the major adviser, and the Dean of the Graduate School.

2. A second member, who must be a full or associate member of the graduate faculty.

3. A third member, who could be either a faculty member or a qualified off-campus expert in the field. If this committee member is not a full or associate member of the graduate faculty, the approval of the Dean of the Graduate School is required. Approval by the dean requires a recommendation from the program administrator accompanied by rationale and curriculum vitae.

For a Ph.D. degree, the advisory committee should be formed during the term immediately after the major adviser is identified for the student, and members should be identified before the Plan of Study is formulated so all committee members have a chance to contribute to the Plan of Study.

The advisory committee will have at least four members. The members consist of:

1. The major adviser, who must be a full or associate member of the graduate faculty. The student selects the adviser with approval of the program administrator and the Dean of the Graduate School. The major adviser-student relationship must be a mutually acceptable one. The major adviser will act as the chair of the student's advisory committee and will be in charge of the Plan of Study. The remaining members of the committee must be agreed upon by the student, the major adviser, and the Dean of the Graduate School.

2. A second member, who must be a full or associate member of the graduate faculty.

3. A third member, who could be either a faculty member or a qualified off-campus expert in the field. If this committee member is not a full or associate member of the graduate faculty, the approval of the Dean of the Graduate School is required. Approval by the dean requires a recommendation from the program administrator accompanied by rationale and curriculum vitae.

4. The Graduate School appointee, who must be a full member of the NDSU graduate faculty from out-side the student's program. This appointment is made by the graduate dean, but suggestions as to whom the appointee might be are welcome. The role of the Graduate School appointee is to ensure that the student's Plan of Study follows Graduate School guidelines and that other Graduate School policies are observed. The Graduate School appointee also ensures that the expectations for the student's performance are reasonable and
that interactions with the advisory committee are conducted on a professional basis.

Development of the Plan of Study will be a joint effort between the major advisor, the advisory committee and the candidate, seeking to strengthen the candidate's background and provide guidance in areas of future interest and concern. Once a Plan of Study is developed, it must be approved by the major advisor, the advisory committee, the department head, and the Dean of the Graduate School, in that order.

The major professor and the student must decide on a thesis or dissertation problem that is suitable to the abilities of the candidate and which provides new and significant scientific information and lends itself to an orderly set of results such that conclusions can be drawn. The thesis/dissertation problem shall be sufficiently limited in scope such that it can be completed in a reasonable amount of time. This time frame is approximately two years for an M.S. degree and three years for a Ph.D. degree. Exceptions to this time frame routinely occur when the student is employed as a research technician or in another capacity while pursuing their graduate degree. The department may decline to provide continued financial support beyond such time frame to encourage the timely completion of the graduate program by individual students. The major professor shall chair the student's advisory committee. It is required that the student write a thesis/dissertation project proposal with the guidance of the major advisor and then meet with the student's advisory committee to discuss the proposal prior to the initiation of the research.

After completion of the oral examination and thesis or dissertation defense, the major advisor shall aid in making the necessary additions or corrections to the completed thesis, as suggested by the advisory committee before submission of the thesis to the Graduate School for final approval.

IV. GRADUATE STUDENT RESPONSIBILITIES:

A. Coursework

Coursework shall be an initial priority of each graduate student. Students must maintain a GPA of 3.0 or better in graduate level classes as described in the current NDSU Graduate Bulletin. The Plan of Study will be determined on a cooperative basis between the advisor and the student and in such a way that the requirements of the department are met. This Plan of Study should be completed by the end of the second semester of enrollment or earlier.

