Biostatistics Education Programs
Graduate Certificate and Master of Science

Student Handbook
2015-2016

Biostatistics, School of Public Health

OHSU

Portland State
UNIVERSITY

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Last update to this handbook: <mark>*9/30/2015*</mark>

Welcome aboard!

This is an exciting time for the field of biostatistics. Today's interdisciplinary and translational research often produces complex data sets, the interpretation of which typically requires advanced training in biostatistics. Nationally, there is a great need of biostatistics expertise at all levels, making it a very good time to pursue more advanced training in biostatistics. All faculty are here to help, guide, and accompany you on this exciting journey through the sea of Biostatistics study and will do our best for you to be successful wherever your training ultimately takes you.

Our Biostatistics Education Programs

The **Biostatistics Graduate Certificate Program** is designed to provide basic to intermediate graduate level biostatistics trainings for a diverse range of students in health sciences. It is primarily aimed at those wishing to become more skilled applied biostatistics method. Graduates of the certificate program will be equipped with a well-rounded background in applied biostatistics and skills to:

- Perform a broad range of basic and intermediate level applied statistical procedures that are required in basic, clinical, population and translational sciences.
- Interpret and summarize analysis results in research reports and papers and communicate them to individuals with varying degrees of statistical knowledge.
- Conduct analyses for one's own research projects or provide support to collaborative research teams.

Our **Master of Science in Biostatistics program** is designed to provide graduate level training in the application and theory of biostatistics. It is primarily aimed at those wishing to pursue career as an intermediate level biostatistician or apply for doctoral programs in Biostatistics. Our MS program is also appropriate for individuals who have earned a Graduate Certificate in Biostatistics and wish to pursue further training. The program will also be appropriate for some clinical and translational researchers (e.g. K awardees or postdoctoral trainees), students in other Oregon graduate programs, as well as working professionals throughout the state and region (e.g. public health practitioners, laboratory scientists, data managers, database programmers, other research professionals).

The MS in Biostatistics Program will produce high quality graduates wishing to pursue careers as intermediate level biostatisticians or apply for doctoral programs. These individuals will be equipped with a well-rounded background in both theoretical and applied biostatistics. Graduates of our program will be able to:

- Apply intermediate to advanced biostatistics theory and techniques to design, plan, and manage data collection to conduct analysis for student research projects or collaborative research teams.
- Translate broad research goals into specifications and procedures for statistical analysis and interpretation of results in basic, clinical, translational, and public health research studies.
- Select and use appropriate statistical analysis software for assessment, decision-making, and information-sharing (e.g., Stata, SAS, R, or other special programs).
- Communicate statistical methods and findings clearly and unambiguously to specialists and non-specialist audiences.

In addition, we have a **Master of Public Health in Biostatistics program**, which is described here: http://oregonmph.org/content/student-handbooks.

Program Setting

Our Biostatistics Education Programs are housed in the joint OHSU-PSU School of Public Health (SPH). In June, 2015, the Council on Education for Public Health (CEPH) approved our application to become an accredited school of public health. The joint SPH has a diverse body of faculty from OHSU and PSU with expertise covering the core areas of public health and much beyond. The faculty have expertise in biostatistics, epidemiology, international health, women's health, environmental and occupational health, financing and delivery of health care services, cancer epidemiology, substance abuse, social ethics, health policy analysis, and research ethics, and energize extensive teaching, research, and service activities.

The biostatistics group consists of 14 primary faculty, 2 MS level instructors, and 3 affiliated faculty. The faculty provide statistical collaboration, training, and maintain active methodology research in biostatistics and broad interdisciplinary research through collaborations with other investigators. The biostatistics faculty collaborates extensively with OHSU investigators, and the research areas of the faculty include Bayesian analysis, big data and statistical learning, bioinformatics, categorical data analysis, complex sampling, clinical trial design and analysis, epidemiology statistics, hierarchical models, spatial-temporal modeling, statistical computing, statistical genetics and survival analysis (See more information under Section *Biostatistics Faculty*).

In addition to the [Graduate Certificate Program](#) and [MS in Biostatistics](#), biostatistics group also offers a [MPH in Biostatistics](#), and contributes significantly to education and training programs such as the Human Investigators Program, Master of Clinical Research, Master of Bioinformatics, [the Summer Research Training Institute for American Indian and Alaska Native Health Professionals,](#) and the Native Researchers' Cancer Control Training Program.

Finally, the Biostatistics & Design Program (BDP) is one of the OHSU shared resource cores, and is hosted by the Biostatistics group. BDP provides biostatistics support to basic, clinical and population science at all phases of research from grant submission, protocol development, study design to statistical analysis and manuscript preparation. Many biostatistics faculty are involved in BDP, and have PhD and MS level staff providing statistical support and consultation. The BDP handles hundreds of research projects each year and provides many internship opportunities for students. Students could talk to director of BDP, Dr. Jodi Lapidus, for internship opportunities.

Graduate Certificate in Biostatistics Program Requirements

(30 credits total)

Required Coursework

(18 credits total)
- BSTA 511 Estimation and Hypothesis Testing for Applied Biostatistics – 4 credits
- BSTA 512 Linear Models – 4 credits
- BSTA 513 Categorical Data Analysis – 4 credits
- BSTA 514 Survival Analysis – 3 credits **OR** BSTA 519 Applied Longitudinal Data Analysis – 3 credits
- BSTA 510 Biostatistics Lab – 3 credits

Electives

An additional 12 elective credits can be taken from the following:
- BSTA 500 Reading and Research in Biostatistics
- BSTA 504 Topics in Biostatistics - 3 credits
- BSTA 515 Data Management and Analysis in SAS – 3 credits
- BSTA 514 Survival Analysis – 3 credits*
- BSTA 516 Design and Analysis of Surveys – 3 credits
- BSTA 517 Statistical Methods in Clinical Trials – 3 credits
- BSTA 519 Applied Longitudinal Data Analysis – 3 credits*
- BSTA 518 Spatial Data Analysis with Geographic Information *S*ystems (GIS) – 3 credits
- BSTA 522 Statistical Learning and Big Data – 3 credits
- BSTA 523 Design and Analysis of Experimental Designs – 3 credits
- PHPM 512 Epidemiology I – 4 credits
- PHPM 513 Epidemiology II (Methods) – 4 credits
- BMI 550 Computational Biology I – 4 credits
- BMI 551 Computational Biology II – 4 credits

*If not taken as a required course as noted above, can count as an elective

MS in Biostatistics Program Requirements

(48 credits, Comprehensive Exam)

Required courses

(33 credits)
- BSTA 511 Estimation and Hypothesis Testing for Applied Biostatistics – 4 credits
- BSTA 512 Linear Models – 4 credits
- BSTA 513 Categorical Data Analysis – 4 credits
- BSTA 514 Survival Analysis – 3 credits
- BSTA 519 Applied Longitudinal Data Analysis - 3 credits
- BSTA 510 Biostatistics Lab – 3 credits
- BSTA 550 Introduction to Probability - 3 credits
- BSTA 551 Mathematical Statistics I – 3 credits
- BSTA 552 Mathematical Statistics II - 3 credits
- BSTA 517 Statistical Methods in Clinical Trials – 3 credits

