

VERTICAL LEARNING CURVE

# Quantitative Methods for Decision Making & Problem Solving

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Course Description

6/22/2010



## Contents

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Contents .....	2
Overview .....	3
Course Outline .....	4
Recommended Readings and Resources .....	6
Credits – Cynthia Hanchey, Ph.D., CDE .....	7

# Quantitative Methods for Decision Making & Problem Solving

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## Overview

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This course provides the student with the concepts, methods and tools for the application of logical and quantitative analysis to business decision making and problem solving. It familiarizes the student with a wide range of software and other classical and contemporary resources related to decision and problem analysis, including basics of logic and decision making, principles of optimization, probabilistic distributions, linear programming, simplex, queuing and transportation problems, break even analysis, inventory management, forecasting and simulation. The course highlights the benefits as well as the limits of quantitative analysis in a real-world context.

Upon completion of this course a student should be able to:

- describe the process of decision-making
- apply the concepts of decision-making
- analyze and describe business problems using objectives and constraints
- solve quantitative-based business problems

This course has **10 modules**, each focusing on a unique topic with unique objectives for your knowledge, skill and values acquisition. Modules may vary in length and difficulty. Failure to demonstrate the required competency in a module leads to a performance review highlighting areas of deficiency and the opportunity to repeat the necessary portions of the module (before you will be allowed to proceed to the next module).

To enroll in this course, you must first review this Course Description and the Course Introduction which may be found at [http://www.vlcglobal.com/docs/course\\_introduction.pdf](http://www.vlcglobal.com/docs/course_introduction.pdf)

## Course Outline

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<b>Module</b>	<b>Issues + Resources</b>
<b>1</b>	<b>Fundamentals of Decision Making &amp; Problem Solving</b> <ul style="list-style-type: none"> <li>▪ Words of the Wise</li> <li>▪ What is a Decision? What does it mean to solve a problem?</li> <li>▪ Understanding Limitation – every problem does <u>not</u> have a solution</li> <li>▪ What is a Good/ Bad Decision?</li> <li>▪ Why are so many decisions faulty? Where things go wrong...</li> <li>▪ Why Process is Important</li> <li>▪ Laziness</li> <li>▪ Predictably Irrational – Self Deception</li> <li>▪ The wrong people doing the analysis, making the decision</li> <li>▪ No or Poor Objectives</li> <li>▪ Faulty Decision Criteria</li> <li>▪ Weak, Irrelevant Assumptions</li> <li>▪ Selective Perceptions &amp; Data Contamination</li> <li>▪ Foregone Conclusions</li> </ul>
<b>2</b>	<b>Fundamentals of Logical Processes</b> <ul style="list-style-type: none"> <li>▪ Examples of Logical Fallacies</li> <li>▪ The Limits of Probabilities Built on Past Experience</li> <li>▪ Inductive, Deductive Reasoning</li> <li>▪ The Roles of Creative Thinking in Decision and Problem Solving</li> <li>▪ Tautologies</li> </ul>
<b>3</b>	<b>How Quantitative Methods Can Help with Decisions and Problems</b> <ul style="list-style-type: none"> <li>▪ Comparing Quantitative and Other Approaches</li> <li>▪ Practical Limits on Quantitative Decision Analysis</li> <li>▪ Principles of Optimization</li> <li>▪ Introduction to Optimization Software</li> <li>▪ Statistics &amp; Probabilities</li> </ul>
<b>4</b>	<b>Overview &amp; Introduction to Tools and Methods</b> <ul style="list-style-type: none"> <li>▪ Recognizing the Expertise of the User Limits Effectiveness</li> <li>▪ Spreadsheets &amp; Data Bases</li> <li>▪ Linear Programming &amp; Simplex</li> <li>▪ Decision Analysis</li> <li>▪ Decision Trees and Implications</li> <li>▪ Probabilistic Statistics and Decision Making</li> </ul>
<b>5</b>	<b>Linear Programming Applications</b> <ul style="list-style-type: none"> <li>▪ Reducing Bias in Qualitative Analysis</li> <li>▪ Applications of Linear Programming That Have Been Encountered in Practice</li> <li>▪ An Appreciation for the Problems That Can be Modeled as Linear Programs</li> <li>▪ Practice and Experience in Formulating Realistic Linear Programming Models</li> <li>▪ Make or Buy Decisions</li> <li>▪ Production Scheduling Decisions</li> <li>▪ Work Force Allocation Decisions</li> </ul>
<b>6</b>	<b>Marketing and Financial Applications</b> <ul style="list-style-type: none"> <li>▪ Basic and Feasible Solutions to Systems of Linear Equations</li> <li>▪ Simplex Method for Solving Linear Programming Problems</li> <li>▪ Marketing Decisions</li> <li>▪ Financial Decisions</li> <li>▪ Operations Decisions</li> </ul>

