

STUDENT HANDBOOK

Department of
Bioinformatics and Biostatistics

**UNIVERSITY OF LOUISVILLE
SCHOOL OF PUBLIC HEALTH AND
INFORMATION SCIENCES**

2010-2011

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FROM THE DEPARTMENT CHAIR

Dear Student:

This handbook has been prepared to acquaint you with the Department of Bioinformatics and Biostatistics at the University of Louisville. It contains policies and procedures and important information you need to know in order to be a successful student.

This publication is meant to be a supplement to the *University of Louisville Graduate School Catalog*. There may be policy or curriculum changes in the handbook that differ from those in the Catalog. In these cases, the Handbook supersedes information in the Catalog. However, all policies and procedures of the Graduate School must be adhered to by all graduate students in the Department of Bioinformatics and Biostatistics. Additional information and University student policies are printed in the *University of Louisville Student Handbook* and the University of Louisville Schedule of Courses, and are available on the University of Louisville website, www.louisville.edu.

It is the student's responsibility to read the Catalog, student handbooks, and official notices to be informed about grades, credits, requirements, and to abide by the regulations of the University of Louisville, the School of Public Health and Information Sciences, and the Department of Bioinformatics and Biostatistics.

Robert J. Esterhay
Associate Professor and Acting Chair
University of Louisville
School of Public Health and Information Sciences
Department of Bioinformatics and Biostatistics
485 E. Gray St Louisville, KY 40202
(502) 852-6135
(502) 852-3294 (FAX)

Department of Bioinformatics and Biostatistics Mission Statement

The Department of Bioinformatics and Biostatistics is dedicated to the proper application of research methods in Bioinformatics, Biostatistics, and Decision Science, and to the training of professionals in each of these areas. This mission consists of three interrelated parts: Education, Research, and Service.

Education

To train professionals in the theory and practice of Bioinformatics, Biostatistics, and Decision Science so that they can contribute statistical, decision-making, and other analytical expertise within academic settings, industry, government agencies, and healthcare organizations.

Research

To advance the disciplines of Bioinformatics, Biostatistics, and Decision Science by conducting primary methodological research in these areas and by collaborating with members of the research community at UofL.

Service

To provide consulting services in Bioinformatics, Biostatistics, and Decision Science to the research community and the UofL Health Sciences Center.

Department of Bioinformatics and Biostatistics Web Page

<http://louisville.edu/sphis/bb>

Contacting Department of Bioinformatics and Biostatistics Faculty or Staff

1. **Telephone Messages:** You may leave a message for a faculty or staff member with the Department of Bioinformatics and Biostatistics assistant (852-1827) or you may leave a voice mail message with individual faculty/staff members at their respective phone extensions.
2. **E-Mail:** All faculty and staff have e-mail accounts and you may communicate with them via e-mail.
3. **Faculty-Staff Mailboxes:** Written messages or materials for faculty/staff may be given to the department assistant who will place the items in the appropriate mailbox.

Department of Bioinformatics and Biostatistics Faculty

Robert J. Esterhay, MD

Associate Professor and Acting Chair
852-6135, bob.esterhay@louisville.edu

Research interests: Health information infrastructure for individual health, health care, and population health; People, organizational, and social issues in health; Network science applications in health; Complex adaptive networks in health; Health transaction cost economics; Social network analysis

Guy Brock, Ph.D.

Assistant Professor
852-3444, guy.brock@louisville.edu

Research interests: The areas of statistical genetics and the analysis of microarray data. Recent projects include developing methods for nonparametric linkage analysis in extended pedigrees, evaluating methods for handling selection bias in linkage studies, and missing value estimation in microarray data. Also interested in developing methods for handling proteomic data.

Somnath Datta, Ph.D.

Professor, Vice-Chair and Ph.D. Program Director
852-6376, somnath.datta@louisville.edu

Research interests: Various topics in Statistics and Biostatistics such as Bioinformatics, Bootstrap Methods, Compound Decision Problems, Empirical Bayes Methods, Nonparametric Function Estimation, Statistical Genetics, Survival Data Analysis, Time Series Analysis etc. Currently working on multistage data that are an important special case of multivariate survival or event time data. Also interested in nonparametric and semiparametric inference procedures for such multistage models. Interested in nonparametric inference procedures for marginal effects in clustered data, such as those arise in longitudinal studies. In the area of Bioinformatics, working on developing novel statistical methods for gene expression and proteomic data.

Susmita Datta, Ph.D.

