Course Identifier: (e.g. TLC801) ___FW891________________________

Course Name: Advanced Topics: Likelihood Estimation for Natural Resources and Ecology

Department: _DOFW_______________  College: __Natural Resources_________________

Primary contact name, phone number, and email *(normally this will be the lead instructor)*

Angie Leslie  355-0138  lesliea@msu.edu

Faculty and Staff Involved in Developing and Offering the Course *please list full name, position at MSU, email address, and project role for each person*

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Type of Course:
_x_ FULLY ONLINE (no required face to face component)
___ BLENDED/HYBRID (some face to face time is replaced by online learning)
___ TECHNOLOGY-ENHANCED FACE-TO-FACE (a face-to-face course which uses technology for teaching and learning in an innovative way)

Semester(s) offered in 2010-2011 and number of students enrolled:

<table>
<thead>
<tr>
<th>SEMESTER</th>
<th># STUDENTS</th>
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<tr>
<td>Summer (1 and 2) of 2010</td>
<td>9</td>
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**I. Course Description (400 word limit)**

This course covers nonlinear model fitting, estimation of uncertainty in model estimates (e.g., likelihood profiling), and methods of inference using multiple models (e.g., AIC model averaging). This course will provide the foundation needed to understand more advanced statistical methods, such as generalized linear modeling and Bayesian statistics.

The course utilizes low-stakes and authentic assessment. Each unit contains two graded assessments. 1. A multiple choice quiz that covers the concepts covered in the unit and 2. a “real-world” case where the students must find the solution (by developing the appropriate model in R and running the model to arrive at the solution.)

Each unit is also interlaced with non-graded assessments so the students can check their own understanding as they progress. These assessments are located within the lecture videos and are also present in a “do you remember the previous units” quiz. This quiz draws from a large pool of questions from all the previous units and is basically a quick review of prior content so students are consistently exposed to older material through the entire course. This quiz concept stemmed from common teaching and learning knowledge – students need to constantly practice and see material several times before it becomes embedded into their mind.
Every unit in this course is technology-enhanced. You will shortly see that every lecture video is fully online and interactive. The lectures contain audio and animation to clarify the complex concepts. There is virtually no static text in this course (except of course for the video transcripts which are provided for those students who prefer this!)

II. Learning and Interaction Goals of the Blended Course

This course was developed centered around two main goals.

1. It is possible to teach complex, high-level, hands-on concepts at a distance.
2. Personalize the content for students with differing backgrounds, experience, skill-levels and learning styles.

This course was originally developed to fill a need to address the lack of quality training in quantitative statistical modeling. Our students consist of fisheries and natural resource professionals who are working nationally and internationally, as well as current students completing their masters or doctoral program within the college of Natural Resources.

The goal of this course is to prove that you can teach complex, high-level, hands-on concepts at a distance. This was accomplished by using media-rich technology that personalizes the content for students with differing backgrounds, experience, skill-levels and learning styles.

Our students

One of the biggest challenges facing educators is the diversity of students in regard to their experience and skills and our students are no exception. Our student summary:

1. Students in both master’s (2 in 1st year) and doctoral program (3 in 1st year, 4 in 3rd year).
2. Students working in the field for many years vs. full-time students.
3. Some students had high-level statistical training while others had minimal training.
4. Some students use the statistical software (R) used in the class daily (4) while others have never heard of it or barely use it (5).
5. Some students have taken an online course previously (2), while others have not (7).

Using technology to personalize content for those with different backgrounds, experience and skill-levels.

Our course was designed to address these gaps through the following.

1. **Start Here Folder.** (see page 3)
2. **Complete and detailed lectures** (assuming no prior knowledge). (see pages 3-7)
3. **Background and Advanced tabs.** (see page 7)
4. **Review Quiz** (see page 7)
5. **I Need Help Link** (see page 7)
6. **Many practice opportunities.** (see page 8)
7. **Focus on Different Learning Styles** (see page 9)

III. Points of Interest and Innovation
1. **Start Here Folder**

The students are directed to this folder when they receive their welcome to the course email prior to the beginning of the semester. This folder welcomes the students to the class with a welcome video, and also addresses several technology-related problems. Students who are unfamiliar with online classes or basic technology can view help pages and videos on topics including how to navigate the ANGEL page, how to post to a discussion forum, how to upload an assignment, and how to use the play bar on the flash videos.