- 7 Distribution / Network Decisions**
- Special Features of Transportation, Assignment and Transshipment Problems
  - Network and Linear Programming Models of the Transportation, Assignment and Transshipment problems
  - The Shortest Route Problem
  - The Maximal Flow Problem
  - The Workforce Assignment Problem
  - Inventory as a Transshipment Problem
  - Additional Software and Tools
- 8 Inventory Decisions**
- Where Inventory Costs Occur and Why Inventory Policy Decision are Important
  - Economic Order Quantity (EOQ) Model
  - Total Cost Model for Specific Inventory Systems
  - Total Cost Model for How-Much-To-Order and When- To- Order Decisions
  - Inventory Systems Involving Production Lot Size, Planned Shortages, and Quantity Discounts
  - Single –Period Inventory Models
  - Quantity and Reorder Point Decisions When Demand Must be Described by a Probability Distribution
  - Lead Time Demand Distributions Used to Meet Acceptable Service Levels
  - Order Quantity Decisions for Periodic Review Inventory Systems
- 9 Waiting Lines Decisions**
- Where Waiting Line Problems Occur and Why These Problems are Important
  - Single-Channel and Multiple- Channel Waiting Lines
  - Poisson Distribution Describes Arrivals; Exponential Distribution Describes Service Times
  - Formulas Identifying Operating Characteristics of the Following Waiting Line Models:
    - Single- Channel Model with Poisson Arrivals and Exponential Service Times
    - Multiple-Channel Model with Poisson Arrivals and Exponential Service Times
    - Single-Channel Model with Poisson Arrivals and Arbitrary Service Times, and No Waiting
    - Single-Channel Model with Poisson Arrivals, Exponential Service Times, and a Finite Calling Populations
  - Economic Considerations in Decisions Concerning the Operation of a Waiting Line
- 10 Forecasting & Simulation**
- Why Forecasting
  - Basic Forecasting Categories and Methods
  - Principles and Tools for Time Series Methods
  - Principles and Tools for Regression Methods
  - Markov Analysis and Other Methods
  - Simulations as a Forecasting Method
  - Relative Advantages and Disadvantages of Simulation Models
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## Recommended Readings and Resources

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- ***An Introduction to Management Science: A Quantitative Approach to Decision Making, 12th Edition* by Anderson, Sweeney, Williams, and Martin. South-Western Cengage Learning, ISBN 0-324-39980-4 (includes CD with software). This book is available in electronic format, and at almost all online and used book stores. This text is NOT required to succeed in this course but is an excellent reference.**
- Free Management Library:  
<http://managementhelp.org/>
- Groups Discussing Inventory Quantitative Model of Decision Making – Yahoo Groups  
<http://groups.yahoo.com/phrase/inventory-quantitative-model-of-decision-making>
- Applied Management Science: Making Good Strategic Decisions  
<http://home.ubalt.edu/ntsbarsh/opre640/opre640.htm>
- Decision Making with Quantitative Tools  
<http://www.cliffsnotes.com/WileyCDA/CliffsReviewTopic/Decision-Making-with-Quantitative-Tools.topicArticleId-8944.articleId-8866.html>
- Problem-solving and Decision-making  
<http://www.businessballs.com/problem-solving.htm>
- Decision-making and Problem-solving by Herbert A. Simon and Associates  
<http://dieoff.org/page163.htm>
- What Is a Decision Support System? By D. J. Power  
<http://dssresources.com/papers/whatisadss/index.html>
- List of Web Sites to Complement *Decision Support Systems: A Knowledge Based Approach*  
<http://www.uky.edu/BusinessEconomics/dssakba/relateds.htm>
- Instructional Sites for Decision Support, Expert Systems & Artificial Intelligence, Knowledge Management, and Other  
[http://www.uky.edu/BusinessEconomics/dssakba/instmat.htm#Instructional Sites \(Software, Applications, Cases\)](http://www.uky.edu/BusinessEconomics/dssakba/instmat.htm#InstructionalSites(Software,Applications,Cases))
- Selected Periodical for Decision Support  
<http://www.uky.edu/BusinessEconomics/dssakba/periodcl.htm>

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## Credits - Cynthia Hanchey, Ph.D., CDE

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### Career Information

Ernest C. Wheeler Chair of Business, 2003-2009  
Paul Dickinson School of Business  
Oklahoma Baptist University, Shawnee, OK

Associate Professor, 1989-2009  
Computer Science Department  
Oklahoma Baptist University, Shawnee, OK

Senior Faculty (tenure), 1988  
Assistant Professor, 1985-1989  
Instructor & Coordinator Lower Division Courses, 1972-1985  
Computer Science Department  
Louisiana State University, Baton Rouge, LA

Acting Chair, Summer 1973  
Participant in Faculty Exchange Program between Computer Science Departments of Louisiana State University and Southern University in Baton Rouge, LA

Programmer, 1971  
Department of Employment Security  
State of Louisiana, Baton Rouge, LA

Graduate Assistant, 1969-1971  
Accounting Department  
Louisiana State University

### **Research**

Computer education and design of computer- related curricula at all levels; gifted education; gender issues related to education; ethics and computing.

