Fall 2015 COURSE SYLLABUS

**Time and Place**
Tuesday and Thursday, 5:30-7:30 p.m., Room 0319 Old Main

**Instructors**
Lawrence D. Lemke  ldlemke@wayne.edu
Room 0224 Old Main  Phone: 577-6412

**Office Hours**
Tuesday, Thursday 7:30-8:00 p.m. and by appointment

**Textbook**

**Course Grading**
Final grades will be comprised of:
- Homework Assignments and Quizzes 30%
- Term Project (Brownfield Action) 30%
- Midterm Exam 20%
- Final Exam 20%

Late assignments will be penalized 10% per day and will not be accepted more than one week beyond their original due date.

The final exam is scheduled as designated in the WSU Schedule of Classes for this term (Thursday, December 17 @5:30pm). No other time will be available, and no exceptions will be made for conflicts such as student travel plans.

**Course Prerequisites**
GEL 1010 or consent of the instructor is required to register for this course. College level coursework in physics, chemistry, and geology is also recommended, although enough background information will be provided so that students with limited geological training can successfully complete class assignments. Similarly, experience in numerical modeling, environmental systems analysis, and a working knowledge of calculus through partial differential equations is helpful, but not a pre-requisite for the course. Students are advised, however, that geostatistics is a quantitative field of study and this course will require manipulation and solution of mathematical relationships throughout the semester. Short reviews of mathematical concepts will be provided prior to their application each week.

**Course Objectives**
GEL 5000 is an introduction to geological site assessment. Experience gained in this course will assist geologists, environmental scientists, and engineers interested in the characterization, assessment, and management of field sites for environmental or economic purposes. Mastery of material presented in this course will benefit those seeking professional employment in applied geology or environmental science as well as students seeking advanced academic degrees in science or engineering disciplines that involve subsurface characterization and modeling. Site assessment involves both qualitative and quantitative analyses: development of conceptual site models requires imagination and experience; quantification of site characteristics requires the design of sampling strategies and application of statistical analyses. The objective of this course is to prepare students to do both by applying concepts and methods introduced in lecture through a series of homework assignments and a comprehensive term project.
By the end of this semester, students should be able to:

2. Conduct and document a Phase II ESA following ASTM E-1903-11.
3. Describe statistical and spatial characteristics of univariate and bivariate environmental data sets.
4. Understand the fundamentals of random function models.
5. Complete spatial analysis of variance including variogram modeling for geologic data sets.
6. Apply geostatistical methods such as ordinary kriging to estimate variables at unknown points.
7. Assess the uncertainty of geostatistical estimates.
8. Use the Stanford Geostatistics Modeling Software (SGeMS) program for geostatistical analysis and Surfer software for presentation of XYZ data and geostatistical analyses in map form.

Course Format and Procedures:

GEL 5000 is a four credit hour course designed for graduate students and senior level undergraduates in geology and environmental science. Learning in this class is intended to be active (not passive). The course is structured in lecture format with five homework assignments and weekly quizzes. Students taking the course for graduate credit are required to complete one additional, advanced homework assignment. Over the course of the semester, students will be responsible for weekly reading assignments. Students are expected to attend all meetings of the course and should be prepared to answer questions and participate in class discussions. Students may be excused from class to participate in religious observances or for personal situations that arise, provided that arrangements are made with the instructor in advance.

Academic Integrity

Each student in this course is expected to abide by the University Student Code of Conduct. Any work submitted by a student in this course for academic credit will be the student's own work. For GEL 5000, collaboration is allowed in the following instances:

- Students are encouraged to study together and to discuss information and concepts covered in lecture and course readings with other students.
- Students can give "consulting" help to or receive "consulting" help from other students. However, this permissible cooperation should never involve one student having possession of a copy of all or part of any work done by someone else (in the form of an email, an email attachment file, a diskette, CD, DVD, jump drive, or a hard copy).
- Use of classroom computers and resident software shall be governed by the WSU ‘Acceptable Use of Information Technology Resources’ policy.