B. Research

Students should have met with their advisor and the advisory committee by at least the end of the second semester of enrollment to discuss their research program. The research program should be well planned at the beginning and the
pertinent literature reviewed and understood. Before embarking on the research project, the student must submit a written thesis proposal for approval by all members of her/his advisory committee. The proposal should follow the standard format pertinent to the research topic or discipline in question. All graduate students should state what aspects of the project represent original research. The proposal must be signed by the student, the advisor, all members of the advisory committee, and the department head. A copy of the proposal will be kept in the departmental files. Any changes in the proposal must be approved by all members of the advisory committee. Typically, proposals should be 10-25 pages in length, double spaced, using a 12 point font, and include the following: title and signature page, one-page abstract, introduction and background (literature review), objectives, materials and methods, significance of research plan, expected results, timetable and references. The proposal should be written in a style of selected funding agency guidelines (e.g., USDA seed grant or others).

The graduate student should take advantage of opportunities to learn research techniques from others in related areas or disciplines at the institution. The graduate student is expected to be involved in other research projects in the laboratory of the student's major advisor as well.

C. Teaching

A graduate student receiving an assistantship must fulfill teaching assignments as a requirement of her/his degree. Specific teaching assignments will be based on the needs of the course instructor, the abilities and interests of the graduate student, and the approval of her/his major advisor. Graduate students are encouraged to contact the department head and teaching faculty prior to the beginning of the semester if they desire an assignment to a specific course. Teaching assistant assignments will be made by the consent of the course instructor and the major advisor of the graduate student. The course instructor will provide the graduate student an outline of responsibilities and expectations at the beginning of the semester. Following completion of the teaching assignment, an appropriate grade in ANSC 793 will be provided by the course instructor. In addition, the course instructor will perform peer review of teaching skills of the student. A maximum of three credits of ANSC 793 will be accepted for each graduate degree.

D. Financial Support

Graduate research assistantships (and, in some cases, part-time employment) are available on a competitive basis. Most research assistantships are supported from research funds of individual faculty members.

Students receiving financial assistance are responsible for contributing to research activities. All students, whether receiving financial aid or not, must check
with their major advisors before scheduling vacation time.

E. Secretarial Support

As a guideline, if the proposed work is in relation to the student's duties and responsibilities to the department, the student may ask a departmental secretary to assist after consultation with the student's major advisor. If the work is in relation to the student's course work (including thesis) or is the student's personal business, the secretaries have no responsibility to perform the task, are not obliged to do such work, and should not be asked to perform such work.

F. Relationship of Graduate Students to Faculty

Even though a graduate assistant is not a full-time employee of the university, the student is a representative of the university. The student shares in the responsibility for the teaching, research, and service programs of the department while at NDSU and is encouraged to use initiative and resourcefulness in carrying out her/his duties. The student is considered by the public and the undergraduate students to represent the department and, therefore, has a responsibility to exhibit exemplary behavior by her/his dress, speech, and conduct. When a graduate student demonstrates a high set of standards, undergraduates have a tendency to follow her/his leadership example.

In conjunction with research, teaching, and public service activities, graduate students are encouraged to visit with other faculty members and staff in the department and university. Graduate students are also expected to assist with academic activities as requested by other faculty members upon consultation with the student's major advisor.

An orientation meeting for new graduate students is held immediately before the first graduate seminar (ANSC 790) each fall semester. Faculty and returning graduate students are expected to attend.

The university also sponsors several orientation and training activities for graduate students, and students are encouraged to take advantage of these programs when appropriate.

G. Plan of Study

The Plan of Study will be prepared by the student and the major adviser. It shall be approved by the advisory supervisory committee, program administrator, academic dean, and Dean of the Graduate School.

The Plan of Study should be submitted to the Graduate School for approval not later than the term immediately after the advisory committee is formed and must be filed in the Graduate School prior to scheduling the
comprehensive/preliminary examination. Revisions in the program of study must be approved by the student, advisory committee, program administrator, and Dean of the Graduate School. The Graduate Dean will officially notify the student, advisory committee, program administrator, and the academic dean of all changes. Each program has the responsibility of defining the requirements for a major in its disciplinary area. The total credits will be determined by each program but must not be less than 30 semester graduate credits for an M.S. degree, and not fewer than 90 semester graduate credits for a Ph.D. degree.