Electives

(15 credits)
- BSTA 500 Reading and Research in Biostatistics
- BSTA 504 Topics in Biostatistics - 3 credits
- BSTA 515 Data Management and Analysis in SAS – 3 credits
- BSTA 516 Design and Analysis of Surveys – 3 credits
- BSTA 518 Spatial Data Analysis with Geographic Information *S*ystems (GIS) – 3 credits
- BSTA 522 Statistical Learning and Big Data – 3 credits
- BSTA 523 Design and Analysis of Experimental Designs – 3 credits
- BSTA 521 Bayesian Methods for Data Analysis – 3 credits
- PHPM 512 Epidemiology I – 4 credits
- PHPM 513 Epidemiology II (Methods) – 4 credits
- BMI 550 Computational Biology I – 4 credits
- BMI 551 Computational Biology II – 4 credits
- PSU: STAT 567 Applied Probability 1 – 3 credits
- PSU: STAT 567 Applied Probability 2 – 3 credits
- PSU: Modern Nonparametric Statistics – 3 credits

Academic Procedures and Policies

Academic Advising

Upon entering the biostatistics graduate program each student is assigned an advisor. The advisor's role is to help the student plan a course of study and answer questions about the program. In addition, it is recommended to attend group advising meetings in the fall and spring quarter.

Course Planning

Please consult with your advisor if you would like to review your planned schedule and determine the schedule that fits best for you. We attempt to post the schedule for the entire academic year, but the course schedule is subject to change without notice and the elective offerings for each term are not truly finalized until a week or so before each term's registration period begins. Always refer to the most recent version of the schedule available on our website:
http://www.ohsu.edu/xd/education/schools/school-of-medicine/departments/clinical-departments/public-health/education-programs/courses-and-schedules/index.cfm

For extremely motivated students, it is possible to complete the Graduate Certificate Program in Biostatistics in three quarters. Below is an example schedule:

Fall	Winter	Spring
Estimation and Hypothesis Testing for Applied Biostatistics (4)	Linear Models (4)	Categorical Data Analysis (4)
	Survival Analysis (3)	Design and Analysis of Surveys (3)
Epidemiology I (4)		
	Reading and Research in Biostatistics (1)	Biostatistics Lab (3)
Computational Biology I (4)		

Below is an alternative course scheduled for students who would like to complete the Graduate Certificate Program in Biostatistics in four quarters:

Fall	Winter	Spring	Summer
Estimation and Hypothesis Testing for Applied Biostatistics (4)	Linear Models (4)	Categorical Data Analysis (4)	Statistical Methods in Clinical Trials (3)
	Survival Analysis (3)		
Epidemiology I (4) (or Computational Biology I (4))		Design and Analysis of Surveys (3)	
		Biostatistics Lab (3)	

Below is an example course schedule for students who wish to complete the MS program in two years:

Year	Summer	Fall	Winter	Spring
1st Year		Estimation and Hypothesis Testing for Applied Biostatistics (4) Introduction to Probability (3) Elective*	Linear Models (4) Mathematical Statistics I (3) Elective#	Categorical Data Analysis (4) Mathematical Statistics I (3) Elective&
2nd Year	Statistical Methods in Clinical Trials (3)	Biostatistics Lab (3) Elective(s)**	Applied Longitudinal Data Analysis (3) Survival Analysis (3) Elective##	Elective&&

*PHPM 512 Epidemiology I, or BMI 550 Computational Biology I
#PHPM 513 Epidemiology II, or BMI 551 Computational Biology II
&BSTA 516 Design and Analysis of Surveys
**BSTA 515 Data management and Analysis in SAS, or BTSA522 Big Data and Statistical learning
##BSTA 500 Reading and Research in Biostatistics
&& BSTA 521 Bayesian Methods for Data Analysis, or BSTA 523 Design and Analysis of Experimental Designs (BSTA 523 will be offered in AY 2016 – 2017, currently scheduled for Spring 2017, time subject to change)

Registration
Students register through the online SIS system at https://sisweb.ohsu.edu/SISPRD/twbkwbis.P_WWWLogin. Using this secure, interactive application, students may display grades and unofficial transcripts, view student account information, review any holds, view and/or print class schedules, and register for classes. Instructions are provided on the ISIS website. Detailed registration instructions are found on the website:
http://www.ohsu.edu/xd/education/schools/school-of-medicine/departments/clinical-departments/public-health/education-programs/courses-and-schedules/course-registration.cfm

If you have problems or questions regarding registration, contact our office at phpm@ohsu.edu.

Academic Calendar
The academic calendar is maintained by the Registrar's Office, and it is the student's responsibility to take note of registration periods and deadlines. The calendar can be found here:
http://www.ohsu.edu/xd/education/student-services/registrar/registrar-forms/index.cfm

Tuition and Financial Aid
Tuition and fees are updated annually and posted on the Registrar's website:
http://www.ohsu.edu/xd/education/student-services/registrar/registrar-forms/index.cfm
Students must be enrolled in at least five credits to receive financial aid.

Financial aid applications can be made through the OHSU Office of Student Financial Aid. Assistantships are occasionally available based on faculty grants and needs. Applicants who have completed the Biostatistics series are preferred candidates. Research assistant positions at OHSU are posted on the OHSU HR website (http://www.ohsu.edu/xd/about/services/human-resources/) and occasionally through emails to the student

listservs. Please note that these positions do not come with a tuition waiver, though some positions may be eligible for an employee tuition discount.

Grading and GPA Requirements

Students are assigned letter grades for classes except for Biostatistics Lab, which is graded "pass/fail." Pluses and minuses may be assigned, with the exception of "A+."

All students must maintain a 3.0 GPA. Students may not receive lower than a B- in any course. If lower than a B- is received, the student will need to repeat the course. Students are not permitted to progress through the BSTA 511-513 and BSTA 550-552 sequence unless they achieve at least a B- in each of the classes.

Incomplete grades

Incomplete grades ("I") are strongly discouraged in the Biostatistics programs. If you need to take an incomplete grade in a course for serious unforeseen personal or professional reasons, you should be aware that the Biostatistics programs strictly adhere to the university policy noted below.

An instructor may assign a student an "I" grade when *all* of the following four criteria apply:
   i. Quality of work in the course up to that point is "B-" level or above.
   ii. Essential work remains to be done. "Essential" means that a grade for the course could not be assigned without dropping one or more grade points below the level achievable upon completion of the work.
   iii. Reasons for assigning an "I" must be acceptable to the instructor. The student does not have the right to demand an "I."
   iv. The circumstances must be unforeseen or be beyond the control of the student. An instructor is entitled to insist on appropriate medical or other documentation.

In no case is an "Incomplete" given to enable a student to do additional work to raise a deficient grade. **All incompletes must be resolved by the end of the subsequent term or they will be converted to an F by the Registrar's Office. It is the student's responsibility to make sure the instructor has submitted a Removal of Incomplete form at least 24 hours before the end of the term.** Contact phpm@ohsu.edu for assistance. An Incomplete agreement must be on file with the SPH Office.

Transfer Courses

Students who have previously completed graduate biostatistics coursework may transfer up to 12 credits (Certificate) or 20 credits towards their degree, if the coursework was not applied towards a previously awarded degree or certificate.

Such transfer will be subject to program approval. The Biostatistics program follows OHSU University By-Laws, which state that coursework must not be more than 7 years old at the time of graduation from OHSU). Only classes with grades of B and better can be transferred towards our degrees.

