Genetics: master's and doctorate, CIP Code: 26.0702

The mission of the interdepartmental Genetics Graduate Program at KSU is to educate students with an in-depth knowledge of genetics, the study of the inheritance and function of genes that control all life on earth. Within the Regents System, the KSU Genetics Graduate Program is unique in training geneticists in agricultural science, in plant and animal breeding, and in use of genetic engineering and genome mapping aimed at controlling diseases in crop plants, at increasing crop yield and at producing pest-resistant and drought-resistant crops. Since the state ranks second in total cropland in the US and first among the states in production of wheat and sorghum, the KSU Genetics Program offers critical educational opportunities for Kansas. The KSU Genetics Program also contributes to KSU's strength in the areas ecological and environmental research, in bioinformatics and biomedicine. The centrality of genetics to all disciplines in biological sciences is illustrated by the genetics courses designed and taught for their own majors in the Division of Biology and the Departments of Agronomy, Animal Science and Industry, Biochemistry, Entomology and Plant Pathology. The Genetics Program offers students the opportunity for in depth knowledge across various genetic specialties through genetics courses in multiple departments, as well as specialization in a sub-discipline defined by their major professor.

The Genetics Graduate Faculty includes members from the Departments of Agronomy, Animal Science and Industry, Biochemistry, Entomology, Horticulture and Plant Pathology; the Division of Biology; and the College of Veterinary Medicine. All have chosen to volunteer their time for this program. Genetics faculty are internationally-recognized researchers and teachers who are receiving external research funding and publishing in prestigious journals. Five of the 29 faculty are University Distinguished Professors, and many have won state, national and international awards. Numerous students apply to the program based on the international reputations of the faculty.

The Genetics Program is training geneticists who are highly competitive for academic, governmental and industrial jobs within the state, region and nation. Genetics M.S. students graduate with at least one publication resulting from their research, and Ph.D. students graduate with 2 to 5 publications. Poster presentations by genetics students range up to 11, and senior students have given 2 or 3 invited talks at national meetings.

Opportunities for students with advanced Genetics degrees remains high. Students graduating in the last 3 years with M.S. degrees have obtained high paying jobs in industry, and with Ph.D. degrees have obtained post-doctoral positions at excellent universities, industry research positions and positions as Assistant Professors at the University of Georgia and North Carolina State University. KSU Genetics graduates are now full professors at Washington State University, the University of Wisconsin, Colorado State University and Purdue University.

The Genetics Program is a small but high-impact program that comes at no extra cost to Kansas State University. All courses taken by genetics students were designed for students in home departments and the course would be taught even without genetics students. Therefore, no additional faculty time is required for Genetics majors, and no special equipment or infrastructure is required. The Genetics Program is an excellent recruiting tool for the university. Many students in other departments were attracted to the Genetics Program and later transferred to these departments. Clearly, maintaining an Interdepartmental Genetics program offering M.S. and Ph.D. degrees provides significant benefits to the university at no additional costs.

Summarized Assessment of Student Learning – M.S., Ph.D.

Student Learning Outcomes:

M.S. SLOs: (1) Understand the basic processes of genetics in prokaryotic and eukaryotic systems, including gene transmission, mutation, expression and regulation, (2) Perform genetic research in an area of specialization. Demonstrate ability to follow instructions; plan and execute experiments; collect information in an organized and timely manner; analyze the data and draw conclusions regarding the hypothesis to be tested, and (3) Develop oral and written communication skills that include the ability to publish research and to communicate the importance and excitement of genetic research to others outside the field, including those with a limited scientific background.

Ph.D. SLOs: (1) Understand the basic processes of classical, molecular, developmental, population and evolutionary genetics and cytogenetics in prokaryotic and eukaryotic systems, including gene transmission, mutation, expression and regulation, (2) Become expert in an area of specialization, conceive and perform original genetic research in this area, and prepare results of the research for

publication in a scientific journal, and (3) Develop oral and written communication skills that include the ability to publish research and to communicate the importance and excitement of genetic research to others outside the field, including those with a limited scientific background.

Results:

The new Genetics core curriculum implemented in the fall of 2004 has had a major impact on the students' understanding of basic genetic processes in microbial, eukaryotic and population genetics.

- For SLO 1:
  - Only 21% of students who joined the program prior to implementation have taken all three courses.
  - Current students who are required to take all three courses are making good progress on completing them. The grades achieved are 40% A, 55% B and 5% C.
  - Seminar grades are an independent measure of a student's skill in genetics, and all students presenting seminars in the 2007-2008 reporting period received a grade of "A".
  - For the M.S. students, the average GPA is 3.74, with the range from 3.32 to 4.00.
  - For the Ph.D. students the average GPA is 3.74, with the range from 3.33 to 4.00.
- For SLO 2:
  - For all students in the program for 2 years or more, 70% have completed their preliminary exams.
  - Evaluation by the major advisor and the student's committee members on both the preliminary exam and the final thesis defense have evaluated students as "highly capable" in the areas assessed, with rare assessments as "capable."
- For SLO 3:
  - M.S. students who have been in the program for more than 2 years have at least one publication
  - For Ph.D. students with over 2 years in the program, the number of publications range from 0 to 5, with the best case including 4 first author publications plus one other.
  - Poster presentations range from 0 for newer students to 11 for a more advanced student.
  - Advanced students have given 2 or 3 invited talks at national meetings.

Actions/Revisions:

The genetics faculty have discussed the assessment results and are satisfied with the indicators assessed and with student productivity. The genetics students are obtaining a significantly broader background in genetics across disciplines and specialties than was true before the core curriculum was adopted in the Fall of 2004.