For the Thesis Based Masters, of the required minimum 30 graduate credits, at least 16 credits must be approved for graduate credit numbered from 601-689, 691; 700-789, 791; 801-889 and 891 while the research credits (798) must be not fewer than 6 nor more than 10 credits. Once these minimum requirements have been met, any other graduate courses can be used to satisfy the remaining Plan of Study requirements. For the Comprehensive Study Based Masters (non-thesis based), of the required minimum 30 graduate credits, at least 21 credits must be completed using courses approved for graduate credit numbered from 601-689, 691; 700-789, 791; 801-889 and 891 while the research credits (797) must be not fewer than 2 nor more than 4 credits.

For a Ph.D. degree, not fewer than 27 credits must be in courses approved for graduate credit numbered 601-689, 691, 700-789, and 791 (referred to as didactic courses). Of these 27 credits, not fewer than 15 credits must be in 700-level course work (700-789 and 791). A student matriculating with a master's degree, including a degree earned at an international institution, must earn not fewer than 60 graduate credits at NDSU. Of these credits, not fewer than 15 credits must be NDSU courses at the 700 level (700-789 and 791). For specific requirements, the student should consult the specific programs.

H. Ph.D. Examination and Candidacy Requirement

A comprehensive/preliminary examination will be required of each student after the greater portion of courses has been completed and any required language proficiency has been certified. This examination consists of a written part and an oral part. Both the written and oral portions should be successfully completed by the end of the student's third year at which time the student is formally admitted to candidacy for the doctoral degree. After passing the comprehensive/preliminary examination, the student will be formally admitted to candidacy for the Doctor of Philosophy degree. At least one academic semester must elapse between the comprehensive/preliminary examination and the final examination.

The final examination will be taken after the candidate has completed the course work and dissertation. This oral examination will be concerned primarily
with the dissertation, but it may also cover material from course work, especially those courses fundamental to the dissertation.

Permission to schedule the comprehensive/preliminary and the final oral examinations must be requested. Permission to schedule the examination must be requested of the Graduate School by the student's major adviser using the Request to Schedule Examination form. The request to schedule must be received by the Graduate School at least two (2) weeks prior to the examination. The notification by the Graduate School will confirm this scheduled examination.

The examining committee shall consist of the advisory committee. The dissertation in a near final form must be given to the committee members at least 7 days prior to the final examination.

At the conclusion of each oral examination, the examining committee shall record, in writing, its approval or disapproval of the candidate and file its report with the Dean of the Graduate School. The committee’s decision filed on the Report of the Final Examination signifies that the student has been examined with respect to the knowledge required in the major area and that all course work has been satisfactorily completed. This form should be filed in the Graduate School within 7 days.

A negative vote by more than one member of the student’s committee will signify failure of either the comprehensive/preliminary examination or the final examination. Upon permission of a majority of the advisory committee members, a candidate is allowed to take each examination twice. The advisory committee will set a date at least one month after the failed examination. Exception to this time limit will be considered by the Dean of the Graduate School upon presentation of written justification from the chair of the advisory committee in consultation with the committee members.

Should both attempts to pass an examination result in failure, the candidate may request to take the examination a third time. A request for a third examination requires the support of the advisory committee and program administrator and the approval of the Dean of the Graduate School after consultation with the Graduate Council.

Continuous enrollment is required until all degree requirements are completed, including submitting final copies.

V. SCHOLASTIC STANDARDS

To be in academic good standing and to receive a graduate degree, a student must have a cumulative grade point average (GPA) of at least 3.0.
All courses taken by a graduate student for which grades are given will be used in calculating the GPA. Credits taken as Satisfactory or Unsatisfactory grading are not used in calculating the GPA. When a course has been repeated, both grades will appear on the transcript, but only the second grade will be used in calculating the GPA. A specific course can be retaken only once, and only three total courses can be retaken.

