Course Syllabus

1. Course Information
Title: SPECIAL TOPICS COURSE Vegetation Description and Analysis
Course number: BIOL 493/693
Credits: 3 credit-hours, 2 lecture + 3 laboratory
Prerequisites: BIOL 239 Introduction to Plant Biology, or BIOL 271 Principles of Ecology, or permission of instructor
Location: lectures – Irving I; Field Trips – within 5 miles of campus; Laboratory – Irving I and O’Neil.
Meeting Time: Fall Semester 2008; Lectures: Monday and Wednesday, 11:45 am -12:45 pm; Labs: Monday, 2:15 -5:15 pm

2. Instructor
The instructor for this course is Martha Raynolds. She is currently a 4th-year PhD student, and has 25 years of experience studying arctic vegetation. She is an active researcher in the fields of plant community and landscape ecology with a focus in arctic systems, vegetation mapping, geographic information systems, remote sensing, and disturbance and recovery of arctic vegetation.

3. Course Readings/Materials
The only required reading material is a set of journal articles that will be available on Blackboard. Recommended reading will include sections of books, relevant journal articles and reports to supplement the material covered in class. This reading is recommended to broaden students’ understanding of the topics and fill any gaps in students’ background, and is required if a student is having difficulty understanding a topic. Some materials are included so students can peruse and become familiar with the reference material available.

Those materials that are available electronically will be put on Blackboard or e-reserve. Books will be put on reserve in the Biosciences Library in the Arctic Health Building. This will include:


Required supplies:
10x-power hand lens for field identification of plants
8.5 x 11 inch notebook for field reference collection and methods notes
Clothing adequate for spending several hours outdoors conducting field work (including day pack, rain gear (top & bottom), waterproof boots, coat/sweater, hat, gloves)

4. Course Description

Catalog description: Concepts and methods of vegetation sampling, classification, gradient analysis, and the relationship of species distributions to their environment. The course teaches students a comprehensive set of sampling and analysis methods used in vegetation science, providing them with practical skills applicable for research and management. Students collect, analyze and interpret vegetation data collected in the Fairbanks area.

Content:
This course will give students a broad overview of concepts and methods of description and analysis of plant community data. These methods of vegetation science include vegetation sampling, classification, and gradient analysis, and exploration of the relationship of species distributions to their environment. Most of the class will be devoted to obtaining comprehensive skills for vegetation sampling and analysis. The first 4-6 labs will be in the field before the weather turns cold and snowy. The second part of the course will be in the herbarium, soils lab, and computer lab, where we will analyze the data collected from the field.

Students will collect a set of field data that they will use for analysis and production of an oral report and final written report that will be due at the end of the course. There are no exams. There are several graded exercises that are essential to understanding the material.

Expected proficiencies: Ability to read, comprehend, and assimilate written information in scientific texts and journals; basic math skills (including algebra); basic computer skills (including accessing the internet, word processing and spreadsheets); basic writing and presentation skills.

5. Course Goals

The goals for the course are: (1) to provide students with a comprehensive set of sampling and analysis methods used in vegetation science, and (2) to develop an understanding and appreciation of vegetation, its composition, structure and function, its wide diversity, and role in local, regional and global ecosystems.

6. Instructional Methods

Mondays will be devoted to lectures on practical methods and associated laboratories, which will be spread among the following activities: field sampling methods, 6 labs; herbarium and plant identification, 1 lab; soils, 1 lab; computer labs, 3 labs for ordination, 2 for classification; 1 lab for vegetation mapping. Wednesdays will be devoted to lectures and discussion of the theories behind sampling and vegetation analysis methods.

7. Course Calendar

Readings:


<table>
<thead>
<tr>
<th>Date</th>
<th>Topics/Activities</th>
<th>Reading assignments (required in bold)</th>
<th>Assignments DUE</th>
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<tbody>
<tr>
<td>Mon. 8 Sept.</td>
<td><strong>Introduction to vegetation sampling</strong></td>
<td>Wear appropriate clothing for being outside for several hours. May require rain gear (jacket and pants), water-proof boots, coat, hat, gloves. Bring hand lens, notebook, pencil.</td>
<td>Be familiar with identification of common boreal plants</td>
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<tr>
<td>Mon. 8 Sept.</td>
<td><strong>Field lab 1</strong> Choosing sample sites, minimal area sampling.</td>
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<tr>
<td>Wed. 10 Sept.</td>
<td><strong>Major considerations in vegetation sampling</strong></td>
<td>KC Chapter 1</td>
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<td>Mon. 15 Sept.</td>
<td><strong>11:45 - 12:00 lecture 1-5 pm Field lab 2</strong> Frequency &amp; cover in quadrats</td>
<td>Bring field gear as for Lab 1 MD&amp;E Chapter 6, pp. 67-80</td>
<td>Minimal area lab report due</td>
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<td>Wed. 17 Sept.</td>
<td><strong>Point sampling methods, density, frequency, cover, line transects, point quadrats, point frame</strong></td>
<td>Paper #1 K&amp;C Chapter 2</td>
<td>Paper #1 summary due</td>
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<tr>
<td>Mon. 22 Sept.</td>
<td><strong>11:45 - 12:00 lecture 1-5 pm Field lab 3</strong> Frequency &amp; cover using point and transect methods</td>
<td>Bring field gear as for Lab 1 MD&amp;E Chapter 6, pp. 80-92</td>
<td>Quadrat frequency &amp; cover lab report due</td>
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<tr>
<td>Wed. 24 Sept.</td>
<td><strong>Introduction to phytosociology approach</strong></td>
<td>Paper #2 KC Chapter 7</td>
<td>Paper #2 summary due Initial notebook check</td>
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<td>Mon. 29 Sept.</td>
<td><strong>11:45 - 12:00 lecture 1-5 pm Field lab 4</strong> Relevé sampling</td>
<td>Bring field gear as for Lab 1 Westhoff &amp; van der Maarle</td>
<td>Diversity lab report due</td>
</tr>
<tr>
<td>Wed. 1 Oct.</td>
<td><strong>Diversity measures</strong></td>
<td>Paper #3 KC Chapter 3</td>
<td>Paper #3 summary due</td>
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<tr>
<td>Mon. 6 Oct.</td>
<td><strong>Forest sampling, plot-count methods and plotless sampling methods</strong></td>
<td>MD&amp;E Chapter 7</td>
<td>Data entry for relevés due</td>
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| Mon. 6 Oct. | **Field lab 5**  
Forest sampling methods | **Bring field gear as for Lab 1 (but warmer!)** |  |
| Wed. 8 Oct. | Descriptive statistics for vegetation data | Paper #4  
KC Chapter 4 | Paper #4 summary due |
| Mon. 13 Oct. | Site factors  
Soil sampling & description | Barbour et al. Chapter 17  
Harden paper | Forest sampling lab report due |
| Mon. 13 Oct. | **Field lab 6**  
Site factors and soils | **Bring field gear as for Lab 1 (but warmer!)** |  |
| Wed. 15 Oct. | Direct gradient analysis, weighted averaging | Paper #5  
KC Chapter 5, pp. 162-169  
McC&G Chapter 5, 18 | Paper #5 summary due  
Mid-term notebook check |
| Mon. 20 Oct. | Flora of Alaska boreal forests and tundra, plant identification keys |  | Data entry – site factors for relevés due |
| Mon. 20 Oct. | **Lab 7 - Herbarium: plant identification** |  |  |
| Wed. 22 Oct. | Indirect ordination, polar ordination | Paper #6  
KC Chapter 5, pp. 169-185  
McC&G Chapters 13, 17 | Paper #6 summary due |
| Mon. 27 Oct. | Soil description, analysis and classification |  | Gradient analysis lab report due |
| Mon. 27 Oct. | **Lab 8 - Soils analyses: pH, grain size, soil color** |  |  |
| Wed. 29 Oct. | Ordination: Principal components analysis | Paper #7  
KC Chapter 5, pp. 186-214  
McC&G Chapters 14, 15 | Paper #7 summary due |
| Mon. 3 Nov. | Introduction to PC-ORD | PC-ORD booklet | Data entry – soils data.  
Turn in complete data set for ordination.  
Topics for oral presentations approved |
| Mon. 3 Nov. | **Lab 9 - Computer lab: Polar ordination and PCA** |  |  |
| Wed. 5 Nov. | Ordination: correspondence analysis, detrended correspondence analysis, discriminant analysis | Paper #8  
KC Chapter 6, pp. 215-226  
McC&G Chapters 19, 20, 26 | Paper #8 summary due |
| Mon. 10 Nov. | Bringing the environmental data into the ordination. Software for relevé data  
Student presentation #1 |  |  |
<p>| Mon. 10 Nov. | <strong>Lab 10 - Computer lab: Ordinations with environmental</strong> |  |  |</p>
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<tr>
<th>Date</th>
<th>Event</th>
<th>Paper/Summary Due</th>
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| Wed. 12 Nov. | Ordination: Nonmetric multi-dimensional scaling, canonical correspondence analysis  
   Student presentation #2 | Paper #9  
   KC Chapter 6, pp. 227-244  
   McC&G Chapters 16, 21 | Paper #9 summary due |
| Mon. 17 Nov. | Table sorting methods and software  
   Student presentation #3 | Ordination lab report due |
| Mon. 17 Nov. | Lab 11 - Computer lab: classification sorting | |
| Wed. 19 Nov. | Numerical classification  
   Student presentation #4 | Paper #10  
   KC Chapter 8  
   McC&G Chapters 10-12, 25 | Paper #10 summary due |
| Mon. 24 Nov. | Review of ordination & classification methods  
   Student presentation #5 | McC&G Chapter 22 | Sorted table lab report due |
| Mon. 24 Nov. | Lab 12 - Computer lab: Analyses for final paper | |
| Wed. 26 Nov. | Discussion of methods used in class papers and presentations | Paper #11 | Paper #11 summary due  
   Topics for final paper approved |
| 27-30 Nov. | THANKSGIVING BREAK | |
| Mon. 1 Dec. | Vegetation mapping  
   Student presentation #6 | |
| Mon. 1 Dec. | Lab 13 – Vegetation mapping: different imagery, scales, legends | |
| Wed. 3 Dec. | Student presentations #7-9 | Paper #12 | Paper #12 summary due |
| Mon. 8 Dec. | Oral presentations #10-12 | Notebooks due |
| Mon. 8 Dec. | No lab – time to work on papers | |

