

MASTER SYLLABUS QANT405: MANAGEMENT SCIENCE

1. Course Details

Semester:	
Course Code:	QANT405
Course Name:	Management Science
Course Prerequisites:	ECON204, MRKT102, QANT300
Course Co-requisites:	None
Credits Hours:	Three (3) credit hours
Classroom:	
Class Timing:	(45 contact hours)
Final Exam Period:	

2. Instructor Details

Professor:
Office Location:
Office Hours:
Email:
Course website:
Phone (Office):

3. Catalog Course Description

Quantitative techniques for managerial decision-making are covered. These techniques include linear and integer programming, nonlinear programming, decision analysis, queuing theory and simulation. Problems are modeled and then solved using computer software.

4. Course Overview

This course introduces students to applied principles of optimization and modeling with an emphasis on business applications. It is expected that during this course students will gain a number of practical skills, including model development, computer-based solution determination, and deriving implications to management. Software used for this course includes Microsoft excel add-ins (various add-ins are available on accompanying book CD).

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5. Course-Level Learning Goals¹

(A) Invariant Learning Goals (In support of the BSBA Programmatic Learning Goal(s)):

Upon the successful completion of this course, the student will be able to:

1. Construct an optimization model and compare alternatives under certainty or risk, sensitivity analysis (contrast), discuss the implication (evaluate) of solutions to the management planning process ;
2. Use Excel and other software to solve applied business problems ;
3. Collect data, simulate performance of a system, validate simulated decisions by way of analysis, and propose cost effective alternatives ; and
4. Discuss the results of an analysis effectively and its applicability to other regions or countries .

Assurance of Learning Validations (Linked to the BSBA Programmatic Learning Goal(s))²:

- A1. Case Study: Student teams of up to five students will be assigned a comprehensive case which requires using the computer to develop the solution, and to answer key questions. The cases appearing at the end of each chapter should be selected by the instructor in such a manner that all key topics such as Linear Programming, Network Analysis, Decision Theory, Nonlinear Modeling, Queuing Theory, Simulation, and Decision Theory are covered by different student teams. One week before the final, each team will make a brief presentation to the class to discuss key issues and results. A written report by each team will also be submitted to the instructor and graded. Five (5) scores are given. The criteria for the first group score (G1O1) is the student team's ability to articulate clearly the key issues of the case and their solutions. For the second score (G1O3), the instructor assesses each individual member's contribution to the overall analysis and solution methodology of the case. The criterion for this score is the degree to which the instructor believes that uniform contributions have been made by each of the group members. The criteria

¹ A note on School of Management Course-Level Learning Goals: Learning goals are partitioned into those that are in support of the programmatic learning goals (Invariant), specific to the localized region of delivery (Contextualized), and specific to the domain expertise of the instructor (Instructor-Specific). The former two categories are required for all courses. Invariant "Assurance of Learning Validations" are specifically linked to the associated programmatic learning goal and objective, with course-level learning goals representing the programmatic goal as it applies to the context of the course. Learning goals that focus on knowledge acquisition (Bloom's Taxonomy) are not specifically or necessarily included into the course-level learning goals, although it is assumed that knowledge acquisition of all relevant business core fundamentals is addressed within each course. Examinations in class are used to provide feedback concerning knowledge and comprehension for the purpose of ensuring that students who have not mastered these will not advance through the curriculum. Attainment of knowledge within each core area is assessed by way of standalone testing of each student as a required part of the instructional program prior to graduation (e.g. ETS).

² A note on School of Management Assurance of Learning Scoring: Scores form the metric for the degree to which the validation (e.g. learning outcome) satisfies the associated learning goal or objective. Assurance of learning validation descriptions identify the criteria for each score that is to be given. Scores are scaled using program or concentration rubrics. It must be noted that scores are to be differentiated from grades. Scores form a criterion from which an instructor will ascertain an overall grade for any instrument of assessment, and the overall assessment the student receives for an instrument is a "grade." A score is an extraction that specifically measures the degree of attainment of a learning goal and/or objective.

for the third score (M2O2) is the appropriate choice and use of software, either that found in the text or Excel-based, and the team's ability to implement that software correctly in solving the case. The criteria for the fourth score (M2O4) is the visual appeal, readability and appropriateness of the PowerPoint slides used in support of the oral presentation.