During examinations and quizzes, you must do your own work. Talking or discussion is not permitted during the exams, nor may you compare papers, copy from others, or collaborate in any way during exams or quizzes. Absolutely no collaboration among students is permitted on take-home exams. Any collaborative behavior during examinations will result in failure of the exam, and may lead to failure of the course and University disciplinary action. Disputes that cannot be resolved using syllabus guidelines will be resolved by the Wayne State University Student Code of Conduct.

Term Project

The semester project involves the application of site assessment practices to a contamination site located in a virtual town called Moraine. Students will work in teams and act as environmental consultants to assess and document environmental conditions at the simulated site using Brownfield Action, a multimedia model for teaching environmental science developed at Columbia University’s Barnard College with funding from the National Science Foundation. Within Brownfield Action, students will use a combination of visual reconnaissance, site history, and interviews to conduct and document a Phase I ESA for the site, and, if warranted, utilize appropriate subsurface testing to conduct and document a Phase II ESA for the site.
# Fall 2015 Course Outline

<table>
<thead>
<tr>
<th>Week</th>
<th>Tuesday</th>
<th>Thursday</th>
<th>Readings(^1)</th>
<th>HW(^2)</th>
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<tbody>
<tr>
<td>1</td>
<td></td>
<td>1. Overview and Introduction</td>
<td>Ch 1, 2</td>
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<td>2</td>
<td>2. Univariate Statistics</td>
<td>3. Bivariate Statistics / Spatial Description</td>
<td>Ch 3, 4</td>
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<td>3</td>
<td>4. Phase I ESA – Outline and Legal Framework: CERCLA Excel Workshop</td>
<td>5. The Walker Lake Data Set</td>
<td>Ch 5, 6</td>
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<td>4</td>
<td>6. Surfer Workshop</td>
<td>7/8. ASTM E 1527-13 (Phase I)</td>
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<td>HW 1</td>
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<td>5</td>
<td>Brownfield Action Kickoff</td>
<td>9. Site Assessment: The Environmental Consultant’s Perspective</td>
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<td>Ch 7</td>
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<td>6</td>
<td>10. Spatial Continuity SGeMS demo</td>
<td>11. Estimation; Random Function Models</td>
<td>Ch 8, 9</td>
<td>HW 2</td>
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<td>7</td>
<td>12. Global and Point Estimation; RFMs</td>
<td>-- No Class --</td>
<td>Ch 10, 11</td>
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<td>9</td>
<td>Review and Catch-up BA Consulting</td>
<td>Midterm Exam (Oct 29(^{th}))</td>
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<td>10</td>
<td>-- No Class --</td>
<td>15. ASTM E-1903-11 (Phase II) BA Phase 1 ESA Due Thurs Nov 5(^{th})</td>
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<td>HW 4</td>
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<td>12</td>
<td>-- BA Consultations --</td>
<td>18. Stochastic Simulation</td>
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<td>HW 5</td>
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<td>13</td>
<td>15. Geostatistics in Practice</td>
<td>THANKSGIVING</td>
<td>Ch 15</td>
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<td>15</td>
<td>21. Sampling Design</td>
<td>Brownfield Action Wrap Up and Review BA Phase 11 ESA Due Thurs Dec 10(^{th})</td>
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<td>16</td>
<td>** Study Day **</td>
<td>Final Exam – December 17(^{th}) 5:30 pm</td>
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\(^1\) Required Text: Isaaks and Srivastava, 1989, *An Introduction to Applied Geostatistics*

\(^2\) Homework due by 5:00pm on Thursday

Note: The instructor reserves the right to modify the course content and schedule as the semester progresses in order to take into account changing needs of the students or instructor, weather-related closures, or any other unforeseen circumstances.

**Accommodations for students with disabilities**

If you have a documented disability that requires accommodations, you will need to register with [Student Disability Services](#) (SDS) for coordination of your academic accommodations. The SDS office is located at 1600 David Adamany Undergraduate Library in the Student Academic Success Services department. SDS telephone number is 313-577-1851 or 313-577-3365 (TDD only). Once you have your accommodations in place, I will be glad to meet with you privately to discuss your needs and accommodations.