Students enrolled in the MPH degree program in Epidemiology at OHSU may apply the core Biostatistics series (BSTA 511, BSTA 512, and BSTA 513) to both the MPH and the Biostatistics graduate certificate or MS program. These are the only biostatistics courses approved to count toward both the certificate and another degree program. For example, if an MPH student takes the required course Survival Analysis and applies it to their MPH degree, it cannot also count toward the MS degree or the Biostatistics certificate. Other courses would need to be taken to reach the required credits for each program.

All transfer paperwork must be filed by the end of the student's first term in the program. Please contact phpm@ohsu.edu for assistance or questions regarding transferring courses.

Course Waivers

It is understood that some students may have already completed a graduate course that appears to be duplicative of a required course. In such cases, students may petition to waive the requirement to take a specific required course; however, students will still need to take the required number of credit hours for graduation.

For this waiver to be granted, the following guidelines are to be followed:
- Courses must address the learning competencies of the course.
- Courses must be at the graduate or professional program level.
- Courses must be comparable to, or exceed, the credit hours of the Biostatistics Certificate course.
- Courses must have been taken within the last 5 academic years and the grade earned must be the equivalent of a B or better.
- Requests must be accompanied by a copy of the course syllabus or equivalent official detailed description.
- All waivers must be approved by both the Biostatistics Education Program Director and the course instructor who will determine comparability of the previous course with the required certificate course.

A waiver of a required course applies only to the course requirement; it does not apply to waiver of credit hours to complete the program of study toward the MS or the Graduate Certificate in Biostatistics.

Procedure: Students requesting course waivers need to demonstrate the comparability of their previous course to the course instructor. To request a waiver, students must provide a copy of the course syllabus of the equivalent course, a transcript for the course, and any other appropriate supporting documentation to phpm@ohsu.edu.

Arrangement of Reading and Research credits
If you have a topic that you would like to explore in depth outside a regular class, please schedule an appointment with a potential faculty supervisor to discuss your interests. If the faculty member agrees to supervise your work, you can register for the Reading and Research in Biostatistics course (BSTA 500) with this faculty member by submitting a special registration form found on the registrar's website.
You will be expected to define, complete, and submit a proposal to phpm@ohsu.edu. A template may be obtained by emailing the same email address. Please cc' your faculty supervisor and faculty advisor. Your final work products should be submitted to the faculty supervisor at the end of the term, and the faculty supervisor will assign your letter grade.

Leave of Absence & Continuous Enrollment Policies
Policy: A student in good standing may petition for a leave of absence. The cumulative amount of leave may not exceed 4 terms. Leave of absence status assures the student a continuation of admission in the program during the period of the leave of absence. A leave of absence is granted only to students in good standing and may, with program approval, constitute a waiver of the time limit for the completion of the graduate degree. Students who fail to return to the graduate program within 12 months of initiating a leave of absence will be administratively withdrawn from the program. Students on an approved leave of absence do not register for courses and are not required to pay instructional or other fees. Access to university or program facilities and services and use of faculty or staff time will be restricted.

Our program does not require enrollment during the summer, so if you are on an approved leave of absence that takes you through the summer term, the summer term will not count as part of your cumulative leave.

Failure to register without an approved leave of absence will result in an administrative withdrawal of the student's admission to the program. Leave of Absence paperwork cannot be filed retroactively.

Petitioning for a Leave of Absence: Students who are considering a leave of absence should complete the withdrawal/leave of absence form found on the Registrar's webpage and submit it to phpm@ohsu.edu prior to the start of the term of leave. There are many acceptable reasons for obtaining an LOA including medical leave for a physical or psychological issue, birth or adoption of a child less than six years of age, family obligations, research, additional graduate degree, military service, financial hardship, time to study for Boards, and other personal reasons.
The Leave request will include the written or verbal verification of circumstances.
- If the request to interrupt study temporarily is due to a physical or psychological illness, the medical or mental health professional that has been providing treatment to the student will, with the student's

written consent, confirm in writing that a Leave is warranted due to the student's health condition. Please see the Medical Leave of Absence instructions on the JBT Health Center's website.

- For students called to active duty in the military, a copy of the dated notice of induction should accompany the LOA request.

Returning from a Leave of Absence: OHSU has a formal re-admittance procedure that students must complete before returning from Leave. Unless stated otherwise in school policy, a student will submit a letter of intent to return a minimum of 20 business days before the start of the next term. Students returning from a Leave should review the school-level policies on the readmission procedure, including application deadlines for financial aid.

Please refer to the specific instructions from JBT Health if you are returning from a Medical Leave of Absence.

A student is responsible for notifying the OHSU if plans change. The school may administratively withdraw a student from a program if a student does not return by the date provided on the Leave of Absence form.

The University will maintain the confidentiality of all information regarding LOAs in accordance with federal and state law. All records concerning Leaves of Absence are confidential and the official copy of such records shall be retained by the School in which the student was enrolled at the time of the Leave. Access to these records is limited by appropriate federal and state law.

Grievances/Disagreements

Policy: Students may initiate a grievance procedure regarding an issue with a course or the program.

Procedure: Anyone who has a grievance or disagreement about an issue should first discuss the issue with the person perceived to be responsible for the action. The student should provide a written description of the problem in dispute. If this discussion does not satisfy the student, the grievance may be appealed to their graduate faculty advisor. If that discussion does not satisfy the student, an appeal may be made to the Program Director. If this review does not satisfy the student, an appeal may be made to the SPH Dean's Office. At each level of appeal within the track, the student will be provided with a written response to the appeal. The student's written grievance and all responses will be electronically filed.

OHSU students can find more information regarding this process on the internal O2 page at https://o2.ohsu.edu/policies-and-compliance/ohsu-policy-manual/chapter-2-student-affairs/ohsu-policy-02-30-050.cfm.

Time to Degree Completion

A student is entitled to take up to six years (18 terms, excluding summer term) to complete the MS or Graduate Certificate program.

Actions to Take As You Approach Completion of Your Coursework for the Certificate or the MS Program

As you complete your coursework, record your classes in the appropriate course table found in Appendix I of this student handbook. It is good practice to meet with your faculty advisor at least once each academic year to review the courses that you have completed to that point, and to discuss the courses that you will be taking in the near future. You can use this table as the basis of your discussions with your faculty advisor.

In the term before your last term of classes, you must do the following:
1. Notify the Education Office (phpm@ohsu.edu) of your intention to complete your program's requirements;
2. Review your degree audit in ISIS to make sure the University's records is in agreement with your record of courses.
3. Submit the "Application for Degree" form found on the Registrar's web page: http://www.ohsu.edu/xd/education/student-services/registrar/registrar-forms/index.cfm

Comprehensive Test for the MS Program

A student's achievement of program-level competencies will be assessed by a comprehensive test. It is an assessment of the student's ability to integrate statistical knowledge and skills covered from the different courses. Students need to demonstrate mastery of the subject matter, skills of critical thinking and independent problem solving as well as interpretation of results in the context of research question. The comprehensive examination compromises of questions reflective of nine core courses in Biostatistics:

1. BSTA 511 Estimation and Hypothesis Testing for Applied Biostatistics
2. BSTA 512 Linear Models
3. BSTA 513 Categorical Data Analysis
4. BSTA 514 Survival Analysis
5. BSTA 517 Statistical Methods in Clinical Trials
6. BSTA 519 Applied Longitudinal Data Analysis
7. BSTA 550 Introduction to Probability
8. BSTA 551 Mathematical Statistics I
9. BSTA 552 Mathematical Statistics II

The comprehensive exam provides evaluation on both biostatistics theories and applied methods. The exam consists of a written, closed book section with six theoretical and applied questions, as well as a lab section, which contains four data analysis components. Both sections are administered in two four-hour segments on separate days. Each year, students have two opportunities to take the examination: at the end of the summer term or at the end of the spring quarter.