A2. Student Optimization Projects: Student teams will be responsible for one of two projects.

- a. Project 1: Each student team will collect real (citation necessary) data for a queuing problem, including costs. Teams will simulate both single queue and multiple queue models. Results will be compared to the prescriptive analysis of the queuing system and students will contrast the mathematical solution and the simulated results. A written report (5-7 pages) will be submitted.
- b. Each student team will collect real (citation necessary) data for a network flow problem, construct the network, and use an optimization technique to demonstrate the optimal solution (e.g. GPS). A written report (5-7 pages) is submitted.

For each project, five scores are retained. The first score is based on the quality of the data collected (M2O1); the second score is based on the ability to appropriately model the system and derive measures of effectiveness and/or optimal solutions using technology, including sensitivity analysis (M2O2); the third score is based on the use of the appropriate formulas to derive the measures of effectiveness and/or solutions (M1O2); the fourth score is based on an understanding of the implication of the solutions, and the proposed system solution as part of a management planning process that considers the tradeoffs between cost minimization and service quality objectives (M4O1) and student must also identify a community or non-profit organization that would benefit from the model developed and specify in what manner the organization would benefit. Although not specifically modeled as a service-learning course, this project may be utilized by interested faculty in that capacity. The fifth score is based on evaluating the applicability of this model to other regions or countries (G3O2).

A3. Optimization Quizzes: Each student is required to take four quizzes. The first quizzes should be based on linear programming, non-linear optimization decision theory, simulation, simulation, queuing models, and inventory models. The quizzes must integrate technology as a solution support. The composite grade for each of the quizzes is based on three scores. The criteria for the first score (M2O2) is the ability to model and solve the problem presented. The criterion for the second score (M2O3) is the ability to utilize, correctly, relevant field specific software. The criteria for the third score (M4O1) is based on the quality and results of a sensitivity analysis, including what-if scenarios together with management implications for practice.

(B) Contextualized (Globalized) Learning Goal(s):

Upon the successful completion of this course, the student will be able to:

1. See Invariant Learning Goal 4 above.

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Assurance of Learning Validation (In Support of the Contextualized (Globalized) Learning Goal(s)):

B1. See Assurance of Learning Validation A2, score 5, above.

(C) Instructor Specific Learning Goal(s) (Optional):

None

Assurance of Learning Validation (In support of the Instructor Specific Learning Goal(s)):

None

6. Teaching and Learning Methodology

The School of Management's teaching and learning strategy is informed by contemporary indicators/sources that derive from its target market, specifically the millennial generation. In particular, behavioral traits for this generation are identified and form the basis of emphasis for the schools' teaching and learning methodologies. These methodologies are reflected in the school's mission statement by way of its TEMPOS campaign³. In addition, teaching and learning strategies are informed by institutional indirect assessment results, periodically collected and reviewed by the Office of Planning and Assessment and the school's faculty⁴. Teaching and learning strategies are also externally referenced systematically (e.g., the Annual Stakeholder's Conference) through continuing consultations with non-board key stakeholder groups, including employers, business and community leaders, accreditation and ministerial agencies, alumni, students, peer institutions, and business and governmental agency representatives.

A component of all courses, as a part of the teaching and learning strategies, is to maintain academic rigor and to be intellectually challenging. This is validated in institutional survey results. However, School of Management faculty members utilize an overall collective portfolio of strategies/initiatives that obtain from the aforementioned sources in delineating those that are most appropriate or emphasized in the courses they lead.

In this course (QANT405), four (4) prioritized teaching and learning strategies focus on:

1. active student engagement into the learning process;
2. innovative and creative thinking;
3. relevant content to student future careers/goals; and
4. case-based learning.

³ Teaching and Learning Strategies: "TEMPOS and the Millennials," revised September 2008.

⁴ E.g., Student Survey on Teaching Quality – Quantitative Data: School of Management.

