**BMI 562/BMI 662: Quantitative Research Methods**

3.0 credit hours

Spring 2013

**PREREQUISITES:** Prior statistics (PHPM 524 or Biostats I &II), and research/evaluation methods (BMI 560), or consent of instructor.

**COURSE DESCRIPTION:** The aim of this course is to help students apply the knowledge gained in previous biostatistics courses to quantitative research problems in biomedical informatics. Students are expected to have a sound understanding of basic techniques in biostatistics including descriptive statistics, t-tests, chi-squared, ANOVA, use of contingency tables, correlation and regression analysis, non-parametric methods and modeling. Each week, we will begin with a research question from the informatics literature (or a student's own research). We will identify appropriate research designs, generate hypothesis (if appropriate), select appropriate test statistics, and use software to analyze the data. At the end of the term, we will have covered ten of the most commonly used statistical techniques in the recent informatics literature (Scotch et al., Use of statistical analysis in the biomedical informatics literature, JAMIA 2010;17:3-5)

**INSTRUCTOR:** Jayashree Kalpathy-Cramer, PhD, M.S
email: kalpathy@ohsu.edu,
Office hours by appointment.

**REQUIRED TEXTBOOK(S):** none (class notes will be provided)

**SUGGESTED TEXTBOOK(S):** A good Biostatistics text (e.g. Fundamentals of Biostatistic, Rosner).
Other suggested readings:
Intuitive Biostatistics, Harvey Motulsky
Designing Clinical Research, Stephen Hulley, Steven Cummings, Warren Browner, Deborah Grady, Thomas Newman
Quantitative Methods for Health Research, Nigel Bruce, Daniel Pope, Debbi Stanistreet

**COURSE COORDINATION:** The course will be taught as a hybrid course. We will have 9 weeks of on-line classes followed by a week of intensive in-class lectures and presentations. Each week, we will provide streamed lectures (recorded last year) and assigned readings. There will be (approximately) weekly short quizzes (10 multiple choice questions + 1 short answer), and homework to enable students to apply what they have learned. Weekly quizzes will be available on Tuesday and due the following Tuesday. Homework will require the use of statistical software and interpretation of results. There will be a final project with a short presentation. Participation on the forums will be an important aspect of the class.

**EVALUATION:** Students will be evaluated based on quizzes, homework, and midterm and final project. The weight to the final grade will be:
Weekly quizzes (drop lowest): 20%
Homework (3 +1 extra credit): 20%
Midterm 20%
Participation 10%
Final Project= 30%

Graduate Studies in the OHSU School of Medicine is committed to providing grades to students in a timely manner. Course instructors will provide students with information in writing at the beginning of each course that describes the grading policies and procedures including but not limited to evaluation criteria, expected time needed to grade individual student examinations and type of feedback they will provide.

Class grades are due to the Registrar by the Friday following the week of finals. However, on those occasions when a grade has not been submitted by the deadline, the following procedure shall be followed:

1) The Department\(^1\) /Program Coordinator\(^2\) will immediately contact the Instructor requesting the missing grade, with a copy to the Program Director and Registrar.
2) If the grade is still overdue by the end of next week, the Department\(^1\) /Program Coordinator\(^2\) will email the Department Chair directly, with a copy to the Instructor and Program Director requesting resolution of the missing grade.
3) If, after an additional week the grade is still outstanding, the student or Department\(^1\) /Program Coordinator\(^2\) may petition the Office of Graduate students for final resolution.

\(^1\) For courses that are run by a specific department.
\(^2\) For the conjoined courses (course number is preceded by CON_ that are run by Graduate Studies.

SOFTWARE: Students can use any software package of their choice. However, support will be provided for R, Stata and SPSS only.

GRADING SCALE: Grading will be done on the standard OHSU A-F scale.

COURSE OBJECTIVES: Upon completion of this course, students should be able to:
1. Generate study designs and hypothesis for common research questions in medical informatics
2. Given a research question and a data set, analyze the data and provide results
3. Provide an interpretation of data analysis that is easily understood by a non-statistician.
4. Critique (and suggest alternatives to) study designs and analyses found in the informatics literature

We will try to cover research questions that utilize: descriptive statistics, t-tests, ANOVA, Wilcoxon rank-sum, precision/recall, sensitivity/specificity, chi-squared, McNemar's, odds ratio, Pearson's r, Spearman, linear and logistic regression, supervised and unsupervised classification and data mining. Examples of research questions will come from several informatics problem domains, including information retrieval, decision support, system implementation evaluation, user studies, etc.
## COURSE OUTLINE:

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<thead>
<tr>
<th>Dates</th>
<th>Possible Topics (subject to change)</th>
<th>Assignments (not likely to change)</th>
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<tbody>
<tr>
<td>Week 1:</td>
<td>Biostatistics Refresher</td>
<td>Weekly quiz 1</td>
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<td>Homework 1 assigned.</td>
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<td>Week 2:</td>
<td>Evaluation of new EHR implementation</td>
<td>Weekly quiz 2</td>
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<td>Week 3:</td>
<td>Information Retrieval system evaluation</td>
<td>Weekly quiz 3, Homework 1 due, Homework 2 assigned</td>
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<td>Epidemiology</td>
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<td>Week 4:</td>
<td>Estimating dose effect</td>
<td>Weekly quiz 4</td>
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<td>Predictors of student success in graduate biomedical</td>
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<td>informatics training</td>
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<td>Week 5:</td>
<td>Modeling</td>
<td>Weekly quiz 5, Homework 2 due, Homework 3 assigned</td>
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<td>Week 6:</td>
<td>Survival Analysis</td>
<td>Weekly quiz 6</td>
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<td>Week 7:</td>
<td>Factor Analysis/PCA</td>
<td>Homework 3 due, Homework 4 assigned (optional)</td>
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<td>Week 8:</td>
<td>Midterm</td>
<td>Weekly quiz 7</td>
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<td>Week 9:</td>
<td>Supervised Classification /Clustering</td>
<td>Weekly quiz 8, Homework 4 due (optional)</td>
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<td>Week 10:</td>
<td>In-Class</td>
<td>Final Project Presentation</td>
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<td>Week 11</td>
<td>Final Review</td>
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### ACADEMIC HONESTY:

Course participants are expected to maintain academic honesty in their course work. Participants should refrain from seeking past published solutions to any assignments. Literature and resources (including Internet resources) employed in fulfilling assignments must be cited. See [http://www.ohsu.edu/xd/education/library/research-assistance/plagiarism.cfm?WT_rank=1#](http://www.ohsu.edu/xd/education/library/research-assistance/plagiarism.cfm?WT_rank=1#) for information on code of conduct for OHSU and [http://www.ohsu.edu/xd/education/teaching-and-learning-center/for-students/index.cfm](http://www.ohsu.edu/xd/education/teaching-and-learning-center/for-students/index.cfm) for more information on citing sources and recognizing plagiarism.

*In an effort to uphold the principles and practice of academic honesty, faculty members at OHSU may use originality checking systems such as Turnitin to compare a student’s submitted work against multiple sources.*
To protect student privacy in this process, it will be necessary to remove all personal information, i.e. student name, email address, student u-number, or any other personal information, from documents BEFORE submission.

STUDENT ACCOMMODATIONS: If you need reasonable accommodation in academic settings, please communicate with the instructor as soon as possible so that we may make appropriate arrangements. Our program is committed to all students achieving their potential. If you have a disability or think you may have a disability (physical, learning, hearing, vision, psychological) which may need a reasonable accommodation please contact Student Access at (503) 494-0082 or e-mail at orchards@ohsu.edu to discuss your needs. You can also find more information at http://www.ohsu.edu/student-access. Because accommodations can take time to implement, it is important to have this discussion as soon as possible. All information regarding a student’s disability is kept in accordance with relevant state and federal laws.

COPYRIGHT INFORMATION: Every reasonable effort has been made to protect the copyright requirements of materials used in this course. Class participants are warned not to copy, audio, or videotape in violation of copyright laws. Journal articles will be kept on reserve at the library or online for student access. Copyright law does allow for making one personal copy of each article from the original article. This limit also applies to electronic sources.

To comply with the fair use doctrine of the US copyright law, Sakai course sites close three weeks after grades are posted with the Registrar. Please be sure to download all course material you wish to keep before this time as you will have no further access to your courses.

USE OF SAKAI: This course will have an online component, which can be accessed through Sakai, OHSU’s online course management system. For any technical questions or if you need help logging in, please contact the Sakai Help Desk.

Sakai Help Desk is available:
Mon – Fri, 8 am – 10 pm
Weekends and holidays, 12 pm – 5 pm

Contact Information:
(Local) 503-494-7074 (4-7074 on campus)
(Toll-free) 877-972-5249
(Web) http://atech.ohsu.edu/help
(Email) sakai@ohsu.edu

NOTE: This syllabus and class schedule is subject to change by the instructor. Changes will be made with as much advance notice as possible.

Revised 03/05/2013