Grading

The comprehensive exam uses a Pass/No Pass grading system, and is based on pre-specified criteria determined by the comprehensive exam committee. Students who do not pass the comprehensive exam on their first attempt will be required to retake exam. Students will be provided information about areas of weakness prior to taking the examination again. A student who fails the second attempt is required to complete a remediation project specified by the faculty advisor and the comprehensive exam committee. Passing the exam or completion of the remediation project is a requirement for graduation.

School of Public Health Resources

Grand Rounds and Other Presentations
The School of Public Health Grand Rounds lecture on various public health topics every third Thursday of each month from 12:00 to 1:00 PM. This lecture series is free and open to the public, and students are encouraged to attend. We hope you will join us—please see department homepage for event details at http://www.ohsu.edu/public-health. Additional presentations may also be offered. Announcements of special events are posted on the website and sent out to department listservs.

Computer Lab
The SPH Computer Lab, CSB 620, has 21 workstations loaded with statistical and Microsoft Office software that you can access 24 hours a day. Your OHSU ID badges will give you access to the building and the room. You may swipe your badge at the keypads on the first, second, and fifth floors of the Campus Services Building. If you notice a problem with one of the workstations, please email phpm@ohsu.edu describing the specific nature of the program and the number of the workstation found on the computer tower so that we may investigate the problem.

Student Lounge
The lounge (CSB 615) is near the computer lab and is also available 24/7 for group study and student meetings. Please email phpm@ohsu.edu if you would like to reserve the lounge or another room on campus, and include:
1. Date of your meeting
2. Time of your meeting
3. Title of your meeting
4. Number of attendees

Biostatistics and Design Program
Finally, the Biostatistics & Design Program (BDP) is one of the OHSU shared resource cores, and is hosted by the Biostatistics group. BDP provides biostatistics support to basic, clinical and population science at all phases of research from grant submission, protocol development, study design to statistical analysis and manuscript preparation. Many biostatistics faculty are involved in BDP, and have PhD and MS level staff providing statistical support and consultation.

Campus Resources

Library

The library (**www.ohsu.edu/library**) is located in the BICC (see campus map on page 19). Students have full access to both the online and physical holdings. Access after 8:00 pm requires an OHSU ID. You can also access electronic journal articles by logging into any OHSU workstation.

If you have questions about library resources, contact:

Laura Zeigen, MA, MLIS, MPH, AHIP
User Experience Librarian | Assistant Professor
Oregon Health & Science University
3181 SW Sam Jackson Park Road - LIB
Portland, Oregon 97239
zeigenl@ohsu.edu | 503-494-0505

Bookstore

OHSU no longer has a physical book store and instead offers all books online: http://www.ohsu.edu/ohsubookstore/. Most books can also be purchased with other online retailers. The Education Office will post a book list on the Courses and Schedules page about a month before the term starts to allow students time to order their books before classes begin.

Fitness and Sports Center

The OHSU Fitness and Sports Center (March Wellness) offers a wide variety of fitness classes, equipment, and programs for students and fitness center members. Full-time OHSU students must present their student ID card with a current term sticker before being admitted to the building. Current stickers can be obtained at the Cashier's Office located in Baird Hall. For more information, please visit their website at http://www.ohsu.edu/academic/acad/fsc/.

OHSU Parking and Transportation Services, (503) 494-8283

Bus passes can be purchased at the Physical Plant where you picked up your ID badge. An annual pass is $318 for TriMet and $384 for C-Tran (as of 8/5/2014). A sticker will be affixed to your badge. If you wish to drive, please note that there is no student parking, so you will have to take your chances with the street parking. The fines for parking in the wrong locations are quite hefty. For more information on parking, buses, and active commuting/biking, please visit http://www.ohsu.edu/parking/.

OHSU Email and H:/ Drives

Please be sure to check your OHSU email frequently, ***even during the summer***, because this is the only email that the various OHSU programs will use to contact you. When you log in to an OHSU workstation, you will also have access to an *H Drive* which is your personal space on the OHSU servers. Please use it only for school-related storage, and be sure to back it up elsewhere prior to graduation. All accounts will be deleted after you graduate. You will receive instructions about how to log into your OHSU account via email before the term begins. If you ever have difficulty logging in, please contact ITG at 4-2222.

Copying and Printing Services

The OHSU Library provides fee-based copier access: http://www.ohsu.edu/xd/education/library/services/copying-and-printing-services.cfm

Course Evaluation System

You will receive an automated notice to complete your course evaluations about one week before the end of the term. The evaluations are administered through Sakai, OHSU's online course management tool to which all students receive access at the beginning of every term. When you receive the notice to complete your course evaluations, please do so as promptly as you can. We look at each and every evaluation on a quarterly basis, and

student feedback is critical as we continue to evaluate and improve our curriculum and teaching. Please note that the evaluations are *anonymous*.

Purchasing statistical software:

With your student ID, you can purchase educational software from the OHSU Library. Here are your purchasing options for the programs used in OHSU biostatistics courses:

Stata
Stata/IC software license prices for students are $98 (annual) or $189 (perpetual). To order a copy for pick up at the university, contact StataCorp directly:
Phone: 800-782-8272 (Monday through Friday 8:00 to 5:00 Central Time)
Fax: 979-696-4601
Online: http://www.stata.com/order/gradplan-sites/#oregon

Be sure to include your OHSU.EDU email address when ordering. Once your order is processed, you will be contacted by a StataCorp sales person with campus pick up times and location. Typically, orders are available for pick up within 2 or 3 business days after the order is placed.

SAS
You can purchase SAS through the OHSU library: http://www.ohsu.edu/xd/education/library/services/sas-software-licensing.cfm. The cost for a single new license is $225, a single license renewal is $150, and installation CDs are available for $60. The license is annual and will expire every November. You may also purchase through SAS directly: http://www.sas.com/nextsteps/index.html,

SPSS
Computers with SPSS software are available in CSB 620 (open 24 hours for OHSU students with student ID badges), the computer lab in SON (nursing students), the medical informatics computer lab (medical informatics students), and the OHSU library (hit and miss, ask at the information desk). If you would like to purchase a Grad Pack or Student Version, you will find copies at the OHSU Campus Store.
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The R Project for Statistical Computing
This is a very popular statistical language that is freely available for Windows, Mac, and Linux computers. (www.r-project.org)

Other Resources:

OHSU Joseph B. Trainer Health & Wellness Center for students: http://www.ohsu.edu/xd/education/student-services/joseph-trainer-health-wellness-center/
OHSU Recreation Center: http://www.ohsu.edu/xd/education/student-services/student-center/recreational-activities/index.cfm
OHSU IT Resources for Students: http://www.ohsu.edu/xd/about/services/information-technology/students/current-student-resources.cfm
OHSU diversity resources for Students (Academic resources, student access, student groups etc): http://www.ohsu.edu/xd/about/vision/center-for-diversity-inclusion/academic-resources/index.cfm
PSU Diversity resources: http://www.pdx.edu/diversity/welcome-our-campus
PSU IT Resources for Students: https://www.pdx.edu/oit/services-support
PSU Career Services: http://www.pdx.edu/careers/for-students
PSU Campus Recreation: http://www.pdx.edu/recreation/home
PSU Library: http://library.pdx.edu/
PSU Student Health and Counseling Center information: http://www.pdx.edu/shac/
Oregon MPH Student Leadership Council: http://oregonmph.org/content/service

Biostatistics Education Program Contact Information

Biostatistics Faculty

Yiyi Chen, PhD
Associate Professor
Areas of interest: Design and analysis of clinical trials, Bayesian statistics

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Phone #: 503.346.0790

Dongseok Choi, PhD
Professor
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Areas of interest: Correlated data, measurement error models, clinical trials, statistical methods of epidemiology, statistical consulting

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Areas of interest: Imaging, glaucoma

Key Administrative Contacts

For administrative issues related to Biostatistics Programs, please contact Natalie Chin or Kristina Mahaffy first.

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See our website for more information about the School of Public Health.

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Department of Biostatistics
3181 SW Sam Jackson Park Road
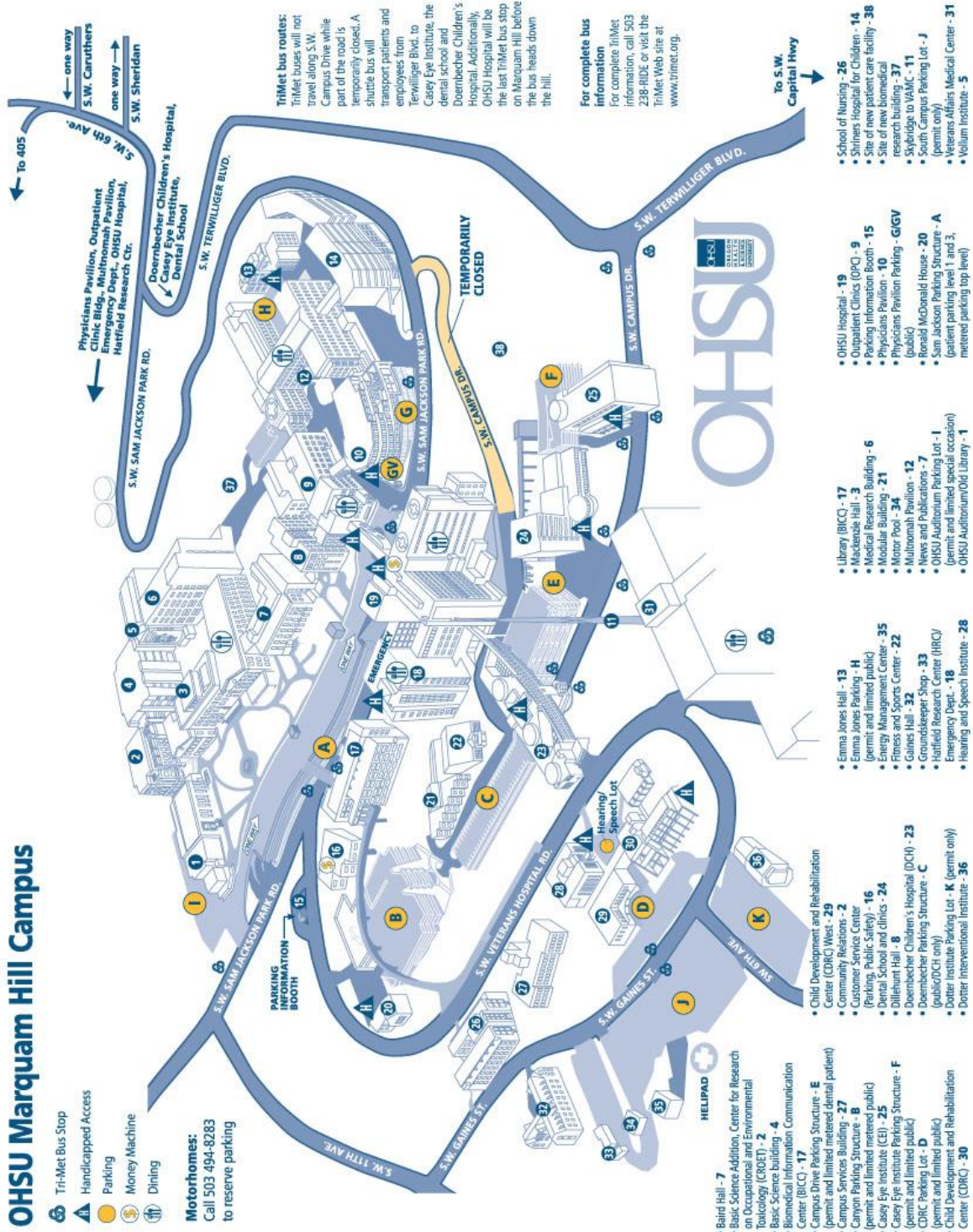Mail Code: CB 669
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Physical address
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Office hours: Monday – Friday, 9:00 am to 4:30 pm

OHSU Campus Map

OHSU Marquam Hill Campus

- Tri-Met Bus Stop
- Handicapped Access
- Parking
- Money Machine
- Dining

Motorhomes:
Call 503 494-8283 to reserve parking

- Baird Hall - 7
- Basic Science Addition, Center for Research on Occupational and Environmental Toxicology (CROET) - 2
- Basic Science building - 4
- Biomedical Information Communication Center (BICC) - 17
- Campus Drive Parking Structure - E (permit and limited metered dental patient)
- Campus Services Building - 27
- Canyon Parking Structure - B (permit and limited metered public)
- Casey Eye Institute (CEI) - 25
- Casey Eye Institute Parking Structure - F (permit and limited public)
- CDRC Parking Lot - D (permit and limited public)
- Child Development and Rehabilitation Center (CDRC) - 30
- Child Development and Rehabilitation Center (CDRC) West - 29
- Community Relations - 2
- Customer Service Center (Parking, Public Safety) - 16
- Dental School and clinics - 24
- Dillehunt Hall - 8
- Doernbecher Children's Hospital (DCH) - 23
- Doernbecher Parking Structure - C (public/DCH only)
- Dotter Institute Parking Lot - K (permit only)
- Dotter Interventional Institute - 36

- Emma Jones Hall - 13
- Emma Jones Parking - H (permit and limited public)
- Energy Management Center - 35
- Fitness and Sports Center - 22
- Gaines Hall - 32
- Groundskeeper Shop - 33
- Hatfield Research Center (HRC) - 18
- Hearing and Speech Institute - 28

- Library (BICC) - 17
- Mackenzie Hall - 3
- Medical Research Building - 6
- Modular Building - 21
- Motor Pool - 34
- Multnomah Pavilion - 12
- News and Publications - 7
- OHSU Auditorium Parking Lot - I (permit and limited special occasion)
- OHSU Auditorium/Old Library - 1

- OHSU Hospital - 19
- Outpatient Clinics (OPC) - 9
- Parking Information Booth - 15
- Physicians Pavilion - 10
- Physicians Pavilion Parking - G/GV (public)
- Ronald McDonald House - 20
- Sam Jackson Parking Structure - A (patient parking level 1 and 3, metered parking top level)

- School of Nursing - 26
- Shriners Hospital for Children - 14
- Site of new patient care facility - 38
- Site of new biomedical research building - 37
- Skybridge to VAMC - 11
- South Campus Parking Lot - J (permit only)
- Veterans Affairs Medical Center - 31
- Vollum Institute - 5

Map labels

To 405
one way — S.W. Caruthers
one way — S.W. Sheridan
S.W. 6th Ave.