In fulfilling graduate course requirements on any plan of study, only grades of A, B, or C are acceptable. For master's paper (797), master's thesis (798), and doctoral dissertation (899), only the grade of satisfactory (S) is acceptable. For seminar (790/890), graduate teaching experience (792/892), individual study/tutorial (793/893), practicum/internship (794/894), or field experience (795/895), only grades of A, B, C, or S are acceptable for graduate credit.

Programs and/or supervisory committees may require a higher performance than C in certain courses. While some courses may be used for graduate credit with a grade of C, courses with grades of D, F, or U may not be used for graduate credit. Acquisition of more than two grades of C, D, F or U may be grounds for dismissal upon recommendation by the program administrator.

These minimal scholastic requirements apply to each student enrolled in the Graduate College. Additional requirements may exist for certain graduate programs.

(This section is extracted from the Graduate Bulletin Online (see Graduate School Policies, https://bulletin.ndsu.edu/graduate/graduate-school-policies/).

VI. REQUIRED, RECOMMENDED, AND ELECTIVE COURSES FOR ANIMAL SCIENCES GRADUATE STUDENTS UNDER THE THESIS OPTION:

** For general requirements for M.S. and Ph.D. degrees, consult the NDSU Graduate Bulletin **

I. **Departmental Requirements:**

*Common courses required for **ALL** Animal Sciences graduate students.*

A. **Required courses for M.S. degree**

1. Six credits of statistical courses (e.g., STAT 661, Applied Regression Models; STAT 662, Introduction to Experimental Design; PLSC 724, Field Design I or others, or *equivalents*)

2. One writing and communication course: (1) Tools for academic writing, 1 credit (ENGL 751), (2) Researching and Writing Grants and Proposals, 3 credits (ENGL 659), (3) Writing and Communicating in the Animal Sciences (ANSC 701), or equivalent.
3. ANSC 790 Graduate Seminar (2 credits)
4. For students receiving assistantships, at least 2 credits ANSC 793 IS/Teaching. All graduate students are encouraged to obtain teaching experience each semester.
5. Overall, the student must complete a minimum of 30 semester graduate credits including 16 didactic credits (for details see https://bulletin.ndsu.edu/graduate/graduate-school-policies/masters-program-policies/).

B. Required courses for Ph.D. degree

1. M.S. required statistics courses or equivalents
2. M.S. required writing and communication course or equivalent
3. ANSC 790 Graduate Seminar (3 credits)
4. ANSC 793 IS/Teaching (3 credits)
5. Core/elective courses determined by the student's specific area of Interest.
6. Overall, the student must complete a minimum of 90 semester graduate credits, including at least 27 didactic credits. If the student has a relevant, completed M.S., 30 credits from the M.S. program count towards the 90 total credits (for details see https://bulletin.ndsu.edu/graduate/graduate-school-policies/doctoral-degree-policies/).

II. Recommended Courses:

1) Animal Breeding & Genetics

A. M.S.

1. PLSC 631 Intermediate Genetics (3 cr)
2. ANSC 657 Genetic Improvement of Livestock (3 cr)
3. BIOC 660/661 or BIOC 701 Comprehensive Biochemistry (4 cr)
4. ANSC 758 Molecular Biological Techniques in the Animal Sciences (3 cr)
5. ANSC 750 Quantitative Genetics Applications of Matrix Algebra (1 cr)
6. ANSC 751 A Primer to Quantitative Genetics (1 cr)

B. Ph.D.

1. M.S. requirements or equivalent
2. Selected specific core/elective courses
2) **Meat Sciences and Muscle Biology**

A. **M.S.**

1. ANSC 755 Advanced Meat Science (2 cr)
2. ANSC 793 Individual/Special Topics (2 cr)
3. BIOC 660/661 or BIOC 701 Comprehensive Biochem (4 cr)
4. ANSC644 Livestock Muscle Physiology

B. **Ph.D.**

1. M.S. requirements or equivalent
2. Selected specific core/elective courses

3) **Animal Nutrition**

A. **M.S.**

1. BIOC 660/661 or BIOC 701 (or 702) Comprehensive Biochem (4 cr)
2. Two graduate nutrition courses (6 cr)
3. One graduate physiology course (3 cr)