### 8. Course Policies

**Attendance & participation:**

Students are expected to attend every class and lab, which will begin promptly. Absent or tardy students are responsible for making up missed content, and transporting themselves to field locations. Students are expected to participate in class discussions. Both attendance and participation will contribute to the final grade.
**Reading assignments:** There will be 12 journal papers to read for the course. Each paper will describe research using one or more of the techniques learned in class. Short answers to a few questions about the papers will be due each Wednesday. Additional reading that supplements the material covered in class will be assigned. This reading is recommended to broaden students’ understanding of the topics and fill any gaps in students’ background, and is required if a student is having difficulty understanding a topic.

**Lab write-ups:**
There will be 8 lab write-ups. These are designed to give the students an opportunity to apply analytical skills they have learned to data they have collected. These analyses will contribute to the oral and written presentations summarizing the data.

**Vegetation Description & Analysis Notebook:**
Each student will fill out a notebook defining, in his/her own words the methods covered in the class. The purpose of this assignment is for each student to finish the class with a methods book that he/she can refer to in the future. Students will be provided with an outline, and will fill the notebook with definitions, examples, references. The notebooks should be filled with whatever material the student finds most helpful. The notebook will be checked twice during the semester, and graded at the end.

**Student oral presentations:**
Each student will research and present some example of vegetation sampling and analysis, in a conference-style presentation, for about 15 minutes, with 5 minutes for questions. Topics are to be approved by the instructor. Undergraduate students are expected to select a relatively narrow topic, relying on three to five scientific references. Graduate students are expected to select a broader topic and explore it in more depth. Students will turn in a copy of their presentation (digital file or notes) for grading.

**Final paper:**
Each undergraduate student will choose one analytical approach, and write a 10-page paper describing the application of that approach to the data collected by the class. The paper can include many of the results developed as part of the class assignments. The paper will be in standard scientific format, with an abstract, introduction, methods, results, discussion, conclusion, acknowledgements and references, with a minimum of 10 peer-reviewed journal articles referenced. Graduate students will write a 15-20 page paper in scientific format, evaluating several different approaches to analyzing the data collected by the class, or apply the methods to their own data set.

**Academic integrity:**
Plagiarism and cheating will not be tolerated. Plagiarism is presenting another’s work as new or original without citing your source. For additional detail, see http://www.uaf.edu/library/instruction/handouts/Plagiarism.html Please speak with me if you have any questions about how to properly use other people’s work.
9. Evaluation

Grades:

Grades will be based on the following criteria: 

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<thead>
<tr>
<th></th>
<th>Undergraduate</th>
<th>Graduate</th>
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<tbody>
<tr>
<td>Homework assignments (8 @ 20 pt each)</td>
<td>160</td>
<td>160</td>
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<tr>
<td>Journal article analysis (12 @ 10 points)</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>Vegetation description &amp; analysis notebook</td>
<td>150</td>
<td>300</td>
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<tr>
<td>Oral presentation to class</td>
<td>100</td>
<td>150</td>
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<tr>
<td>Final paper</td>
<td>100</td>
<td>200</td>
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<tr>
<td>Class participation</td>
<td>70</td>
<td>70</td>
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<tr>
<td>TOTAL</td>
<td>700</td>
<td>1000</td>
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Note: These criteria may be modified somewhat as the course progresses. Final grades will be as follows: greater than or equal to 90% = A; 80-89% = B; 70-79% = C; 60-69% = D; < 60% = F.

Assignments are due at the beginning of class on the days shown in the syllabus. 5% of the total points will be deducted for every day an assignment is late.

10. Support Services

Office hours and contact:

Students are encouraged to contact the instructor with any questions, or to clarify the lecture or the assignments. I will be happy to review drafts of assignments. Thursdays 9-12, drop by, or by appointment in Arctic Health, Room 158A. Phone 474-6720, fnmkr@uaf.edu. Home phone: 479-3726.

11. Disabilities Services

The instructor will work with the Office of Disabilities Services (203 WHIT, 474 7043, to provide reasonable accommodation to students with disabilities. Any student needing special accommodation should talk with the instructor before the class or lab in question. These discussions will be held confidential.