Physicians Pavilion, Outpatient Clinic Bldg., Multnomah Pavilion, Emergency Dept., OHSU Hospital, Hatfield Research Ctr.

Doernbecher Children's Hospital, Casey Eye Institute, Dental School

S.W. SAM JACKSON PARK RD.
S.W. TERWILLIGER BLVD.
S.W. SAM JACKSON PARK RD.
S.W. CAMPUS DR.
S.W. TERWILLIGER BLVD.
S.W. CAMPUS DR.
S.W. VETERANS HOSPITAL RD.
S.W. GAINES ST.
S.W. GAINES ST.
SW 8TH AVE
S.W. 11TH AVE.
S.W. SAM JACKSON PARK RD.

To S.W. Capital Hwy

TEMPORARILY CLOSED

PARKING INFORMATION BOOTH

EMERGENCY

Hearing/Speech Lot

HELIPAD

OHSU

TriMet bus routes: TriMet buses will not travel along S.W. Campus Drive while part of the road is temporarily closed. A shuttle bus will transport patients and employees from Terwilliger Blvd. to Casey Eye Institute, the dental school and Doernbecher Children's Hospital. Additionally, OHSU Hospital will be the last TriMet bus stop on Marquam Hill before the bus heads down the hill.

For complete bus information For complete TriMet information, call 503 238-RIDE or visit the TriMet Web site at www.trimet.org.

Campus map and location of classes - Most of our classes are held in our conference room, CSB 679. Sometimes courses are held in the School of Nursing, which is right next door to the Campus Services building, or in Mac Hall, across campus. Several classes are held in UHS 8B60 (University Hospital, #6 on the map). The easiest way to get there from the Campus Services building is to exit the front of the building, make a right on SW Veterans hospital road and enter Doernbecher Children's hospital on your right (bldng #10). You will enter on floor #10. Head down the hall toward the elevators, and go down to floor 9. Make a left out of the elevators, continue down the hall and through the hospital lobby. You'll come to another set of elevators. Take them or the adjacent stairs down to the 8th floor. The class room will be right in front of the elevators.

BIOSTATISTICS COURSE DESCRIPTIONS

In addition to the courses listed below, there may be courses offered through the School of Nursing, Department of Medical Informatics and Clinical Epidemiology, or other departments at OHSU or PSU that are appropriate electives. Please contact Dr. Jodi Lapidus before the term starts to obtain permission.

BSTA 500 Reading and Research in Biostatistics
Instructor(s): various biostatistics faculty
Credits: 1 - 3
Term Offered: all terms
Prerequisite: permission of instructor
Course Description: The student and the instructor plan the course of study consistent with the student's interest and degree objectives.

BSTA 504 Topics in Biostatistics
Instructor(s): various biostatistics faculty
Credits: 1 - 3
Term Offered: all terms
Course Description: The topics will vary year to year.

BSTA 510 Biostatistics Lab
Instructor: Dongseok Choi, PhD
Credits: 3
Term Offered: all terms
Pre-requisite: BSTA 512 or consent of instructor.
Course Description: The course provides hands-on data analysis and/or biostatistical consulting experience to students outside classroom settings. Students will have opportunities to perform data analysis with inputs from faculty members. Students should have adequate skills in at least one statistical program among STATA, SAS or R and has finished BSTA 512 Linear Models or equivalent. Students meet weekly for 1 hour with the course instructor for discussion on their projects and are also encouraged to have regular meetings with an assigned faculty advisor and/or consultee(s). Students are expected to work individually or in a team of 2~3 on actual data analysis. The workload will be at least 9 hours per week including all activities (classes, meetings, readings, coding, and analysis).

BSTA 511 Estimation and Hypothesis Testing in Applied Biostatistics
Instructor(s): Mike Lasarev, MS
Credits: 4
Term Offered: Fall
Prerequisite: admission to the Epi/Biostat MPH or the Biostatistics Certificate/MS/MBST program and one undergraduate statistics course; others with departmental approval
Course Description: This course is designed for students in the Epidemiology & Biostatistics track of the Oregon MPH program, the Graduate Certificate/MS/MBST in Biostatistics, and others who will go on to take BSTA 512 and BSTA 513. A broad range of topics in probability, distribution, estimation and hypothesis testing will be covered. These will be followed by nonparametric methods and simple methods for categorical data. In addition, one-way analysis of variance (ANOVA) and correlation and simple linear regression will be covered. Most homework will require using statistical software (Stata).

BSTA 512 Linear Models
Instructor(s): Thuan Nguyen, MD, PHD
Credits: 4
Term Offered: Winter
Prerequisite: A grade of B- or better in BSTA 511

Course Description: This course is the second course in the required sequence for the Epi/Biostat track in the Oregon MPH program and the Graduate Certificate in Biostatistics. In this course, students will focus on *linear models* that include Regression Analysis and Analysis of Variance (ANOVA). In conjunction with the conceptual and theoretical developments, homework assignments and data analysis projects will be assigned in supporting the topics.

BSTA 513 Categorical Data Analysis
Instructor(s): Yiyi Chen, PhD
Credits: 4
Term Offered: Spring
Prerequisite: A grade of B- or better in BSTA 512
Course Description: Biostatistics III is the third course in the required sequence for the Epi/Biostat track in the Oregon MPH program and the Graduate Certificate in Biostatistics. This course covers topics in categorical data analysis such as cross tabulation statistics, statistics for matched samples, and methods to assess confounding and interaction via stratified tables. It will also explore logistic regression in detail, and relate results back to those found with stratified analyses. Similar to linear regression in Biostatistics 2, topics for logistic regression will include parameter interpretation, statistical adjustment, variable selection techniques and model fit assessment. If time allows, students will have the opportunity to briefly explore other analysis methods. Most homework assignments for this course are to be completed using statistical software.

BSTA 514 Survival Analysis
Instructor(s): Jodi Lapidus and Mara Tableman
Credits: 3
Term Offered: Winter
Prerequisite BSTA 512 or consent of instructor
Course Description: Analysis of survival time data using parametric and nonparametric methods for estimation, hypothesis testing, and regression methods for censored data with covariates. In addition to the traditional parametric models such as the Weibull and log-normal, the Kaplan-Meier (empirical) estimate of the survival function and the Cox proportional hazards regression model are studied in detail. Determination of power and sample size calculations will be covered. This course is cross listed with STAT 578 in Mathematics and Statistics at PSU.

