COURSE SYLLABUS
FNRM 3471 / FNRM 5471 Forest Management Planning
Fall, 2017
3 credits

Instructor: Howard Hoganson, Professor
Department of Forest Resources
North Central Research and Outreach Center
University of Minnesota
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Grand Rapids MN 55744
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Scheduled Class Times: Wednesdays and Thursdays 1:30-2:45 PM (GH 19)
Fridays 11:45 – 1:00 PM (GH 19)

The class times were selected to coordinate with schedules for other classes. Three credit classes during fall semester at the University of Minnesota that meet for 75 minutes each meeting time (session) typically meet twice each week. Over fall semester, that sums to 28 sessions. The plan for this three credit class is to have 75-minute sessions with no fewer than 28 sessions and no more than 30 sessions. Each session will be at one of the three days and times listed above. Each student is expected to attend each scheduled session. The tentative schedule of session meeting times will be distributed on the first day of class. Sessions will be spread out throughout the semester, with most weeks having at least one session. The specific schedule will be developed considering that some forestry students typically attend the Society of American Foresters National Conference during fall semester.

Student workload expectations are aligned with University of Minnesota Policy -- students, for a 3 credit class, are expected to spend an average of 9 hours of work each week (including class meeting time) to earn an average grade. Course grades are based on the quality of the work submitted, not on hours of effort.

Office Hours: (visiting faculty office, 105 Green Hall, phone: 612-624-4221)
Wednesdays & Thursdays: 3:00 – 4:00 PM
Fridays: 10:30 – 11:30 AM

Note: Unless otherwise notified, no office hours are scheduled for days when the class is not scheduled -- the instructor is not likely on campus those days.

No Pre-requisites
Recommended: FNRM 3218 Measurements and Modeling of Forests
ESPM 3261 Economics and Natural Resources Management
FNRM 3411 Silviculture *** or concurrent registration
Inter-related Course Objectives:

1. To better understand forest management planning:
   a. Many of the interacting facets of forest management situations.
   b. Stand-level decisions and economic measures to help compare options.
   c. Strategies for coordinating stand-level decisions across a forest or landscape to help achieve forest-level objectives while satisfying forest-level constraints.
   d. How one’s own professional expertise can contribute to forest planning.

2. To better understand management science tools used to support decision-making in forest management.
   a. How stand-level management situations fit specific problem structures of operations research (management science).
   b. How forest-level management situations fit specific problem structures of operations research (management science).

3. To gain a better understanding of recent forest management planning efforts and associated decision support systems, in Minnesota & elsewhere.

Course Structure:

1) Take advantage of the small number of students in the class. Students are encouraged to actively participate, listen, and respect the views of others. Forest planning often involves an interdisciplinary planning team that requires active group participation. Classmates likely represent diverse perspectives and expertise. Try to take advantage of that.

2) Students are encouraged to: (a) visit the instructor during office hours, (b) email questions to the instructor, and (c) feel comfortable asking questions in class. Learning is the priority for this class.

3) The analytical nature of management science is not easy for many students. It is also not something necessarily retained long-term from a lecture or reading. Emphasis for the class is on learning by doing homework sets.

4) Lectures and homework will often build on previous lectures and homework. Students in the past have found it valuable to maintain a steady pace, starting the homework soon after it is available. A homework set will unlikely be done well if started the day before it is due. Lectures will likely be easier to follow if you’ve started the related homework.

5) Questions on homework and exams will vary in difficulty. Intent is for at least a few questions to challenge all students and the instructor. Students are encouraged to make an honest attempt for all questions. Partial credit is likely, especially when a student shows their work in a “reasonable-to-understand” format.
6) Math can help us better understand forestry situations! However, most forestry students didn’t choose forestry for the opportunity to apply math. Some forestry students are intimidated by math. The math for this class is not calculus. Don’t let the math curb your interest and enthusiasm. Your math skills may just be rusty. That happens to most of us.

7) For most students, the most difficult aspects of analyzing forest management problems relate to: (a) setting up a problem as a math model, (b) understanding how the model is applied or solved, and then (c) interpreting the results. Experience is helpful. This helps explain why homework sets are stressed.

