

## ENMA 703/803: APPLIED OPTIMIZATION

Spring 2006  
Monday 19:10 – 21:50 PM  
Kaufman building, Room 247

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**Office Hours:** Wednesday: 4:00-7:00 PM, Thursday 2:00-5:00 PM, or by appointment.  
**Instructor Web Site:** <http://www.odu.edu/~grabadi/>  
**Class Web Site:** <http://blackboard.odu.edu/>  
**How to Login:** See the **Blackboard** section in this syllabus  
Login to Blackboard frequently for notes, downloads, announcements etc.

### COURSE OBJECTIVES

The main focus of the class will be on modeling and solving linear and non-linear optimization problems with applications in manufacturing and service. Most problems are of combinatorial nature, and therefore, require the use of computers. Theory and rationale of solution algorithms will be introduced, but more emphasis will be on how to model problems mainly using spreadsheets.

### TEXT, REFERENCES, AND CLASS MATERIAL

**Required Text:** Baker, K, *Optimization Modeling with Spreadsheets*, 2006, ISBN 0-534-49474-9

Students are encouraged to seek other sources on discrete and combinatorial optimizations including books, journal articles, and tutorials. Certain topics may be covered from multiple sources and some additional material may be identified or supplied to students during the semester for additional reading. The library at Old Dominion University provides students with access to many electronic and physical technical journals and books.

### CLASS NOTES AND SLIDES

This class will be mostly hands-on where students are expected to use laptops in most lectures. Therefore, slides and notes may not be available for every lecture; instead, notes, graphs, mathematical models and equations, etc maybe presented in class and it is recommended that students take their own notes during lectures. It is, however, expected for students to login to the class web site on Blackboard before class for updates and downloads, which I will do my best to have available one day prior to class whenever applicable. In some cases, downloads could be available a few hours before class. In addition, the textbook comes with a CD that includes spreadsheet models and datasets that will be used in class; hence, it is required to install these files on your computer and/or have them available on a CD or a thumb drive.

### COMPUTER HARDWARE AND SOFTWARE REQUIREMENTS

**Hardware Requirements:** Computers will be heavily used in this course to implement optimization models in Excel Spreadsheets. Minimum hardware requirements are Pentium II 233 MHz and 64 MB RAM. If you have a laptop with these minimum requirements, bring it to class as we will implement models and run exercises in class. If you do not have a laptop, one will be provided to you, but you will need to have a thumb drive to copy any files that you may need or work on during the sessions.

**Software Requirements:** MS-Excel XP/2000/ME/98 and Excel Solver add-in will be required. The Premium version of Solver is included on the CD that accompanies the textbook. Prior to first class, perform a full installation of all files and add-ins included on the CD following the installation instructions in the book. The use of Excel Solver will be presented in class; however, good knowledge of Excel is expected and will be very important to succeed in this class. If other additional software tools or modeling environments are used, information regarding such packages will be provided.

The **digital drop box** in Blackboard will be used to turn in your assignments and reports. Assignment and project reports must be typed, and therefore, you should be comfortable with word processing software such as MS-Word including its equation editor. Both MS-Word and PDF format are acceptable.

**EXAMS, HOMEWORK ASSIGNMENTS, AND PROJECTS**

- There will be three case studies and a project. For ENMA 803 students (i.e., Ph.D. students), an additional optimization research paper will be required. All assignments are individual including the project and research paper.
- The project and research paper topics must be in the area of optimization with your choice of an application. It is highly recommended to select a problem from your work environment or one of specific interest to you. The scope of the project must include modeling, implementing, and solving the defined problem, and reporting the results. If spreadsheets are not the most appropriate modeling environment, you can propose to use another environment. The research paper must be based on your Ph.D. research area, or on peer reviewed research articles. The project and research paper quality must be at the level of peer reviewed conference articles at minimum. One page proposal must be submitted and approved before students start working on the project or paper.
- Homework problems will be assigned but *not* collected for grading. It is important, however, to do the homework problems to be able to do the case studies. Some homework problems will be discussed in class and students will be expected to have an active participation in the discussion/solution.

**GRADE DISTRIBUTION**

<u>ENMA 703</u>	
Three Individual Case Studies (equally weighted)	70 %
Individual Project	30 %
 <u>ENMA 803</u>	
Three Individual Case Studies (equally weighted)	60 %
Individual Project	25%
Individual Research Paper	15 %

**GRADING SCALE**

90-92	A-	93-100	A		
80-82	B-	83-86	B	87-89	B+
70-72	C-	73-76	C	77-79	C+
< 70	F				

**ACADEMIC INTEGRITY**

The Old Dominion honor system is in effect for all student work submitted during the course. In effect, this stipulates that lying, cheating or plagiarism are violations of the honor system and will be subject to

disciplinary action. Violation of the honor code will not be tolerated. The punishment ranges from getting “F” in the course to being expelled.

