

# EMSE 388.10

## Quantitative Methods in Cost Engineering

### Course Information:

EMSE 388.10

Time: Tuesdays, 7:10 p.m. to 9:40 p.m.

Location: DSS Lab (Room 119), 1776 G St N.W., Washington DC 20052.

### Instructor Information:

Amita Singh

GWU Office Address: 1776 G Street N.W., Room 135, Washington DC 20052.

GWU Telephone Number: 202-994-1563

E-mail: [amsingh@lmi.org](mailto:amsingh@lmi.org) (primary e-mail address), [amitas@gwu.edu](mailto:amitas@gwu.edu)

Office Hours: By appointment

### Course Description:

Cost Engineering is an emerging discipline within the field of finance that provides industry with tools and techniques to estimate and manage costs throughout a business process lifecycle.

Until recently, developing solutions to complicated finance problems required extensive software development expertise. Today the power of EXCEL and add-ins such as @RISK, SOLVER, and PRECISION TREE makes it possible to tackle these problems with relative ease. However one still requires an understanding of the manner in which to define the problem and quantify the knowns and the unknowns to develop comprehensive and meaningful solutions using these software tools. To this end, the course will cover a variety of financial models will be considered as EXCEL case studies, e.g. fitting exponential growth of Microsoft sales, multi-period capital budgeting using the Analytical Hierarchy Process and Solver. These case studies will be used to highlight some of the theoretical complexities in solving these problems.

### Recommended Prerequisite:

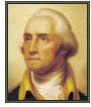
EMSE 269 Elements of Problem Solving and Decision Making or EMSE 260 Survey of Finance and Engineering Economics

### Course Objectives:

Each student should:

- (1) learn how to use the software EXCEL to solve complicated financial problems,
- (2) learn the theoretical underpinnings of these financial models to be able to draw meaningful conclusions,
- (3) learn what areas to look into if further understanding is needed.

A variety of theoretical problems will be introduced in a financial context, such as non-linear optimization, regression analysis, analytical hierarch progress, and uncertainty analysis. Students should complete this course with sufficient expertise to model the problem at hand utilizing the appropriate econometric methods.



**Method of Instruction:**

During the class the material will be presented using ADOBE ACROBAT and EXCEL spreadsheets. Students are expected to print a copy of the slides ahead of time and read them at least once before each session. This should reduce the need for taking notes during class and stimulate student – instructor interactions.

Homework: Homework is considered to be a vital part of the course. Homework assignment will be given in the lecture notes. For each homework problem a student will be called upon to discuss their solution, so you must be prepared! The rest of the class should be involved in the discussion. Homework should be handed in the following week before class starts. Your level of effort will be graded. Not handing in the homework problem will result in 0 points. An inadequate level of effort will be awarded 1 point, and an adequate level of effort 2 points. A perfect solution of the Homework Exercise will result in 3 points. Hence, not having the correct answer may still result in 2 points, the aim being to learn at this stage. You should each bring electronic files of your homework to class in case you are called upon to show your work to the rest of the class.

Reading Assignments: Lecture Notes for the next class

**Method of Evaluation:**

Three in-class Computer Quizzes will be assigned using Microsoft Excel. Students will hand in the electronic copy of their files, which will be graded.

**FINAL GRADE CALCULATION:**

25% Homework  
25% QUIZ 1  
25% QUIZ 2  
25% QUIZ 3

**Text and Software:**

The course does not require a textbook and will be taught from lecture notes. Some of the case studies that are being discussed are revised originals versions from the recommended additional text below.

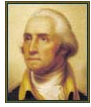
Software: Microsoft Excel available in our computer labs

Recommended additional text (but not necessary):

“Financial Models using Simulation and Optimization” by Wayne Winston

**Lead Professor:**

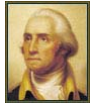
Dr. J. Rene van Dorp, Associate Professor,  
Department of Engineering Management and Systems Engineering,  
1776 G St NW, Suite 110, Washington DC 20052.



Session Topics:

Session	Date	Class Topic	Homework Assigned (due in the following class)
1	1/16/2007	Intro Sensitivity Analysis with Data Tables: NPV Calculations and Profit Optimization	1 - NPV Analysis, 2 - Concavity
2	1/23/2007	Intro Sensitivity Analysis with Data Tables: Storage Capacity Decision, NPV Comparison with random Interest Rates	No homework given
3	1/30/2007	REGRESSION - Estimating Linear Relationship between Stock Return and Market Return Fitting Exponential Growth	3 - Regression, 4 - Mean Residuals
4	2/6/2007	REGRESSION - Using Multiple Regression to Forecast Sales	5 - Example QUIZ
5	2/13/2007	SOLVER - Determining Monthly Loan Payments	6 - Monthly Payment (Due 3/2/05)
6	2/20/2007	<b>QUIZ 1 - PRACTICAL EXERCISE FOR GRADE (Sessions 1,2,3,4)</b>	
7	2/27/2007	SOLVER - Funding a Pension Liability, Multiperiod Capital Budgeting, Portfolio Optimization with Solver	7 - Variance
8	3/6/2007	SOLVER - Funding a Pension Liability, Multiperiod Capital Budgeting (continued)	None
9	3/13/2007	<b>SPRING BREAK</b>	Will be Provided
10	3/20/2007	SOLVER - Analytical Hierarchy Process (AHP), Using AHP to select a job, Using AHP and Solver for Project Selection	None
11	3/27/2007	<b>QUIZ 2 - PRACTICAL EXERCISE FOR GRADE (Sessions 5, 6, 7)</b>	
12	4/3/2007	UNCERTAINTY - The nuts and bolts of @RISK 1	8 - Proof Theorem
13	4/10/2007	UNCERTAINTY - The nuts and bolts of @RISK 2	9 - Inv. Triangular
14	4/17/2007	UNCERTAINTY - Project Network Risk Analysis 1	
15	4/24/2007	<b>QUIZ 3 - PRACTICAL EXERCISE FOR GRADE (Sessions 11, 12, 13 and 14)</b>	

- Electronic copies of the lecture notes and the extra problem assignment can be downloaded from Dr van Dorp's Faculty web-page at:  
<http://www.seas.gwu.edu/~dorpjr/EMSE388/Intro.html>
- Please send me an introductory e-mail at [amsingh@lmi.org](mailto:amsingh@lmi.org) with subject "EMSE 388 Spring 2007" so I can create an e-mail class list. Electronic solutions of the homework will be distributed via this e-mail list.



**Academic Integrity:**

THE ACADEMIC INTEGRITY CODE WAS DEVELOPED  
BY THE STUDENTS AND THE FACULTY OF GW WORKING  
TOGETHER IN 1995. BY ATTENDING GW EACH STUDENT  
IS PART OF THIS TRADITION.

"THE RIGHT ANSWER COMES FROM YOU"

Cheating will not be tolerated. Copying or looking in another student's paper during the exams will not be tolerated. All homework that you submit for a grade must be your own. This does not mean that you cannot work together to some degree in discussing how to approach the assignments (unless otherwise noted by the instructor with regard to specific assignments). Figuring out how to solve a problem together is fine; developing the solution write up is not. You must write your own solutions to the homework. Also, no material from previous EMSE 388 classes may be used. In the event of cheating, action will taken in accordance with the Academic Integrity Code. A copy of the Academic Integrity Code may be picked up at:

ACADEMIC INTEGRITY OFFICE  
THE GEORGE WASHINGTON UNIVERSITY  
609 22nd STREET, N.W. BLDG. AJ  
WASHINGTON D.C. 20052