Professor
852-0081, susmita.datta@louisville.edu

Research interests: Bioinformatics, Biostatistics, Statistical issues in Population Biology, Statistical Genetics, Infectious Disease Modeling and Survival Analysis. Also involved in developing statistical methods for analyzing microarray data. I have been working on the problems of modeling gene expression profiles through partial least squares regression, validation of clustering algorithms for grouping genes and developing various statistical tools for detection of differential gene expression. I am

also actively interested in proteomic data (MALDI-TOF, SELDI) analysis to understand disease etiology (colon, lung cancer etc.). I am involved in collaborative research with interdisciplinary scientists from Biochemistry, Biology, Public Health and Computer scientists.

L. Jane Goldsmith, Ph.D.

Associate Professor

852-8780, jane.goldsmith@louisville.edu

Research interests: Primarily collaborative research in medicine and dentistry. Also interested in statistical methodology research relating to sample size, information theory, nonlinear models, and inter-rater agreement.

Seong Ho Kim, Ph.D.

Assistant Professor

852-3525, s0kim023@louisville.edu

Research interests: Bioinformatics, Proteomics, Bayesian statistics.

Maiying Kong, Ph.D.

Assistant Professor

852-3988, maiying.kong@louisville.edu

Research interests: Parametric and semiparametric response surface modeling in drug interaction; Bioassay; Linear and nonlinear regression; High dimensional splines; Mixed effect models; Generalized linear models; Pre-clinical studies; Early phase studies; PD/PK modeling; Statistical computing.

Steven J. McCabe, M.D., M.Sc.

Assistant Professor

852-3300, smccabe@kkahand.com

Research interests: Clinical research as it relates to hand and upper extremity surgery. Also interested in measuring the results of treatment including the use of outcomes questionnaires and utility measurements. Interested in all aspects of the management of carpal tunnel syndrome. Currently developing an interest in cost-effectiveness analysis in upper extremity surgery.

John A. Myers, Ph.D.

Assistant Professor

852-3986, john.myers@louisville.edu

Research interests: Problems in health care economics and the impact of these problems on public policy and medical guidelines. Examining the theoretical foundations of cost-effectiveness analysis, including such issues as measuring the effectiveness of interventions that have an influence on

two closely linked individuals, more precisely modeling quality adjusted life years gained over time, and the role risk attitudes play in assessing the effectiveness of health care interventions. Another major area of study is investigating the position religiosity and spirituality has in the care of chronically ill patients and patients receiving end of life care. Other work includes examining HIV disease progression, modeling the transition from use of alcohol to dependence of alcohol, and the interrelationship of donor's and recipients during organ transplantation.

Shesh N. Rai, Ph.D.

Professor

852-4030, shesh.rai@louisville.edu

Research interests: Clinical Trials, Cancer Biostatistics

Rudolph S. Parrish, Ph.D.

Professor

852-3283, rudy.parrish@louisville.edu

Research interests: Statistical methods in bioinformatics with applications to high-dimensional biology techniques, statistical computing, clinical trial design, group-sequential methods, linear and mixed-effects models, and modeling. Current activity is in evaluation of statistical methods for analysis of microarray data through simulation approaches and use of genomic biomarkers in clinical trials.

Dongfeng Wu, Ph.D.

Associate Professor and MS Program Director

852-1888, dongfeng.wu@louisville.edu

Research interests: Probability modeling and statistical inferences in periodic cancer screening.

Department of Bioinformatics and Biostatistics Staff

Savitri Appana, M.S.

Biostatistician

852-7676, snappa01@louisville.edu

Lynne Dosker

Administrative Assistant

852-1827, lcdosk01@louisville.edu

Alex Cambon, M.Eng.

Biostatistician

852-4111, accamb01@louisville.edu

Douglas J. Lorenz, M.S.P.H.

Biostatistician

852-3635, Douglas.Lorenz@louisville.edu

Delayed Class Schedule for Bad Weather

Regular University classes follow the Delayed Class Schedule for Bad Weather, which is printed in the Schedule of Courses. Weekend classes may be canceled for bad weather. There is no delayed schedule for weekend classes. Faculty will make special arrangements to make up classes because of the cancellation.

University Holidays and Academic Calendars

In addition to the Calendar of Events, the U of L Web site has other calendars, including "University Holidays," which lists the dates university offices are closed. It is at www.louisville.edu/ur/onpi/infoctr/holidays.htm.

"Academic Calendars" cover the academic year and are located at www.louisville.edu/ur/onpi/infoctr/academic.htm.