#### PAPERS PRESENTED (partial listing)

- "Gambling on Technology" presented at the International Association for Computer Information Systems Conference, 2006 in Reno, NV
- "BLUES in Ethics: Blending Undergraduate Education Skills in Ethics" presented at the International Association for Computer Information Systems Conference, 2005 in Atlanta, GA
- "Skills, Etiquette, Protocol: What Do Students Need?" presented at The College Teaching and Learning Conference 2004 in Lake Buena Vista, FL
- "PEERS: Peer Evaluation and Effective Review Samples" presented at Information Systems Education Conference, ISECON 2002, San Antonio, TX
- "Women in Programming Is Not an Oxymoron!" presented at the Central Plains Regional Conference of the Consortium for Computing in Small Colleges, April 2001, Branson, MO
- "Introduction to Computing: One School's Course" presented at the International Association for Computer Information Systems Conference 1998, Cancun, Mexico

- "Communication Skills and Programming Languages" presented at the International Association for Computer Information Systems Conference 1997, St. Louis, MO
- "An Assessment of Needs of Graduates with Computer Science/Computer Information Systems Degrees" presented at South Central Small College Computing Conference 1994, Amarillo, TX
- "Labs, Learning Styles and Gender" presented at NECC '93, Orlando, FL
- "Math and Science: Way to the Top for Women in Academia" presented at Women & Work Conference 1991, Arlington, TX
- "PEERS: Peer Evaluation and Effective Review Samples" published in Proceedings of the Information Systems Education Conference, ISECON 2002
- "Trends in Computer Skills of Entering Freshmen" co-authored with D. Hanchey, published in Proceedings of the International Association for Computer Information Systems Conference (Sept.-Oct. 1998)
- "Introduction to Computing: One School's Course" co-authored with D. Hanchey, published in Proceedings of the International Association for Computer Information Systems Conference (Sept.-Oct. 1998)
- "Communication Skills and Programming Languages" published in Proceedings of the International Association for Computer Information Systems Conference (Oct. 1997)
- Dissertation, Dissertation Abstracts International (#9528275), "An Assessment Model for Surveying Graduates" published in The Journal of Computer Information Systems, Winter 1995-96.
- "An Assessment of Needs of Graduates with Computer Science/Computer Information Systems Degrees" co-authored with J. Kingsbury, published in Proceedings of South Central Small College Computing Conference 1994.
- "Labs, Learning Styles and Gender" published in Proceedings of NECC '93
- "Gender Equity--A Partial List of Resources" presented at NECC Pre-Conference Research Workshop entitled "In Search of Gender-Free Paradigms for Computer Science Education," June 1990, excerpted in Communications of the ACM, November 1990, p. 46. Published in an NECC Monograph (1992) In Search of Gender-Free Paradigms for Computer Science Education edited by C. Dianne Martin and Eric Murchie-Beyma.
- NSF Chautauqua Participant: "Cryptology and the Breaking of the Axis Codes in WW II" (2006 at Bletchley Park, England)
- Microsoft Workshop Participant: "Gaming", pre-conference workshop at CCSC CP, (2006 at Maryville, MO)
- BlueJ Day Participant; pre-conference workshop at ACM SIGCSE (2006 in Houston, TX)
- NSF Chautauqua Participant: "Internet Programming: Building Interactive and Database Driven Web Sites" (June 2004 at Christian Brothers University in Memphis, TN)
- Reviewer for "Legal, Social, and Ethical Issues of the Internet" in The Handbook of Information Security, to be published by Wiley and Sons.
- "Skills, Etiquette, Protocol: What Do Students Need?" presented at The College Teaching and Learning Conference 2004 in Lake Buena Vista, FL
- National Science Foundation, Graduate Research Fellowship Program, Washington, DC, Panelist, February 2002, January 2005
- National Science Foundation, Information Technology Workforce Program, Washington, DC, Panelist, January 2002
- National Science Foundation Course, Curriculum, and Laboratory Improvement Program, Panelist, February and July, 1999, July 2000, July 2001, July 2002, January 2005
- ACM/IEEE Computing Curricula 2001 Knowledge Area Focus Group, member

**Recognition and Honors (partial listing, 1990 – Present)**

- 2003-04 and 1998-99 Faculty Development Incentive Award Recipient
- Grace Hopper Celebration of Women in Computing 1994 Scholarship Recipient
- 1986-87 OBU Promising Teacher Award
- Dictionary of International Biography (23rd ed., 1994; 24th ed., 1995; 28th ed. 2000)
- Outstanding People of the 21st Century (1st ed.)
- Twentieth Century Award for Achievement
- International Women of the Year (1998-99, 1999-2000)
- America's Registry of Outstanding Professionals (2001-2001)
- 2000 Outstanding Scholars of the 20th Century