The University of Toledo

New Graduate Course Proposal

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College: Medicine
Dept/Academic Unit: Public Health and Preventive Medicine

Alpha/Numeric Code (Subject area - number): PUBH 8130

Proposed title: Molecular Epidemiology
Proposed Effective Term: 2014 Fall

Is the course cross-listed with another academic unit? Yes
Approval of other Academic unit (Signature and title):

Is the course offered at more than one level? Yes
Credit hours: Fixed: 3

Delivery mode:
Activity Type
Primary: Lecture
Secondary: Web Assisted Instruction
Tertiary

Minimum Credit Hours
Maximum Credit Hours
Weekly Contact Hours

Terms Offered: Fall Spring Summer
Years offered: Every Year

May the courses be repeated for credit? No
Maximum hours:
Are students permitted to register for more than one section during a term? No
Grading system: Normal Grading (A-F, S/U, WP/WF, PR, I)

Prerequisites (must be taken before): e.g., C or higher in BIOE 4500 or BIOE 5500 and C or higher in MATH 4200, etc.
Catalog Description (75 Words Maximum)

This course covers both the major theoretical and practical issues of conducting an epidemiologic study involving molecular and genomic techniques. This course will emphasize examples from infectious diseases, chronic diseases, and cancer research literature.

Attach a syllabus and an electronic copy of a complete outline of the major topics covered. Click here for the template.

Course Approval

NCCAT
Department Curriculum Authority

Department Chairperson

College Curriculum Authority or Chair

College Dean

Graduate Council

Dean of Graduate Studies

Office of the Provost

For Administrative Use Only

Effective Date

CIP Code

Subsidy Taxonomy

Program Code

Instruction Level
PUBH6130/PUBH8130 Molecular and Genomic Epidemiology

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I. Course Description

This course covers both the major theoretical concepts and practical issues of conducting an epidemiologic study involving molecular and genomic techniques. Recent advances in biostatistics, bioinformatics, and molecular biology are revolutionizing the field of epidemiology, creating vast opportunities for studying the relationship between variations at the molecular or cellular level and the early detection, etiology or prognosis of important diseases. Class topics include introduction to the basics of molecular biology, biomarkers, epidemiologic study design and analysis, ethical/legal concerns, and discussion of specific research involving current methods and newly emerging technologies. The course will emphasize examples from the infectious diseases, chronic diseases, and cancer research literature.

II. Course Objectives

After completion of the course, students should be able to:

1. Summarize and explain the major theoretical and practical issues involving molecular and genomic epidemiology.
2. Interpret research that integrates laboratory and epidemiological techniques.
3. Identify and choose web-based resources for molecular epidemiology.
4. Discuss strengths and weaknesses of current OMICS methods for epidemiologic applications.
5. Evaluate the role of genetic variation in disease causation.
6. Recognize methods of phylogenetic reconstructions and use tree to test evolution in the context of an epidemiologic investigation.
7. Compare study designs used in molecular epidemiology, and identify biases, confounders and effect modifiers.
8. Describe the role of biomarkers in population research, including their advantages and limitations.
9. Identify and describe the important ethical and legal issues involved in genomics and proteomics research.
10. Design an epidemiologic study involving the use of molecular techniques.
III. Evaluation of Student Performance

Assignments (A)  20%

There are four assignments in this course. These assignments are intended to improve skills in searching the web resources, bioinformatics & statistical analysis, study design, and identification of biases and confounding in molecular epidemiologic studies. Students registering for PUBH8130 are required to do an additional assignment (to be posted at week 12).

Quizzes (Q)  30%

There will be a total of 8 quizzes. Each quiz will cover the material presented in that particular week. Few questions from previous quizzes may also be included. Further instructions will be supplied for each particular quiz.

Project  20%

A project will explore a topic of the course in greater depth. A written report, along with a power point presentation, is required. A project that addresses a question through data analysis with a written report and summary of conclusions would be sufficient. More detailed descriptions of the project along with suggested topics will be posted to the course webpage at the appropriate times during the term. The tentative due date for project submission is the end of week 12.

Final examination  30%

The final exam will be a take-home exam. The exam will cover all the materials presented in the course.

IV. Instructional Material

There is no required text for this course. All the required materials will be available on the course web site. Readings will consist of original literature and review articles.

V. COURSE POLICIES:

Attendance: No required.

Independent Assignments: All assignments, quizzes, and exams must be completed individually. Acts of plagiarism and copying other work will not be tolerated.

Ethical Behavior and Practice: All students are expected to follow the requirements established for the course. In relation, students must read and understand the applicable expectations for ethical behavior and practice stated in the Student Handbook established by the UI HSC Graduate School and/or the Northwest Ohio Consortium for Public Health.
## VI. Schedule

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<tr>
<th>Week</th>
<th>Topic</th>
<th>Quiz/Assignment</th>
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<tbody>
<tr>
<td>1</td>
<td>Introduction, Biological primer, Epidemiological primer</td>
<td>Q1</td>
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<tr>
<td>2</td>
<td>Bioinformatics</td>
<td>A1</td>
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<td>3</td>
<td>Gene and Genome, Structural genomic</td>
<td>Q2</td>
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<td>4</td>
<td>Introduction to Genetics, Genetic polymorphisms &amp; complex diseases</td>
<td>Q3</td>
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<td>5</td>
<td>DNA arrays, Gene expression arrays</td>
<td>Q4</td>
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<tr>
<td>6</td>
<td>Proteomics</td>
<td>A2</td>
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<td>7</td>
<td>Molecular techniques</td>
<td>Q5</td>
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<tr>
<td>8</td>
<td>Study Design and Analysis, Bias and confounding</td>
<td>A3</td>
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<tr>
<td>9</td>
<td>Ethical and Legal Issues, Biomarkers</td>
<td>Q6</td>
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<td>10</td>
<td>Human evolution and disease</td>
<td>Q7</td>
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<td>11</td>
<td>Phylogenetics, Infectious disease</td>
<td>A4</td>
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<tr>
<td>12</td>
<td>Chronic disease, cancer</td>
<td>Q8</td>
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<tr>
<td>13</td>
<td>DNA identification and genetic testing, Epigenetics</td>
<td>Project presentation</td>
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<td>14</td>
<td>Application of molecular epidemiology to bioterrorism, Pharmacogenomic</td>
<td>Project presentation</td>
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<tr>
<td>15</td>
<td>Nutrigenomic, Topics in applied molecular epidemiology</td>
<td>Final Exam</td>
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