Cardinal Card Student ID

www.louisville.edu/campuscard

New students receive a card during orientation. They should take their student ID and a photo ID to the main office in Room 08K of the Houchens Building (on the Belknap Campus) or to the satellite office at the first-floor security station of the Abell Building. Office hours are 8:30 a.m. to 5 p.m. weekdays at the main office and 2 p.m. to 4 p.m. Tuesdays at HSC. Hours will be extended and will include weekends at the beginning of the semester. Call for details.

Catalogs and Course Schedules

Registrar's Office, Houchens, 6522

www.louisville.edu/student/services/registrar

Online catalogs are available at www.louisville.edu/provost/undergrad/catalog, and at <https://graduate.louisville.edu/Programs/graduate-catalog/>. New and returning students with a valid ID can get a copy of the 2007-2008 undergraduate catalog or graduate catalog from the registrar's office, ACCESS office, Office of Admissions, University Bookstore, information centers, Office of Continuing Studies (Shelby Campus) and the Fort Knox Education Center. There is a \$1 charge.

Financial Aid

Financial Aid Office, Houchens, 5511

www.louisville.edu/student/services/fin-aid

When financial aid arrives, students will receive a residual check. They can verify the status of financial aid forms, awards and electronically transferred funds at www.louisville.edu/student/services/fin-aid or they can call the automated voice response system at 2222.

Parking Permits
Department of Public Safety, 7275
www.louisville.edu/admin/dps/parking

Please visit the Department of Public Safety's website for up to date permit prices, parking regulations, and maps.

Tuition Payment
Bursar's Office, Houchens, 6503

Information on tuition rates and payment options is available at www.louisville.edu/admin/bursar/bursttf1.htm.

Postal Services

A postal office is located on the ground level of the HSC Library & Commons Bldg. Hours of operation are 12noon-3pm, Monday through Friday. Phone number is 5339.

Health and Safety

Escort Service
Department of Public Safety, 6111

The DPS provides an on-campus escort service seven days a week from dusk to dawn. Call DPS for an escort.

Health Insurance
6479, [admissions.louisville.edu/orientation/summer/ insurance.html](http://admissions.louisville.edu/orientation/summer/insurance.html)

Student insurance plans include in-patient and outpatient care and spouse and dependent coverage. It is available for students who have no insurance or those who already have hospitalization coverage.

Routine Health Services
Belknap Campus, Health Services Building, 6479; HSC, Ambulatory Care Building, 6446

Student health services provide the same services as a regular physician and can give some prescriptions. Offices are open 8 a.m. to 4:30 p.m. Appointments are preferred.

Emergency Health Services

A student health services practitioner is on call after hours to answer questions via telephone that cannot wait until the next business day. HSC has a protocol for needle sticks that can be initiated over the telephone by calling 6446. If an emergency takes place on campus, call 911 or the campus police at 6111. During office hours, health services can take care of minor on-campus emergencies if the patient can come to the office. When a person needs medical attention after office hours, they should go to an immediate care center that is approved by their insurance carrier or to an emergency room.

HSC Bookstore

The Health Science Center Bookstore, located on the first floor of the K Wing Bldg. (Floyd Street Side), carries textbooks and supplies for courses taught on the HSC campus. Textbooks, lab coats, pens, binders and other supplies are available for purchase. Novelty items, sweatshirts, mugs, bumper stickers, greeting cards, candy and other items are also available. Hours of operation are:

9am-6pm	Monday-Thursday
9am-4:30pm	Friday
11am-3pm	Saturday

Gray's College Bookstore, located at 6565 Second Street off Broadway next door to McDonalds, also carries textbooks and supplies.

Kornhauser Library

The Kornhauser Library, located on the second floor of the Library & Commons Building, is the main library for the HSC campus. Books related to the health sciences, professional journals and periodicals, and other publications are available to students. Hours of operation are:

8am-10pm	Monday-Thursday
8am-6pm	Friday
10am-7pm	Saturday
1pm-9pm	Sunday

Official and Unofficial Transcripts/Records Verification

Students may request official transcripts on-line through the University Registrar's Office. Students may also now print unofficial transcripts on-line. To

request an official transcript, or to print an unofficial transcript, please visit: <http://www.louisville.edu/student/services/registrar/services.htm>
Official transcript requests usually take 3-5 business days to be processed and mailed. Students may also request transcripts by going directly to the Registrar's Office on Belknap campus.

Students may be required to provide proof of good standing for scholarship applications, insurance forms, or to enroll at another school as a visiting student. When these situations occur, you should plan ahead and allow at least 24 hours for request of this nature to be processed. "While you wait service" is not available.

Address/Name Changes

It is the student's responsibility to notify the University of Louisville of any changes in name and/or address. Address, name, and phone number changes can be made by visiting ULink. If you fail to notify the school of your address change, the Department is not responsible for problems that may arise if information we distribute by mail is not received by you.