All faculty members that instruct this course should consider how to execute the course to emphasize these key components of the strategies considered. Following a review of learning outcomes, faculty members consider how re-orientation of teaching and learning strategies might result in strengthening these outcomes, and adjustments are made, accordingly. Faculty members also consider how the School of Management Triple Platforms of Excellence (Professional Enrichment, Experiential Education, and Student Advancement) might be leveraged as a part of this strategy, and provide recommendations to the Directors of those platforms. The school also reviews the distribution of identified teaching and learning strategies periodically to ensure comprehension and the integration of each (from the designated list of approximately 20-25 strategies) within the curriculum. Finally, results from student teaching evaluations also provide indications of how various teaching and learning strategies are integrated into the course delivery. The following issues (indicator number is provided) are among those in the evaluations that bear on this review and analysis:

7. The instructor was responsive to student questions.
8. The instructor was available for course related consultation and advice.
9. The instructor graded and returned student work and exams promptly.
10. The instructor incorporated information technology (e.g. computer or the Internet) in the course.
18. The instructor was responsive to student needs and concerns.
21. The instructor assigned challenging course work.
22. The instructor provided helpful, constructive feedback on assignments and course work.
23. The instructor acknowledged cultural differences and diversity among students.
24. The instructor helped me understand the subject matter.

Along with teaching and learning strategies, the notion of student effort/time on task is also considered, although it is not necessarily driven by metrics. It is noted that the notion of student effort, specifically metric driven, is not a universally adopted approach⁵. However, if an instance occurs where student learning outcomes do not meet targeted academic standards, the School of Management utilizes indirect inputs in this area to explore the interdependencies between factors including the amount of work required in the course, the degree of challenge in the coursework, and level of critical analysis, among others⁶.

In addition, QANT300 previously introduced students to math modeling through the use of model structures that are common in industry. This class builds on QA300 through its objective of teaching students how to

⁵ See the Victorian TAFE Association Response – Strengthening the AQF: Proposal, June 2009. East Melbourne, Victoria, Australia, retrieved from http://www.vta.vic.edu.au/docs/PositionDiscussion%20Papers/VTA_Response_Strengthening_the_AQF.pdf on February 22, 2010.

⁶ Sample data regularly collected through the New York Institute of Technology Student Rating of Courses/Teaching Form.

develop math models according to a number of modeling approaches, including math programming and decision analysis. Applications are drawn from the text as well as current events. The course, Socratic in nature, leads the student from model development through solution attainment and sensitivity analysis. Software is utilized as a decision support tool.

7. Required Resource(s)

Hillier, F., and Hillier, M. (2007). *Introduction to Management Science: A modeling and Case Studies Approach with Spreadsheets*. 4th Edition. McGraw-Hill/Irwin Publishing. ISBN 13: 978-0-07-809660-0.

8. Reference Resource(s)

Anderson, D., Sweeney, D., Williams, T., and Martin, R. (2007). *An Introduction to Management Science: Quantitative Approaches to Decision Making*. 12th Edition. South-Western College Publishers. ISBN-13: 978-0324399806.

9. Assessment Methodology and Grading Guidelines

Instrument	Points (i.e. weights)	Time on Task ⁷
Final Test	150 points	20 hours
Midterm Exam	125 points	20 hours
Case Study (see A1)	50 points	15 hours
Student Optimization Project (see A2)	50 points	15 hours
Quizzes (see A3)	100 points (25 points each)	10 hours
Homework and Reading Assignments		40 hours
TOTAL	475 points	120 hours

⁷ An estimate of the period of time during which a student is actively engaged in a learning activity, excluding classroom contact hours.

10. Grading Guidelines:

11. Attendance Policy: Students are expected to attend every class session. Instructors will inform students of the exact number of absences and late-arrivals permitted during the semester. Students who exceed these limits may be subject to failure. If a student misses any class or test, the instructor has the right to either grant or deny an opportunity to make up the work that was missed. In such cases, the instructor shall be the sole judge of the validity of a student's explanation for having missed the class or test.

12. Deductions for Late Arrival, Early Departure, and Unexcused Absences:

13. Policy for Make-Up Assignments or Quizzes:

14. Classroom Behavior: Behavior that disrupts, impairs, interferes with, or obstructs the orderly conduct, processes, and functions within an academic classroom or laboratory violates the student code of conduct and may result in disciplinary action. This includes interfering with the academic mission of NYIT or individual classroom or interfering with a faculty member's or instructor's role to carry out the normal academic or educational functions of his classroom or laboratory, including teaching and research.