### **CLASS ATTENDANCE**

Class attendance is “expected”. If for some reason a student should miss a class, it is the *student’s responsibility* to:

1. Inform themselves of any administrative announcements (e.g. schedule changes) discussed during a session.
2. “Make-up” any of the course material covered in the session. This is of particular importance as there will be work presented in the sessions that may not be covered adequately in the textbook.

It is not necessary to inform me of an absence should a situation arise where attendance is not possible. Please note however, that *I reserve the right not to provide extensive information about what transpired in a class.*

### **EMAIL**

I will be communicating with all students using both Blackboard announcements and ODU email addresses. You need to activate your ODU email login for several reasons:

- 1) It is the same login and password for the Blackboard system, so you are going to need it anyway
- 2) You need it to do course evaluations by the end of the semester
- 3) Helps university reduce mailing expenses
- 4) Official university correspondence and important information being sent via email.
- 5) It’s a university policy
- 6) Starting shortly student bill notifications will be sent via email to the student's ODU email account.

If you have not activated your student e-mail account it is about a 30 second process: go to <http://season.odu.edu> and follow the link at the upper left of the page for "REQUEST NEW E-MAIL OR LAN ACCOUNT"

If you already have your student e-mail account, but don't regularly check it, you can have the ODU e-mail automatically forwarded to any e-mail address you desire in less than 30 seconds. Just go to <http://season.odu.edu> and follow the link at the left of the page for "FORWARD E-MAIL TO ANOTHER ACCOUNT". All you need is your email account-id ("Account Name" = your id which is the part of your e-mail address that precedes the "@odu.edu") and password. Then just follow the directions.

If you send me an email from an address other than your ODU email account, I will reply to it. However, whenever I initiate an email message, I will use your ODU email address.

### **USING BLACKBOARD:**

1. Access the system at: <http://blackboard.odu.edu/>
2. It is a requirement of all Blackboard courses that you have an Old Dominion University Student Midas account to access Blackboard. If you do not have a Midas account, you can request one at <https://midas.odu.edu>. Be prepared to complete the security profile in the event you lose or forget your password in the future. *It may take several hours for the information about a new account or password to become active in Blackboard, Therefore, please allow up to 24 hours before reporting any login problems to Customer Service.*
3. If you do not own a computer to upload assignments, you still have access to a computer through Old Dominion's computer labs. Course material will be posted under Course Documents

4. To upload your assignments, click on Tools >> Digital drop Box >> Send files (more instructions on assignment submission will be available for each assignment individually)
5. If you never used Blackboard before, visit and read the student help page which could be found at:

***<http://www.odu.edu> > Current Students > Blackboard > Student Help***

**IMPORTANT DATES IN SPRING 2006**

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January 9 (Monday)	First Class
January 14-16 (Sat-Mon)	Martin Luther King, Jr. Holiday
February 20 (Mon)	Project proposal due
March 6-11 (Mon-Sat)	Spring Holiday
March 14 (Tuesday)	Last day to withdraw from classes
April 25 (Tuesday)	Classes end
April 27 (Thursday)	Exams begin
May 4 (Thursday)	Exams end
May 6 (Saturday)	Commencement

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### TENTATIVE CLASS SCHEDULE

<b>Date</b>	<b>Topics</b>	<b>Material</b>
January 9	Course Overview Introduction to Modeling and Spreadsheets Mathematical Programming	Syllabus Ch 1 Ch 2
January 16	Martin Luther King Day (No Class)	—
January 23	Allocation, Covering and Blending Models	Ch 2
January 30	Network Models	Ch 3
February 6	Network Models	Ch 3
February 13	Sensitivity Analysis	Ch 4
February 20	Sensitivity Analysis	Ch 4
February 27	Data Envelopment Analysis	Ch 5
March 6	Spring Break (No Class)	—
March 13	Integer Programming	Ch 6
March 20	Integer Programming	Ch 6
March 27	Nonlinear Programming	Ch 7
April 3	Nonlinear Programming	Ch 7
April 10	Modern Heuristics and Evolutionary Algorithms	Ch 8 + External material
April 17	Modern Heuristics and Evolutionary Algorithms	Ch 8 + External material
April 24	Project Presentations	