No Smoking

The Health Science Center campus has been designated as smoke-free. Smoking is not allowed in any office, classroom, or laboratory site on the Health Science Center campus. Smoking is no longer allowed on the Health Sciences Campus, including outdoor areas.

Disability Statement

Students with disabilities, who need reasonable modifications to successfully complete assignments and otherwise satisfy course requirements, are encouraged to meet with the instructor as early as possible to identify and plan specific accommodations. Students may be asked to supply a letter from the Disability Resource Center or other documentation, which will assist in modification planning.

Policy on Work-Restricted Religious Holidays

Federal law and University policy prohibit discrimination on the basis of religious belief. Students who observe work-restricted religious holidays must be allowed to do so without jeopardizing their academic standing in any course. Faculty are obliged to accommodate students' requests for adjustments in course work on the grounds of religious observance, provided that the students make such requests in writing during the first two weeks of term.

The Department of Bioinformatics and Biostatistics Chair must investigate and resolve student complaints arising from alleged faculty failure to make reasonable accommodation under these guidelines.

Note: A calendar of typical work-restricted holidays is available at <http://www.louisville.edu/provost/holidays.html>. This list is not exhaustive. Information about specific holidays is also available by phone from the University Multicultural Center at 8867.

Student Government Association

The purpose of the School of Public Health and Information Sciences Student Association" or "SPHIS Student Association" is to empower the students of SPHIS to make group decisions, take group actions, and participate in governance of SPHIS through an organization that is operated entirely by and for the students of SPHIS.

The intent of the Association is to become a Registered Student Organization in the University of Louisville.

A member of the Association is any student currently enrolled in a degree program in SPHIS, whether full-time or part-time. For a student to be considered currently enrolled, the student must be enrolled in at least one course. A newly enrolled student in a degree program in SPHIS is not a member until the first day of classes for the semester in which the student is first enrolled. If a member leaves the degree program in which he or she is enrolled, he or she is no longer a member.

A member of the Association is any student currently enrolled in a degree program in SPHIS, whether full-time or part-time. For a student to be considered currently enrolled, the student must be enrolled in at least one course. A newly enrolled student in a degree program in SPHIS is not a member until the first day of classes for the semester in which the student is first enrolled. If a member leaves the degree program in which he or she is enrolled, he or she is no longer a member.

Members may:

- Vote in elections or referenda of the Association
- Run for elected positions in the Association
- Serve on SPHIS Council of Chairs and Deans and SPHIS Faculty Forum
- Serve as representative of SPHIS on Graduate Student Council
- Petition for a meeting or vote by entire membership on one or more issue

SPHIS Policy on Academic Dishonesty

Determination of a Violation of Academic Honesty

A violation of academic honesty will be determined solely by the director of the course involved or, in the event that a violation of academic honesty is not related to a specific course, the director of the student's academic program. The information on academic dishonesty presented in the University policy, reproduced below, represents guidelines to help the student understand several major aspects of academic dishonesty. These guidelines cannot exhaustively define academic honesty or dishonesty.

If the student is uncertain whether a planned activity or behavior could be construed as a violation of academic honesty, the student is strongly advised to discuss the matter with the course director or, if applicable, the program director prior to engaging in the activity or behavior.

Absence of Consideration for Ignorance of Policies on Academic Honesty

Students are expected to be familiar with applicable policies on academic honesty. Ignorance of one or more of these policies will neither excuse a violation nor be considered in determining disciplinary actions.

Plagiarism and Electronic Sources of Information

The following is intended to amplify and emphasize the inclusion of electronic sources of information as sources that must be cited as references when material is used from them. Information that is available through the Internet or from other electronic sources is not considered to be common knowledge solely because it is available widely and electronically. Designation of common knowledge is limited to knowledge that is widely known either generally or within a specific field or discipline. If the student is unclear whether an item of information is common knowledge or not, he or she is strongly advised to cite the source.

Disciplinary Procedures for a Violation of Academic Honesty

The course director may take whatever disciplinary action or actions he or she determines to be appropriate in response to a violation of academic honesty. These actions may include, for example, failing the course and denial of retaking the course.

The course director may also recommend to the academic program director that the student be dismissed or expelled from the program, which may be done at the sole discretion of the program director.

If the violation of academic honesty is not related to a specific course, the program director may take whatever disciplinary action he or she determines to be appropriate, including, for example, suspension or dismissal from the program.