8) We want to understand the formulas we use and apply common sense. Data is generally related to real world situations. Consider whether your estimates seem reasonable! For example, on a per acre basis, we wouldn’t expect any management option, in terms of timber production values, to be worth millions of dollars per acre. Or in contrast, have all stand options be near zero in estimated value and varying by less than a penny per acre.

9) Often a good way to learn something well is to help teach it to others. Grades will not be based strictly on a curve. Students are encouraged to work together, helping each other learn.

10) Most homework sets will involve some group work. All students in a group are expected to contribute. Group members will change between assignments. Potential meeting times on days when the class does not meet are expected to be good times for groups to meet.

11) During the last two weeks of the semester, all students will be part of an informal presentation to the class summarizing what they learned for their last homework set. This last homework set will be fairly open-ended and more of a class project.

12) All students are expected to complete coursework responsibilities with fairness and honesty. Failure to do so can result in a penalty up to an "F" or "N" for the course. If you have questions regarding expectations for a specific assignment or exam, please ask the instructor. For more information on fairness and honesty, visit the website for the University’s Office of student conduct and academic integrity: www.oscai.umn.edu.

13) For most lectures, notes will be made available to the student, either in class or by email. Because much of the material builds on previous lectures, students are encouraged to bring handouts from recent lectures to class. It is important to keep handouts organized, as the collection will become large. It is recommended that students date each handout based on the date distributed.

14) No cell phones or cameras in class. Penalty for any visible cell phone or camera when an exam is distributed is an automatic zero for that exam. Penalty for each occurrence of a visible cell phone or camera during a lecture is a 20 point deduction from your total point score for the semester.

15) Students are allowed to use a simple calculator on an exam. It must not have any graphic, computer programming, or communication capabilities.
Textbooks:

1) No text is required. Two helpful references:

   b. Gupta, S.K. and J.M. Cozzolino. 1975. *Fundamentals of operations research for management.* Holden-Day Inc., San Francisco. 405 pp. ISBN: 0-8162-3476-0. This is an old text, but the basic operations research model structures and basic solution methods have not changed since this was published.

2) One homework set has the option to review:

3) Copies of all 3 books are on reserve for this class in the Natural Resources Library located in 375 Hodson Hall.

Grades: Grades for graduate credit (FR5471) will follow the same process as for undergraduate credit with additional modifications as described under (2) below. The meaning of possible grades is as defined for all classes by University of Minnesota Administrative Policy:

A Represents achievement that is outstanding relative to the level necessary to meet course requirements
B Represents achievement that is significantly above the level necessary to meet course requirements
C Represents achievement that meets the course requirements in every respect
D Represents achievement that is worthy of credit even though it fails to meet fully the course requirements
S Achievement that is satisfactory, which in undergraduate courses is equivalent to a C- or better.
F (or N) Represents failure (or no credit) and signifies that the work was either (1) completed but at a level of achievement that is not worthy of credit or (2) was not completed and there was no agreement between the instructor and the student that the student would be awarded an I.
I (Incomplete) Assigned at the discretion of the instructor when, due to extraordinary circumstances, e.g., hospitalization, a student is prevented from completing the work of the course on time. Requires a written agreement between instructor and student.

1. **Course grades for undergraduate credit (FNRM 3471)**

   a) Course grade will be based on total points scored based on the following components and estimated number of points:
      i) 6 Homework sets totaling approximately 360 points
      ii) 2 “midterm” exams --70 points each, totaling 140 points
      iii) Class attendance, class participation & teamwork totaling 30 points
      iv) Final exam -- 70 points
b) The instructor will use subjective judgment to convert a student’s total point score (out of ~ 600 points) to a course grade on a 4.0 scale. Overall, it is a balancing act between (1) curving -- maintaining an average class grade and (2) recognizing that the class size is small with the “average score” potentially above or below overall expectations. Exams and homework sets vary in difficulty, making standard 90%, 80% break points potentially inappropriate.

c) Exams will be cumulative, but emphasizing material since the prior exam.

d) Due dates for homework will be announced in class at the time each homework set is distributed. Homework sets can be submitted to the instructor via email and are due by 4 pm on the announced due date, unless otherwise noted. Tentative due dates are shown on the calendar showing the tentative class schedule. Homework can usually be submitted as Microsoft Excel or Word files with it important to present results in an easy-to-follow format to receive partial predict.