15. Students with Physical or Educational Challenges:

- It is the policy of New York Institute of Technology to provide reasonable accommodations for students who are otherwise qualified but have disabilities, including learning disabilities, health impairments, and other disabling conditions. Possible accommodations include, but are not limited to, test schedule modifications, class relocation, and possible assistance in acquisition of necessary equipment.
- The college has an interest in helping students with disabilities to be competitive in this academic environment. Therefore, reasonable accommodations will be made upon proof both of disability and need for the accommodations. It must be understood that accommodations are meant to facilitate educational opportunities. Admission to NYIT and accommodations do not guarantee success. Therefore, in addition to accommodations, the college encourages utilization of auxiliary services available to all students to maximize opportunities for success. Students whose disabilities may require some type of accommodation must complete a request for accommodations form and an intake interview with their campus services coordinator prior to the academic semester. Accommodations may be requested at any time during the semester; however, accommodations cannot be applied to past failures, only to future academic endeavors. Appropriate modifications of accommodations will be worked out on a case-by-case basis and will not necessarily incorporate all requested changes.
- Students for whom auxiliary services—such as readers, interpreters, note takers, etc.—have been approved should arrange these with their campus services coordinator. In addition to discussing

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appropriate educational modifications, the campus services coordinator will serve as a liaison with other college faculty and administration on behalf of students with disabilities.

16. Academic Integrity:

- Each student enrolled in a course at NYIT agrees that, by taking such course, he or she consents to the submission of all required papers for textual similarity review to any commercial service engaged by NYIT to detect plagiarism. Each student also agrees that all papers submitted to any such service may be included as source documents in the service's database, solely for the purpose of detecting plagiarism of such papers.
- Plagiarism is the appropriation of all or part of someone else's works (such as but not limited to writing, coding, programs, images, etc.) and offering it as one's own. Cheating is using false pretenses, tricks, devices, artifices or deception to obtain credit on an examination or in a college course. If a faculty member determines that a student has committed academic dishonesty by plagiarism, cheating or in any other manner, the faculty has the academic right to 1) fail the student for the paper, assignment, project and/or exam, and/or 2) fail the student for the course and/or 3) bring the student up on disciplinary charges, pursuant to Article VI, Academic Conduct Proceedings, of the Student Code of Conduct. The complete Academic Integrity Policy may be found on various NYIT Webpages, including: <http://www.nyit.edu/images/uploads/academics/AcademicIntegrityPolicy.pdf>.

17. 15 Week Topical Class Schedule

Week	Topic and book chapter	Text Chapter
Wk 1	Introduction and Course Overview	Ch. 1
Wk 2	Linear programming: basic concepts	Ch. 2
Wk 3	Formulating Linear Programs; See supplement on CD	Ch. 3
Wk 4	Linear programming models and technology	Ch. 4
Wk 5	Sensitivity analysis	Ch. 5
Wk 6	Network Modeling	Ch. 6
Wk 7	Exam 1	
Wk 8	Queuing*,**	Ch. 11
Wk 9	Nonlinear Programming	Ch. 8
Wk 10	Decision Analysis	Ch. 9
Wk 11	Decision Trees	Ch. 9

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Wk 12	Integer Programs	Ch. 7
Wk 13	Computer Simulation	Ch. 12 & 13
Wk 14	Presentations	
Wk 15	Exam 2	

*The instructor must illustrate at least two economic analyses of waiting line problems using POM/QM for Windows, and discuss cost vs. quality issues in the context of a business plan. This content is included to improve BSBA programmatic learning goal M4O1.

**Queuing is moved from Wk 12 to Wk 8 to help students improve attainment of BSBA programmatic learning goal G3O2.

18. Using the NYIT Library

All students can access the NYIT virtual library from both on and off campus at www.nyit.edu/library. The same login you use to access NYIT e-mail and NYITConnect will also give you access to the library's resources from off campus.

On the left side of the library's home page, you will find the "Library Catalog" and the "Find Journals" sections. In the middle of the home page you will find "Research Guides;" select "Video Tutorials" to find information on using the library's resources and doing research.

Should you have any questions, please look under "Library Services" to submit a web-based "Ask-A-Librarian" form.