Registration Procedures

The University of Louisville ULink course registration system is available at <http://ulinklouisville.edu>. You will need your student ID number, password, and the four digit number assigned to each course in order to add, drop, or exchange courses in ULink. The University has also implemented a touchtone registration system, (502) 852-2222. Students register for courses by phone according to the total number of credit hours and an alphabetic rotation established by the University's Office of Registration. Specific registration instructions will be listed in the Schedule of Courses each semester or available on the web: www.louisville.edu/registar . Students may also register at <http://ulink.louisville.edu>.

Students are required to meet with the Program Directors prior to registration for assistance in course selection. If students have any questions about procedures, they should contact the department assistant Lynne Dosker at 852-1827.

Students who register for courses without having met the prerequisites will have their registration canceled and will be required to re-register on a space available basis. Registrations will also be canceled for continuing students on probationary status who fail to meet with their Program Director prior to registering. Advising holds are placed on all students prior to each semester's open registration period. The hold will be removed after the student receives approval from the Program Directors. Re-registration will be on a space available basis.

Drop/Add Procedures

Students wishing to alter their schedule of courses in any way must make the changes with the University's Office of Registration. Failure to officially withdraw from a course may result in a grade of F.

Students may drop/add at any time during the Early Registration period after their first scheduled time for registration. The touch-tone and ULink systems

may be used for drop/add. See the Schedule of Courses for current instructions for Drop/Add after classes begin.

Students may not withdraw from any course after the published deadline in the Schedule of Courses without the approval of their assigned advisor and Graduate School Dean. The grade report will reflect a grade of "W".

Assistantship students are required to be enrolled full-time (nine hours in both the fall and spring semesters and six hours in the summer) in order to maintain those assistantships. Any student who drops below a full-time course load will have their assistantship pay suspended.

CURRICULUM

The school based M.P.H. Degree program offers a concentration in Biostatistics. The department based masters program provides a concentration in either Biostatistics or Decision Science for the M.S. degrees. The doctoral program in Biostatistics also offers additional emphasis tracks in Bioinformatics and Decision Sciences. Each emphasis at the doctoral level focuses on the respective discipline with regard to coursework, although some electives may be taken by students in the other concentration area.

The Ph.D. program will be available to students who are continuing in the UofL M.S. program or to students entering the program with a master's degree in biostatistics, statistics, decision science, or a related discipline. In conjunction with their advisor, students will develop a plan for completing required and elective courses.

Program of Study

Upon admission to a degree program, a Program of Study will be developed for each student by a faculty advisor and approved by the Department Chair. The Program Director will assume the role of faculty advisor until the student chooses a thesis/dissertation advisor at which point this responsibility will be shifted to the thesis/dissertation advisor. If it becomes clear that a Ph.D. student will be working with a given faculty member prior to forming a dissertation committee, the student may request a change in course advisor by completing the form "Request to Change Academic Advisor" form and having it signed by the Program Director, the new academic advisor, and the Department Chair. Ph.D. students who did not complete the M.S. in the Department of Bioinformatics and Biostatistics may be required to complete additional coursework normally offered in the M.S. program. Decisions regarding additional coursework will be made by the faculty advisor and such courses will become part of the Program of Study. This approach gives maximum flexibility for addressing differing student qualifications and interests.

Master of Public Health

Program Director: Robert R. Jacobs, Ph.D.

Program Administrator: Tammi A. Thomas

Website: <http://louisville.edu/sphis/academics/master-of-public-health.html>

The Master of Public Health (MPH) degree program is a school-based program designed to graduate students each with core competencies in public health and specialized competencies in one of the following concentrations: in biostatistics, environmental and occupational health, epidemiology, health management, and health promotion and behavior.

Please check the above web-site for a description of the current curriculum.

Master of Science in Biostatistics-Decision Science

Program Director: Dongfeng Wu, Ph.D.
Administrative Assistant: Lynne Dosker
Website: <http://louisville.edu/sphis/bb/academics.html>

The M.S. biostatistics-decision science is a 36 credit-hour program including the thesis. Additional hours may be needed for completion of the concentration program.

Coursework

36 total credit-hours of required coursework
24 credit-hours of core coursework
3-6 credit-hours of concentration coursework
6-9 credit-hours of thesis research

Required Coursework			
Semester	Course #	Course Title	Credit - Hours
Fall I	PHEP-501	Introduction to Epidemiology	3
	PHST-661	Probability	3
	PHST-680	Biostatistical Methods I	3
	Semester Total		9
Spring I	PHST-662	Mathematical Statistics	3
	PHST-681	Biostatistical Methods II	3
		Elective course	3
	Semester Total		9
Fall II	PHST-602	Biostatistics-Decision Science Seminar	1
	PHCI-624	Clinical Trials I	2
		Concentration course	3
		Concentration course	3
	Semester Total		9
Spring II	PHST-602	Biostatistics-Decision Science Seminar	1
	PHDA-603	Public Health Practicum I	2
		Concentration course(s)	6
	Semester Total		9
Degree Total			36

Electives

An elective course must be chosen from the following list or as approved by student's faculty advisor.