e) When graded homework sets or exams are returned in class, the instructor will provide feedback regarding overall class performance. For any grades, students should feel free to consult with the instructor if they think that they have been graded unfairly or if they have questions or concerns regarding grading procedures.

f) A homework set turned in late will be penalized 2 points for each day or partial day it is late. If circumstances exist that are beyond the student's control, the instructor will consider reducing penalties.

g) To earn a class grade of C- or better, each student must complete each homework set with a score of at least 50% of the total points for that set and 50% of the points associated with the portion of set to be completed by each individual. These requirements do not consider any “late penalties” in calculating percentages. Any homework set not earning these 50% requirements will be returned to the student for revision to raise that grade to the 50% minimum. For a revision, no additional late penalty will be applied, but the grade for a revised homework set (pre-penalty) cannot be raised above the 50% requirements. Meeting the 50% requirement for each homework set does not necessarily guarantee a grade of C-, as final course grades are based on the student’s total point score as described in earlier statements.

h) All exams, including the final exam will be closed-book and closed-notes. All exams can be comprehensive, covering material from homework, class lectures, and any assigned readings.

i) During a class session prior to each exam, students will be given the opportunity to preview and start the exam. No notes can be taken when previewing an exam.

j) The scheduled time for the final exam is as assigned by the University exam scheduling rules based on class meeting time. Each student will also have the option to complete the final exam at a time scheduled by the instructor during the last week of class.
2. **Course grades for graduate credit (FNRM 5471)**

   a) Course grades for graduate credit will be determined as described above for FNRM 3471 using a separate grading curve.

   b) Through work for the homework sets, graduate students are expected to demonstrate that they have taken leadership to help others in the class learn. For the more open-ended last homework set, graduate students will likely be expected to do that assignment individually even though most undergrads will be working in small groups.

   c) The instructor is open to additional open-ended work by graduate students to help demonstrate their understanding of the material. Graduate students are encouraged to consider how tools from operations research may be helpful for their own research. However, any additional open-ended work does not reduce expectations about potential role of graduate students for homework sets.
## Planned Topics and Order of Presentation

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<tr>
<th>Class Sessions</th>
<th>Class Topics</th>
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<tbody>
<tr>
<td>1-2</td>
<td><strong>Course introduction</strong>: Structure of class, student survey, facets of forest management, background terminology and concepts from forest economics.</td>
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<tr>
<td>2 to 4</td>
<td><strong>Introduction to stand-level problems</strong>: Economic measures for timber production: net present value (NPV), soil expectation value (SEV), optimal rotation age, linking harvesting and regeneration decisions, graphical and mathematical solutions. HW#1: Finding the value of existing stands based on its timber production potential.</td>
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<td>4 to 7</td>
<td><strong>Introduction to linear programming (LP)</strong>: example of a small LP forestry problem, graphical solutions, simplex method, finding an initial feasible solution. The LINDO software package. HW#2: Solving small, 2-variable LP problems to better understand LP model solutions and the information they provide.</td>
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<tr>
<td>8 to 12</td>
<td><strong>Introduction to forest-level problems</strong>: Forest regulation, allowable cut, area control, &amp; volume control. Impacts of even-flow, departures from even-flow and extended rotations on the economics of timber production. Potential allowable cut effect on stand-level analyses. HW#3: Using a traditional simulation model to compare alternative forest regulation strategies for one forest cover type. Guest speaker and Exam 1.</td>
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<td>13 to 16</td>
<td><strong>Introduction to dynamic programming (DP)</strong>: Example DP applications. DP models for stand thinning strategies. DP models for broader ecological/landscape spatial objectives. HW#4: Using DP to integrate timber production with production of core-area of older forest for a small forest.</td>
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<td>17 to 22</td>
<td><strong>LP models for forest-level planning</strong>: Model I and Model II formulations, Forest regulation based on LP. Sensitivity analysis of linear programming: shadow prices and reduce costs. HW#5: Interpreting LP model solutions for a Minnesota Case study. Exam 2</td>
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<td>23 to 25</td>
<td><strong>Linking stand-level &amp; forest-level analyses; Real world applications</strong>: Forest-wide planning as a series of modified stand-level economic analyses. Dual problems -- linking stand-level &amp; forest-level planning. Minnesota DNR Subsection planning.</td>
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