BSTA 515 Data Management and Analysis in SAS
Instructor(s): Xinbo Zhang, PhD
Credits: 3
Term Offered: Fall
Prerequisite BSTA 511 or equivalent or consent of instructor
Course Description: This course is designed for students who want to develop and expand their skills in data management, statistical analyses and graphics for real world applications using SAS. After brief introduction, the course will cover intermediate to early advanced level programming skills in SAS. The class will be taught in a computer lab in order to give the student hands-on experience using SAS to manage data, perform analyses and produce graphs. Class sessions and homework will be oriented around particular data management and analysis tasks. Health-related data sets will be provided for students to use. This course could be extremely helpful in preparation for research projects.

BSTA 516 Design and Analysis of Surveys
Instructor: Thuan Nguyen, MD, PHD
Credits: 3
Prerequisite: BSTA 511 or consent of instructor
Term Offered: Spring
Course Description: This course is designed to introduce basic concepts, techniques, and current practice of sample survey design and analysis with emphasis on community health surveys. Topics in design include simple random sampling, systematic sampling, stratified random sampling, cluster sampling, multistage sampling, and replicated sampling. Examples of complex designs will be drawn from telephone surveys, the Current Population

Survey and various health surveys of National Center for Health Statistics. Topics in analysis include post-stratification adjustments, ratio and regression estimators, and methods for estimating variance from complex surveys. To illustrate the current practice of survey analysis, selected data from National Health and Nutrition Examination Survey will be analyzed using STATA.

BSTA 517 Statistical Methods in Clinical Trials
Instructor(s): Yiyi Chen, PhD
Credits: 3
Term Offered: Summer
Prerequisite: BSTA 512 Linear Models or consent of instructor
Course Description: This course is designed for students who are interested in learning design and analysis of clinical trials. Starting with a brief introduction to the four phases of clinical trials, the course will cover the most widely used sing-stage and two-stage trial designs. Sample size computations associated with major designs, methods of randomization and blinding, and analysis methods for different designs and endpoints will all be introduced. Towards the end of the course there will be several advanced topics overview sessions such as Bayesian methods in clinical trials, adaptive clinical trial design, designs for cancer clinical trials, etc. These special topics sessions will be open to wider audiences not necessarily enrolled in the program (e.g. clinical researchers from OHSU Knight Cancer Institute or OCTRI, or interested faculty from OHSU departments). Guest lecturers may be invited to some of the sessions. In addition to homework assignments, students will form groups and work on class project under the supervision of the instructor.

BSTA 518 Spatial Data Analysis with GIS
Instructor(s): Dongseok Choi, PhD
Credits: 3
Term Offered: TBD
Prerequisite: BSTA 512 or consent of instructor
Course Description: This course is designed for students in Biostatistics Certificate Program, the Epidemiology & Biostatistics track of the Oregon MPH program, and others who are interested in GIS/Spatial Statistics applications for environmental and health related research. Geographic information system (GIS) software is a powerful tool for assessment, decision-making, and information sharing. GIS provides a platform for the analysis of health data in relationship to population demographics, socioeconomic factors, surrounding social and health services, and the natural environment. The course will also cover basic statistical methods for the analysis of spatial data such as kriging and spatial clustering. The class will be taught in a computer lab and students are required to do a course project with a data set throughout the quarter under the supervision of the instructor.

BSTA 519 Applied Longitudinal Data Analysis
Instructor(s): Rochelle Fu, PhD
Credits: 3
Term Offered: Winter
Prerequisite: BSTA511 (or equivalent), BSTA 512 (or equivalent), and BSTA 513 (or equivalent), or permission of the instructor
Course Description: This course is a required course for students in the Master programs and Graduate Certificate program in Biostatistics and could also be used as an elective course for students in Epi/Biostat track in the Oregon MPH program and other programs. This course is designed for students who have taken the basic applied statistical courses and wish to learn the more advanced statistical methods for longitudinal data. Longitudinal data consist of measurements of predictor and response variables at two or more points in time for many individuals. This course covers the statistical properties of longitudinal data and special challenges due to the repeated measurements on each individual, exploratory methods and statistical models for longitudinal data. For statistical methods, the course will briefly cover the more traditional repeated measure analysis of variance (ANOVA) approach for continuous data, and focus more on mixed model approach and estimation based on generalized estimating equation. Real life examples from either instructors' experience and/or the health sciences literature will be used to explain the concept and application of these models by using continuous, binary and count data. Homework assignments and final class project play a central role to understand and appropriately apply the methods covered in the course.

BSTA 521 Bayesian Methods for Data Analysis

Instructor: Rochelle Fu, PhD
Credits: 3
Term Offered: Spring, based on student needs, not offered every year.
Prerequisite: BSTA 511, BSTA 512, BSTA 550, and BSTA 551 or consent of instructor
Course Description: Different from other courses in the M.S. program, which are based on the "frequentist" method of statistical reasoning, where probability is understood to be a long run frequency of a "repeatable" event, Bayesian methods are based on a different philosophy – that probability of an event is based on ALL information known at the time. Bayesian methods for data analysis enable one to combine information from previous similar and independent studies (prior information), with information from a new study, yielding updated inference for model parameters. This course will cover the concept of Bayesian analysis, posterior distribution, Bayesian inference and prediction, prior determination, one parameter and two parameter models, Bayesian hierarchical models, Bayesian computation, model criticism and selection as well as basic comparison of Bayesian and Frequentist Inferences. Real life examples in medical and health science will be used to explain the concept and application of Bayesian models.

BSTA 522 Statistical Machine and Big Data Learning

Instructor(s): Dongseok Choi, PhD
Credits: 3
Term Offered: Fall
Prerequisite: BSTA 512 (or equivalent) or permission of instructor
Course Description: This course is designed to introduce statistical methods for machine learning and new emerging challenges in big data analysis. In recent years, statistical machine learning has played a crucial role in informatics and data science. Ever increasing data size creates new challenges for traditional statistical learning and this is an active research area. This course will cover traditional statistical learning methods as well as newer methods for such challenges.

BSTA 523 Design of Experiments

Instructor(s): Byung Park, PhD
Credits: 3
Term Offered: TBD
Prerequisite: BSTA 511 (or equivalent) or permission of instructor
Course Description: This course covers experimental design and statistical analysis of biological/clinical data from various experiments. This course provides not only the theoretical aspect of experimental design but also hand-on experience in designing and analyzing experiments. The course begins with a discussion of design principles that include concepts of replication, randomization, blocking, multifactor studies, and confounding. Basic matrix algebra concepts will be explored to establish the basis for linear models. Students, then, are introduced to various experimental designs including analysis of variance (ANOVA) in both single and multi-factorial settings, experiments to study variances, complete/incomplete block designs (CBD), split plot designs, repeated measures ANOVA, analysis of covariance (ANCOVA), response surface designs, and diagnosing agreement between the data and model. The course also provides experience in analyzing unbalanced experimental data. Computer application is included as part of the course to introduce students to data management, reading output, along with interpreting and summarizing results.

BSTA 550 Introduction to Probability

Instructor(s): Meike Niederhausen, PhD
Credits: 3
Term Offered: Fall
Prerequisite: BSTA 512 (or equivalent) or permission of instructor
Course Description: This course is designed to introduce history, concepts, and distributions in probability, Monte Carlo simulation techniques, and Markov chains. Students will also learn how to write R codes for various statistical computations and plots. Previous experience in R is not required. R is free software available from http://www.r-project.org.