Electives		
Course #	Course Title	Credit - Hours
MATH 566	Nonparametric Statistics	3
PHCI 605	Survey Research Methods	3
PHCI 622	Case-Control Studies	3
PHCI 623	Cohort Studies	3
PHBI 750	Statistical Methods for Bioinformatics	3
PHEH 600	Introduction to Environmental Health	3

Biostatistics Concentration

Coursework

Biostatistics Concentration Coursework			
Semester	Course #	Course Title	Credit - Hours
Fall II	PHST-683	Survival Analysis	3
	PHDA-666	Master's Thesis Research	3
	Semester Total		6
Spring II	PHST-684	Categorical Data Analysis	3
	PHDA-666	Master's Thesis Research	3
	Semester Total		6
Concentration Total			12

Decision Science Concentration

Coursework

Decision Science Concentration Coursework			
Semester	Course #	Course Title	Credit - Hours
Fall II	PHDA-663	Analysis for Decision Making (cross-listed with IE-643)	3
	PHDA-666	Master's Thesis Research	3
	Semester Total		6
Spring II	PHDA-666	Master's Thesis Research	6
Concentration Total			12

Thesis

To successfully complete the M.S. degree, each student must successfully defend a master's thesis on a topic approved by his or her major professor and thesis committee.

Thesis Committee

Students choose a principal advisor (major professor) and at least two other committee members. One member of thesis committee must be from allied

department in the university. The committee is appointed by the dean of the school upon the recommendation of the program director.

Thesis Preparation

The thesis is to be prepared in format and binding according to the guidelines established by the School of Interdisciplinary and Graduate Studies (SIGS), available at <https://graduate.louisville.edu/pubs/theses-dissertations>.

Thesis Approval

The thesis is to be submitted in completed form to the chair of the thesis committee at least fifteen days before the end of the term in which the candidate expects to be graduated, and the candidate is not eligible for the final oral examination until the thesis has been accepted by the committee.

The thesis committee schedules an oral examination of the candidate, which all faculty and students of the department are invited to attend. This defense is scheduled at the convenience of the members of the thesis committee. The thesis is approved by a majority vote of the committee.

Thesis Distribution

One unbound copy of the thesis, signed by the thesis committee, must be deposited with SIGS before graduation. A copy of the final, signed thesis must also be deposited with the department office.

Doctor of Philosophy in Biostatistics

Program Director: Somnath Datta, Ph.D.
Emphasis Coordinators: Susmita Datta, Ph.D. Bioinformatics
 Steven J. McCabe, M.D., M.Sc. Decision Science
Administrative Assistant: Lynne Dosker
Website: <http://louisville.edu/sphis/bb/academics>

Introduction

Biostatistics involves the development and application of statistical techniques to scientific research in health-related fields, including medicine, epidemiology, and public health. Students in the Ph.D. program receive state-of-the-art training in the latest statistical methodology in order to tackle the challenges associated with the study design and data analysis of modern research conducted in the health sciences. The Ph.D. program provides advanced training in biostatistical theory and methods, with the goal of enabling the student to carry out original research. In addition, students may elect to train with an emphasis on decision science or on bioinformatics.

Biostatistics involves the development and application of statistical methods in research in health-related fields, including public health, medicine, dentistry, and nursing. This program is designed to train students in biostatistics for carrying out research in biomedical fields and in statistical methods used in biomedical research.

Decision science, or formal decision analysis, is an emerging, cutting edge discipline that provides researchers with additional tools with which to develop the clinical and health-care policies and guidelines that affect public health. The decision science emphasis goes beyond traditional decision science programs by providing a mathematically rigorous, interdisciplinary approach to decision-making that is capable of adapting to the ever-changing health care environment. The decision science emphasis provides advanced training in the theory and methods of formal decision analysis, with the goal of enabling students to carry out original research. The focus is on training a well-qualified biostatistician to work within the specialized field of decision science.

