

# Genomics, Phenomics, and Bioinformatics Doctorate

## Department Information

- **Department Web Site:**  
ndsu.edu/gpb/ (<http://ndsu.edu/gpb/>)
- **Application Deadline:**  
Fall semester international applications - May 1; Spring semester international applications- October 1; Domestic applications must be received at least one month prior to the start of the semester
- **Credential Offered:**  
Ph.D.
- **English Proficiency Requirements:**  
TOEFL iBT 71, IELTS 6; Duolingo 105
- **Program Overview:**  
[ndsu.edu/programs/graduate/genomics-phenomics-and-bioinformatics](http://ndsu.edu/programs/graduate/genomics-phenomics-and-bioinformatics) (<http://ndsu.edu/programs/graduate/genomics-phenomics-and-bioinformatics/>)

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Code	Title	Credits
<b>Functional Genomics</b>		
PLSC 611	Genomics	3
CSCI 732	Introduction to Bioinformatics	3
PLSC 721	Genomics Techniques (or)	2
or BIOC 674	Methods of Recombinant DNA Technology	
796 Current Topics (1 credit, 3 semesters)		3
790 Graduate Seminar (1 credit, 2 semesters)		2
<b>Requested Core Courses (unless in M.S. transcript)</b>		
PLSC 631	Intermediate Genetics	3
STAT 726	Applied Regression and Analysis of Variance	3
Graduate Evolution Course		
Electives: At least one course from three elective areas		15
899 Doctoral Dissertation		up to 90

Code	Title	Credits
<b>Bioinformatics Option</b>		
PLSC 611	Genomics	3
CSCI 732	Introduction to Bioinformatics	3
CSCI 859	Computational Methods in Bioinformatics	3
796 Current Topics (1 credit, 3 semesters)		3
790 Graduate Seminar (1 credit, 2 semesters)		2
Required Core Courses (unless in M.S. transcript)		
CSCI 679	Introduction to Data Mining	3
CSCI 765	Introduction to Database Systems	3
STAT 661	Applied Regression Models	3
Electives: At least one course from three elective areas		15

899 Doctoral Dissertation	up to 90
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Code	Title	Credits
<b>Phenomics Option</b>		
CSCI 679	Introduction to Data Mining	3
ABEN 747	Numerical Modeling of Environmental and Biological Systems	3
Physiology Course		3
796 Current Topics (1 credit, 3 semesters)		3
790 Graduate Seminar (1 credit, 2 semesters)		2
STAT 726	Applied Regression and Analysis of Variance	3
CSCI 765	Introduction to Database Systems	3
Electives: At least one course from three elective areas		15
899 Doctoral Dissertation		up to 90

Code	Title	Credits
<b>Physiology Electives</b>		
ANSC 663	Physiology of Reproduction	3
BIOL 662	Physiological Ecology	3
BIOL 664	Endocrinology	3
BIOL 683	Cellular Mechanisms of Disease	3
BIOL 825	Biology of Aging	3
MICR 650		3
MICR 680	Microbial Physiology	3
MICR 785		3
PPTH 751	Physiology Of Plant Disease	3
PLSC 686	Applied Crop Physiology	3
PLSC 750	Crop Stress Physiology	3
PSCI 747	Cardiovascular Pharmacology	3
PSCI 762	Advanced Biopharmaceutics	2
PSCI 765	Cancer Cell Biology	2
<b>Gene Expression Electives</b>		
BIOC 660	Foundations of Biochemistry and Molecular Biology I	3
BIOC 683	Cellular Signal Transduction Processes and Metabolic Regulation	3
BIOC 719	Molecular Biology of Gene Expression and Regulation	3
BIOC 723	Structural Basis of Membrane Transport and Signaling	3
BIOL 682	Developmental Biology	3
BIOL 820	Advanced Cell Biology	3
MICR 775		3
PLSC 731	Plant Molecular Genetics	3
<b>Genetics and Genomics Electives</b>		
ANSC 657		3
ANSC 750		1
ANSC 751		1
ANSC 752		1
BIOL 679	Biomedical Genetics and Genomics	3
BIOL 859	Evolution	3
BIOL 860	Evolutionary Ecology	3
BIOL 862	Environment and Adaptation	3