This folder also gets the students familiar with and set up to use the online meeting software for personal help and group study sessions. Students are able to view short videos on how to use Adobe Connect and Skype. A video on how to download Skype and add us as a contact is also presented. We also ask the students to do a quick Adobe Connect connection test during this first week so we can prevent log-on issues during the study session. This seemed to have worked because the instructors never had to deal with log-on issues or students unable to attend the live sessions because of technology related problems.

This folder also contains a quick audio, PDF and Flash video check along with a quick quiz on the syllabus and an introduce yourself discussion forum to make sure students know how to use these online tools.

2. **Complete and Detailed Lecture Videos**

Guided Practice – Guided practice exercises are included in the videos to help students practice the concepts they just learned. Guided practice works in a couple of different ways. The students are asked to perform a specific task. Students can complete the task without help if they want, but there are either code hints or several procedural “hints” provided for the students who need them. The procedural hints work by providing a series of hints, each displaying a little information to get the students to recall what they learned. Each hint gets progressively more detailed if they need it.

![Screenshot of Steps to Find Mean](image1)

![Screenshot of Practice](image2)

![Screenshot of Challenge](image3)
Animations – Each video is filled with animations and timing that help present the content in a clear manner. It is difficult to show the animations on this static form, but screen shots are included with a brief explanation to help clarify.

- Parts of equations are highlighted and labeled as the audio talks about it.
- Visually shows where the data fits into the equation as we discuss it.
- Parts animate in when discussing how nested if else statements work. (If condition 1 is met then the loop goes to statement 1, if it is not met it continues to condition 2)
- Lines of code appear when we talk about it and it displays the definition with color coding.
- Animates the graph based on the values in parenthesis and in the subscript.
- This box fills with the correct output as we animate how a loop works.
- Animates what happens when you use different starting values. You get 2 different answers and that is why good starting values are important.
- Shows definitions and where they are in the graph.
**Built-in questioning** – Each lecture video has quick assessments built-in. These questions 1. Help break up the content so students are active learners rather than just passively watching the video. 2. It gives the students an opportunity to practice what they learned, and 3. It is a mode of self-assessment for the students so they will know if they understood the material or if they need to go back for another look.

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Recreate function syntax by selecting the correct elements in the drop down.

**Question about how to analyze the data**
**Personalized movement**- Students are given opportunities to dig deeper into the material within the lecture videos if they choose. They can opt to try another practice activity before moving on or skipping it. They can skip a section of the lecture if they already have the background (derivatives shown below) or take that portion of the lecture. They can also click links to take them directly to a video on the topic to learn more.

**Interactions** – Interactions are included to keep the students actively engaged with the lecture materials. Students do not just passively watch the video. There are rollovers embedded so the students can learn more or view definitions at their own pace.
3. **Background and Advanced Links**- *(see appendix A and B)*

The main page of each unit has links to important items such as the background and advanced links. These links were created to help with the diverse skill levels of our students. Students who have been out of school for a while or did not take enough statistics can use the background link to find links to easy to follow pages on the web. These pages have good introductory explanations and more examples. The advanced tab have links to pages or articles that expand on the units concepts for those who want to learn more.

4. **Review Quiz**- *(see appendix A)*

Each unit includes a practice review quiz. This quiz pulls from a pool of each previous units practice questions. The purpose of this quiz is to keep all information current. The theory behind these quizzes is repetition. The more students see and practice the content, the better likely they will remember it and retain it in long term memory. Often students forget the material in previous units because they completed the unit and moved on. This quiz is a quick review and students are forced to re-review old material and think about it again. Students will also find connections with the previous units material because now they can see how the concepts presented previously apply to what they are learning now.