Bioinformatics requires the development and application of statistical methods for many of the areas covered by the field, including genomics, proteomics, statistical genetics, and metabolomics. Current biomedical research technologies generate high volumes of data that require extension of existing statistical methodologies and development of new methodologies in order to extract

important information regarding biological processes. The emphasis on bioinformatics is designed to fulfill the expanding need for biostatisticians with advanced training in this area. Students in the bioinformatics emphasis gain a basic understanding of molecular and cellular biology, genetics, and bioinformatics and an in-depth knowledge of statistical theory and methods. Graduates are able to carry out original statistical research in genomics, proteomics, metabolomics, and evolving areas of systems biology.

Students who complete the M.S. program in biostatistics with the Department of Bioinformatics and Biostatistics or who already possess the equivalent of an M.S. in statistics, biostatistics, decision science, or a related discipline may apply for admission to the Ph.D. program.

The Ph.D. program in biostatistics is located in the Department of Bioinformatics and Biostatistics.

Program of Study

Upon admission to the Ph.D. program, a program of study is developed for each student by the faculty advisor and approved by the program director and department chair. Students who did not complete the M.S. program in biostatistics with the Department of Bioinformatics and Biostatistics may be required to complete additional coursework normally offered in the M.S. program. Decisions regarding additional coursework are made by the student's assigned faculty advisor and such courses become part of the program of study. This approach gives maximum flexibility for addressing differing student qualifications and interests.

Curriculum and Degree Requirements

The Ph.D. program in biostatistics is a 34 credit-hour program (minimum beyond a master's degree) including the dissertation. Additional hours may be needed for completion of the program.

Completion of the coursework is the prelude to sitting for the comprehensive examination. Successful completion of the comprehensive examination allows the student to enter doctoral candidacy. A doctoral candidate must then develop and successfully defend a dissertation proposal that describes an original and independent research project. Upon successful defense of the proposal, a student may then proceed to continue dissertation research. Upon successful completion of the research, defense of the dissertation, and demonstration of the required competencies listed below, a student is awarded the Ph.D. degree.

Coursework

34 total credit-hours

25 credit-hours of required coursework

9 credit-hours of elective courses

Required Coursework			
Emphasis (if any)	Course #	Course Title	Credit- Hours
All	PHST-710	Advanced Statistical Computing I	3
	PHST-762	Advanced Statistical Inference	3
	PHST-781	Advanced Linear Models	3
	various	Electives	9
	PHST-703	Doctoral Practicum in Consulting	1
	Subtotal		
No emphasis	PHST-691	Bayesian Statistics	3
	PHST-724	Advanced Clinical Trials	3
	PHST-780	Advanced Nonparametrics	3
	PHST-782	Generalized Linear Models	3
	PHST-783	Advanced Survival Analysis	3
	Subtotal		
Emphasis on decision science	PHDA-690	Utility Theory and Assessment	3
	PHST-691	Bayesian Statistics	3
	PHDA-701	Advanced Medical Decision Making	3
	PHDA-663	Decision Analysis	3
	PHDA-705	Statistical Methods for Cost-Effectiveness Analysis	3
	Subtotal		
Emphasis on bioinformatics	PHBI-751	High-Throughput Data Analysis	3
	CECS-660	Introduction to Bioinformatics	3
	BIOC-545	Advanced Biochemistry I	3
	-OR- MBIO-667	Graduate Cell Biology	3
	PHBI-750	Statistics for Bioinformatics	3
	PHBI-752	Statistical Genetics	3
	Subtotal		
Degree Total			34

The student may be required to take one or more prerequisite courses for a required course if the student does not meet the prerequisites. These prerequisite courses become part of the program of study but are in addition to the number of coursework credit-hours presented above.

Electives

The student must take electives from the following list. The student's program of study specifies the particular courses to be taken.

<i>Electives</i>					
<i>Emphasis</i> *			<i>Course #</i>	<i>Course Title</i>	<i>Credit-Hours</i>
<i>--</i>	<i>D</i>	<i>B</i>			
x	x		PHBI-750	Statistics for Bioinformatics	3
x	x		PHBI-751	High-Throughput Data Analysis	3
x	x	x	PHST-682	Multivariate Analysis	3
x	x	x	PHST-711	Advanced Statistical Computing II	3
x	x	x	PHST-725	Design of Experiments	3
x	x	x	PHST-785	Nonlinear Regression	3
x	x	x	PHST-675	Independent Study in Biostatistics	1-3
x	x		PHBI-752	Statistical Genetics	3
x			PHDA-705	Statistical Methods for Cost-Effectiveness Analysis	3
	x		PHST-724	Advanced Clinical Trials	3
	x	x	PHST-782	Generalized Linear Models	3
		x	PHST-691	Bayesian Statistics	3
		x	PHST-780	Advanced Nonparametrics	3
x	x	x	PHST-704	Mixed Effect Models and Longitudinal Data Analysis	3
		x	CECS-632	Data Mining	3

*Key for emphasis: -- = no emphasis
D = emphasis on decision science
B = emphasis on bioinformatics

The student may be required to take one or more prerequisite courses for an elective course if the student does not meet the prerequisites. These prerequisite courses become part of the program of study but are in addition to the number of coursework credit-hours presented above.