MICR 681	Microbial Genomics with Computational Laboratory	3
MICR 682	Microbial Genetics	3
PPTH 755	Population Biology of Plant Pathogens	3
PPTH 759	Host-Parasite Genetics	3
PLSC 631	Intermediate Genetics	3
PLSC 741		3
PLSC 751	Advanced Plant Genetics	3
PLSC 782	Population and Quantitative Genetics	4
PSCI 617	Pharmacogenomics	2
<b>Computer Science, Statistics, and Computational Biology Electives</b>		
ANSC 850	Linear Models in Animal Breeding	1
ANSC 851	Genetic Prediction	1
ANSC 852	Applied Variance Component Estimation	1
ANSC 856		1
BIOL 842	Quantitative Biology	3
BIOL 877	Analysis of Population and Demographic Data	3
CSCI 679	Introduction to Data Mining	3
CSCI 724	Survey of Artificial Intelligence	3
CSCI 736	Computational Intelligence	3
CSCI 765	Introduction to Database Systems	3
CSCI 879		3
MATH 630	Graph Theory	3
MATH 636	Combinatorics	3
MATH 830	Graph Theory	3
MATH 839	Topics in Combinatorics and Discrete Mathematics	3
MATH 864	Calculus Of Variations	3
MATH 867	Topics in Applied Mathematics	3
MICR 724		3
PLSC 749	Applied Plant Molecular Breeding	3
PH 674	Epidemiology	3
PH 706	Essentials of Epidemiology	3
PH 731	Biostatistics	3
PH 750	Epidemiologic Methods I	2
PH 752	Epidemiologic Methods II	2
PLSC 724	Field Design I	3
STAT 650	Stochastic Processes	3
STAT 661	Applied Regression Models	3
STAT 711	Basic Computational Statistics using R	3
STAT 712	Applied Statistical Machine Learning	3
STAT 713	Introduction to Data Science	3
STAT 714	Statistical Big Data Visualization	3
STAT 725	Applied Statistics	3
STAT 726	Applied Regression and Analysis of Variance	3
STAT 764	Multivariate Methods	3
STAT 840	Introduction to Statistical Design and Analysis of Gene Expression Experiments	3
STAT 851	Bayesian Statistical Inference	3
STAT 860	Statistical Machine Learning	3
<b>Modeling and Sensing Electives</b>		
ABEN 747	Numerical Modeling of Environmental and Biological Systems	3
ABEN 758	Applied Computer Imaging and Sensing for Biosystems	3
CE 725	Biomaterials-Materials in Biomedical Engineering	3
CSCI 628	Artificial Intelligence, Ethics, and the Environment	3

GEOG 655	Introduction to Geographic Information Systems	4
GEOG 656	Advanced Geographic Information Systems	3
GEOG 665	Remote Sensing of the Environment	3
GEOG 670	Remote Sensing	3
GEOG 680	Geographic Information Systems Pattern Analysis and Modeling	3
PAG 654	Applications of Precision Agriculture	3

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## Admission and Application Requirements

- Graduate School admission and application requirements are found on the Admission Information (<http://catalog.ndsu.edu/graduate/admission-information/>) page.
- In addition, this program requires the following for the Functional Genomics track:
  - a Bachelor of Science (B.S.) degree with an introductory biology class emphasizing molecular biology; with courses in genetics, physiology, biochemistry; an upper-division statistics class.
  - A minimum undergraduate GPA of 3.0.
- The following for the Bioinformatics and Phenomics tracks:
  - a B.S. degree with an introductory biology class emphasizing molecular biology; with courses in calculus, upper-division statistics class, calculus or matrix algebra, and programming language experience.
  - A minimum undergraduate GPA of 3.0.
- Students can be accepted conditionally into any track without meeting the course or GPA requirements, but will be required to meet those requirements while in residency.