5. **I Need Help Link**- *(see appendix B)*

Each unit interface contains a link to set up a personal meeting with the instructor. Students in online environment consciously know there is an instructor, but the distance often makes them hesitant to ask for help when they need it. This link was created to address this issue. The link is visibly and centrally located within the units interface so students see it every time they complete a task. (which is when the students will be stuck on material!). The link opens a short survey asking whether the student wants to meet in person or online, what times they have available, and a description of their question or what they need help with. Instructors are notified via an email alert when someone submits the survey and are prompted to set up a meeting. This is a safe and non-threatening way for students to reach out for help!
6. Many Practice Exercises-

Each unit has several practice exercises. After a lecture video, students are able to practice a real-world example of what they learned on their own. Remember, they were shown how to do it in the lecture videos, and were given opportunities within the lecture videos to practice with guidance. These exercises are here to test their knowledge on their own without “hints”. Students do have access to the exercise solutions and detailed output code with hints if they get stuck. These are also great printable resources for the students to use later when they need to do a like mode.

Arrows and bubbles are used to explain different lines of code and its use. Elements of graphs are explained.
7. Learning Styles- *(see lecture videos pages 3-7)*

The items presented previously all lead up to course content that is made with all learning styles in mind. Students are given opportunities to learn how they want to learn. (i.e. They can use the audio or mute it, they can read the lectures or view them.)

*Using technology to personalize content for those with different learning styles.*

**Personalized Learning:**
- If they want to watch the lecture videos they can, if they don’t they can read the video handout.
- If they want to listen to audio they can, if not they can mute it.
- If they want to follow along with the video examples they can, otherwise they can just watch it.
- They can complete the practice exercises or skip them.
- They can read the video transcript or turn the closed captioning off.
- They can participate in the peer-to-peer discussion question and answer forum if they want to.
- They can use the background information link if they need it, or skip over it if they don’t.
- They can view the contents of the advanced tab if they want to know more on the subject.
V. Evidence of Effectiveness with Students
This was our first time offering this course so we do not have an comparative data. This class also did not have a SIRS because it was offered as a special topics course. We did, however, ask our own survey questions to the students half way through and upon the course completion. We asked about the effectiveness and the value added of the different components of the course. Students responded positively to the content and the technologies provided. The graphs display the results.

![Bar chart showing student perceptions of the value added](chart1.png)

IV. Accessibility
This course was developed with accessibility in mind.

- Alt text on all images. (for screen readers)
- All lecture videos have full audio. (visually impaired)
- Each lecture video has a printable text handout (for screen readers).
- Closed captioning is provided on each lecture video. (for hearing impaired)
- Alt text is included for equations displayed on pages. i.e. this description describes the equation below (Start binomial n choose k end binomial = start fraction n factorial over left parenthesis n-k right parenthesis factorial k factorial.

\[
\binom{n}{k} = \frac{n!}{(n-k)!k!}
\]
VI. Plans for Sustainability

This course is the first of several for our fully online Master’s degree program that is in development. This course is also offered as a non-credit course for students who do not wish to pursue a degree program. Students who complete the course as a non-credit course are awarded a certificate of completion. This course will also be part of a non-credit certificate program for those working in the industry. We continually solicit feedback on each unit. This is collected via unit surveys that ask for student opinions of the content and delivery and requests for improvement along with a link to let us know if they see anything that needs to be fixed such as broken links. This way we will continually be able to keep the content fresh and in working order.

Appendix A
Appendix B

Contains the unit objectives and shows students where there are in the overall organization and timeline of the course. Helps them keep on track because it shows that not all units are the same length.

Contains links to relevant, easy to follow web pages and videos for those who need a little more background help on the content.

All handouts for this unit are displayed here.

A link to constantly remind students that there is an instructor ready and willing to help if they are having problems or have questions. This is a quick survey that asks whether or not they want to meet in person or online, days and times they are available, and a quick description of the questions.

Contains links and articles that extend on the concepts of the unit for those who had some of this knowledge and want more. This keeps the advanced users interested.

A link to email me if they see anything that is not working so I can fix it.

Contains a summary of the unit.

1. Pulls the main points that we want to make sure the student got from the unit.
2. Makes connections to previous units.
3. Emphasizes why the content is important and relevant.

A unit survey asking random questions such as how things are going, what areas are unclear in this unit? What would you like more information on?