BSTA 551 Mathematical Statistics I
Instructor(s): David Yanez, PhD
Credits: 3
Term Offered: Winter
Prerequisite: differential and integral calculus and BSTA 550 Introduction to Probability
Course Description: The objectives of the two term sequence are to (1) provide students with fundamental principles for conducting statistical inference both via estimation and hypothesis testing and (2) develop the mathematical skills for applying these principles in new situations. In the first term we focus on principles of data reduction and estimation, but will also introduce hypothesis testing if time permits.

BSTA 552 Mathematical Statistics II
Instructor(s): Jessica Minnier, PhD
Credits: 3
Term Offered: Spring
Prerequisite: BSTA 551 Mathematical Statistics I
Course Description: The second course in this two-course sequence focuses on hypothesis testing, interval estimation, and asymptotic results.

PHPM 512 Epidemiology I
Instructor: John Stull, MD, MPH
Credits: 4
Offering: Fall
Prerequisite: admission to the MPH program or Biostatistics Certificate program and previous or concurrent registration in BSTA 511 or comparable biostatistics course
Course Description: Basic epidemiological principles applicable to infectious and non-infectious diseases, host-agent-environmental relationships, and concepts of disease causation will be reviewed. Students will gain familiarity with epidemiologic measures such as incidence, prevalence, mortality, natality, case fatality, relative risk and other rates and ratios and will use age-adjustment and other standardization techniques. Types and sources of public health data will be reviewed, their use in comparing groups, and statistical significance. Epidemic curves, outbreak investigation principles, surveillance concepts and basic designs of observational studies and sources of bias will be covered.

PHPM 513 Epidemiology II: Methods
Instructor: William Lambert, PhD
Credits: 4
Offering: Winter
Prerequisite: PHPM 512 and BSTA 511
Course Description: Students will develop skills in recognizing strengths and weaknesses of various epidemiologic study designs; describing sources of bias that can distort measures of effect/association; and designing case-control studies, cohort studies, and randomized clinical trials. The class will also explore additional study designs used less frequently, such as nested case-control studies and case-crossover studies. Students will gain experience in recognizing and evaluating the role of confounding in data derived from epidemiologic studies. Additional tutorial sessions, to be scheduled at a time convenient for the students, will include problem-solving exercises focused on study design and analysis. Written homework assignments and problem-oriented learning will occupy a central role in facilitating mastery of epidemiologic methods and issues.

BMI 550/650 Bioinformatics and Computational Biology I: Algorithms
Credits: 4
Note: 4 credits includes 1 credit Lab
Offering: On Campus: Fall
Prerequisite: A previous course in algorithms (recommended).

Course Description: The course will be a problem-driven examination of the algorithmic issues in computational biology. The course will provide students with the computational fundamentals underlying the techniques covered. Students will be expected to learn basic algorithm principles, basic mathematical and statistical proofs, and molecular biology. The emphasis is on algorithm development and application to biological problems, particularly those from functional genomics studies. Topics will include: Mapping (Genetic linkage maps, physical maps), Sequencing (Whole genome sequencing: shotgun approaches and ESTs), Sequence analysis (multiple sequence alignment, fragment assembly, EST assembly, genome annotation, algorithmic side of gene finding and BLAST). Students will be evaluated on written assignments and a programming project.

BMI 551/651 Bioinformatics and Computational Biology II: Statistical Methods

Credits: 4
Note: 4 credits includes 1 credit Lab
Prerequisite: BMI 550
Offering: On Campus: Winter
Course Description: This course will be a problem-driven examination of the quantitative issues in computational biology. The course will provide students with the statistical fundamentals underlying the techniques covered. Topics will include applications involving MCMC Models, Maximum Likelihood, Random Walks, Hidden Markov Models, Estimating Genealogical Relationships and Networks. Students will be evaluated on written assignments and a programming project.

Appendix I: Course Matrices

GRADAUTE CERTIFICATE IN BIOSTATISTICS - 30 credits total		
Required Courses - 18 credits	**Credits**	**Term Offered**
BSTA 510 Biostatistics Lab	**3**	All
BSTA 511 Estimation and Hypothesis Testing for Applied Biostatistics (PHPM 525 Biostatistics I)	**4**	Fall
BSTA 512 Linear Models (PHPM 526 Biostatistics II)	**4**	Winter
BSTA 513 Categorical Data Analysis (PHPM 527 Biostatistics III)	**4**	Spring
BSTA 514 Survival Analysis **-OR-** BSTA 519 Applied Longitudinal Data Analysis	**3**	Winter
Elective Courses - 12 credits chosen from the courses below		
BSTA 500 Reading and Research in Biostatistics	**1-3**	Varies
BSTA 504 Topics in Biostatistics	**3**	Varies
BSTA 514 Survival Analysis*	**3**	Winter
BSTA 515 Data Management and Analysis in SAS	**3**	Fall
BSTA 516 Design and Analysis of Surveys	**3**	Spring
BSTA 517 Statistical Methods in Clinical Trials	**3**	Spring
BSTA 518 Spatial Data Analysis with Geographic Information Systems (GIS)	**3**	TBD
BSTA 519 Applied Longitudinal Data Analysis*	**3**	Winter
BSTA 522 Statistical Machine Learning and Big Data	**3**	Fall
BSTA 523 Design of Experiments	**3**	Spring
PHPM 512 Epidemiology I	**4**	Fall
PHPM 513 Epidemiology II	**4**	Winter
BMI 550 Computational Biology I	**4**	Fall
BMI 551 Computational Biology II	**4**	Winter
Other electives must be approved by the Program Director, Dr. Rochelle Fu. ** Course may be counted towards electives if not taken for the "required coursework" section.*		

Master of Science - 48 credits total		
Required Courses - 33 credits	**Credits**	**Term Offered**
BSTA 510 Biostatistics Lab	**3**	All
BSTA 511 Estimation and Hypothesis Testing for Applied Biostatistics	**4**	Fall
BSTA 512 Linear Models	**4**	Winter
BSTA 513 Categorical Data Analysis	**4**	Spring
BSTA 514 Survival Analysis	**3**	Winter
BSTA 517 Statistical Methods in Clinical Trials	**3**	Winter
BSTA 519 Applied Longitudinal Data Analysis	**3**	Winter
BSTA 550 Introduction to Probability	**3**	Fall
BSTA 551 Mathematical Statistics I	**3**	Winter
BSTA 552 Mathematical Statistics II	**3**	Spring
Elective Courses - 18 credits chosen from the courses below		
BSTA 500 Reading and Research in Biostatistics	**1-3**	All terms
BSTA 504 Topics in Biostatistics	**3**	TBD
BSTA 515 Data Management and Analysis in SAS	**3**	Fall
BSTA 516 Design and Analysis of Surveys	**3**	Spring
BSTA 518 Spatial Data Analysis with Geographic Information Systems (GIS)	**3**	TBD
BSTA 521 Bayesian Methods for Data Analysis	**3**	Spring
BSTA 522 Statistical Machine Learning and Big Data	**3**	Fall
BSTA 523 Design of Experiments	**3**	Spring
PHPM 512 Epidemiology I	**4**	Fall
PHPM 513 Epidemiology II	**4**	Winter
BMI 550 Computational Biology I	**4**	Fall
BMI 551 Computational Biology II	**4**	Winter
PSU: STAT 567 Applied Probability 1	**3**	Winter
PSU: STAT 568 Applied Probability 2	**3**	Spring
PSU: Modern Nonparametric Statistics	**3**	TBD