Comprehensive Examination

Upon completion of the required coursework for the Ph.D. degree, a student is eligible to sit for the doctoral comprehensive examinations. Each student must take two exams.

- Exam 1 covers the following topics:
 - Statistical inference
 - Linear models

- Exam 2 covers the following topics, depending on the student's emphasis, if any:
 - No emphasis
 - Student choice of any two of the following:
 - Statistical computing
 - Clinical trials
 - Generalized linear models
 - Survival analysis
 - Emphasis on decision Science
 - Utility theory, assessment, and medical decision making
 - Student choice of one of the following:
 - Bayesian analysis
 - Cost-effectiveness analysis
 - Emphasis on bioinformatics
 - Statistical methods in bioinformatics (including high-throughput methods) and statistical genetics
 - Student choice of one of the following:
 - Bayesian analysis
 - Statistical computing

Dissertation

In order to complete the degree, a candidate must submit and successfully defend a dissertation on a topic approved by his or her major professor and the dissertation committee. Dissertation work may be started following successful completion of doctoral comprehensive examinations.

Dissertation Committee

The dissertation committee is formed by the candidate's proposing a major professor (or principal advisor) and at least four other committee members. One member of the dissertation committee must be external to the Department of Bioinformatics and Biostatistics. The committee is appointed by the dean of the school upon the recommendation of the program director and chair of the department.

Dissertation Proposal (Pre-Dissertation Essay)

A dissertation proposal or pre-dissertation essay is submitted to the major professor and the dissertation committee. The proposal must be approved by a majority vote of the dissertation committee before the candidate undertakes further work on the dissertation.

The dissertation proposal is a typed document not exceeding 25 pages in length excluding topics (v) to (viii), below. The following formatting is used: Times New Roman 12-point font, margins of 1 inch on all sides and 1.5-line spacing throughout the body of the document. The Graduate School dissertation guidelines for citing references must be followed. The document is divided into the following sections and in the following sequence:

- (i) Introduction and Literature Reviews – general introduction to the area of proposed research and relevant literature reviews
- (ii) Specific Aims and Significance – short section describing the specific aims of the proposed research and their potential importance in the field
- (iii) Preliminary Results – summary of the research findings the student already has (e.g., simulation results) towards one or more of the specific aims. This is an important component of the proposal that demonstrates the feasibility of the proposed research by the student.
- (iv) Research Plan – detailed description of the research towards the specific aims to be undertaken during the rest of the doctoral study period
- (v) References – complete references to all the cited literature. Journal names should not be abbreviated
- (vi) Tables – including table headings
- (vii) Figures – one figure per page
- (viii) Appendix – copies (in PDF format) of published articles and preprints that are most relevant to the proposed research

Dissertation Preparation

The dissertation is to be prepared in format and binding according to the guidelines established by the School of Interdisciplinary and Graduate Studies.

Dissertation Approval

The dissertation is submitted in completed form to the dissertation committee at least thirty days before the end of the term in which the candidate expects to be graduated. A candidate is not eligible for the final oral examination until the dissertation has been accepted by the committee.

The dissertation committee schedules an oral examination of the candidate. All faculty and students of the school are invited to attend the presentation portion. The defense is scheduled at the convenience of the members of the dissertation committee. The dissertation must be approved by the full committee.

Dissertation Distribution

One unbound copy of the dissertation, signed by the dissertation committee members, must be deposited with the School of Interdisciplinary and Graduate Studies before graduation. A copy of the final, signed dissertation must also be deposited with the department office.

Applying for Degree

Students are responsible for completing an "Application for Degree" form at the beginning of the semester in which they will defend their thesis or dissertation. These forms can be found at the Graduate School on Belknap Campus in either Jouett Hall or the Houchens Building, or can be obtained from the Department of Bioinformatics and Biostatistics assistant. The form must be submitted to the Graduate School by the due date posted for the respective graduation semester. Future deadline dates can be found on the Graduate Academic calendar at <http://www.louisville.edu/ur/onpi/infoctr/undergrad.htm> .

For any questions or concerns students might have during the semester in which they plan to graduate in, students' best resource is the Graduate School. The Department of Bioinformatics and Biostatistics faculty and staff are also here to advise and assist you with any questions you might have.