B. **Ph.D.**

1. M.S. requirements or equivalent
2. BIOC 702 Comprehensive Biochem II (4 cr)
3. One graduate statistics course (3 cr)
4. BOT/BIOL 720 Advanced Cell Biology (3 cr)
5. Selected specific core/elective courses

4) **Physiology of Reproduction**

A. **M.S.**

1. ANSC 728 Advanced Reproductive Biology (3 cr)
2. ZOO 660 Animal Physiology (4 cr) or ANSC 730 Growth Biology (2 cr) or equivalent
3. BIOC 660/661 or BIOC 701 (or 702) Comprehensive Biochem (4 cr)

B. **Ph.D.**

1. M.S. requirements or *equivalents*
2. BIOC 702 Comprehensive Biochem II (4 cr)
3. ZOO 664 Endocrinology (3 cr) or equivalent
4. Selected specific core/elective courses

5) **Nutritional Physiology**

A. **M.S.**

1. BIOC 701 Comprehensive Biochem I or equivalent (4 cr)
2. BIOC 702 Comprehensive Biochem II or equivalent (4 cr)
3. ANSC 776 Digestive Physiology (3 cr),
   BOT/BIOL 720 Advanced Cell Biology (3 cr), or *equivalent*

B. **Ph.D.**

1. M.S. requirements or equivalents
2. Selected specific core/elective courses

6) **Animal Health and Stewardship**

A. **M.S.**

No recommendations

B. **Ph.D.**

No recommendations

VII. **THESIS PREPARATION and FINAL EXAMINATION:**

The preparation of an M.S. or Ph.D. thesis/dissertation in Animal Sciences may follow the traditional format including literature review, materials and methods, results and discussion, and references. However, it may be recommended or required by the major professor that the student pursue a different format to facilitate timely publication of thesis/dissertation results in a refereed scientific journal. Such a format would be organized as follows: a complete literature review of the subject matter of the thesis followed by one or more independent sections, each capable of standing alone as a refereed scientific article. One or more of these chapters would contain the results of the thesis/dissertation research. Each section or chapter would contain an abstract, a short introduction, materials and methods, results, discussion, and literature cited section. The format would be consistent with the editorial policy of the journal for which the article would be submitted for publication. All graduate students are strongly encouraged to work with their advisor towards timely publication of their results in refereed journals.

Following the journal article(s), the student would be expected to include a general discussion section which would serve as a postscript and as a forum for stimulating further hypotheses and for presenting philosophy and discussion not
normally acceptable in the discussion section of a journal article. This section may serve to inform others of problems and pitfalls encountered in the type of research reported. Suggestions for future research may also be included. Following this chapter, the thesis would conclude with a reference or literature cited section to include those references not cited in the submitted paper portion of thesis and any appendix or other (e.g., acknowledgements) sections which might be needed.

A form (Request to Schedule Examination) must be filled with the Graduate School at least 14 days before the scheduled day of the examination. This form must be signed by the adviser, department head, and academic dean. The chair may request to read the disquisition prior to signing the form.

The final oral examination will be taken after the candidate has completed coursework and the dissertation. This oral examination will follow a public seminar (40-50 minutes, including a ~30 minute presentation and question/answer session) covering the dissertation research from the entire program. The oral examination will be concerned primarily with the dissertation, but questions may cover material from coursework, especially those courses fundamental to the dissertation. The candidate will be expected to demonstrate a thorough understanding of all aspects of her/his dissertation including literature survey, experimental design and rationale, and significance of the obtained results.

The department will pay for printing a hard copy of the thesis or dissertation for the department library. The student and/or advisor should inform a designated office staff member that the final copy of the thesis/dissertation was approved by the Graduate School, and immediately provide this final version to the office staff member. Then, the department will order the printed and bound final version of the thesis or dissertation to be stored in the departmental archive.