EST 342 Industrial Engineering:
Intro To Operations Research I

SYLLABUS:

Instructor: Moriarty, Email: kevin.moriarty@sunysb.edu Summer 20xx
Office: Old Computer Science Building Gradual School Rm 1423
Phone: 632-1898 **Office Hours;** TBD

COURSE DESCRIPTION: This course is intended to be an introduction to operations research (OR) models and applications to systems within industrial engineering. This course will introduce deterministic and stochastic models in operations research. The student will learn to formulate, analyze, and solve mathematical models that represent real-world problems. The deterministic portion, of the course will cover linear programming and the simplex algorithm, and related analytical topics. It will also cover transportation, network, integer, and non-linear models and stochastic models that handle the randomness inherent in most real systems. Topics such as queuing models are included. Upon completion of this course the student will be capable of identifying problems in which operations research models can be utilized, as well as the ability to solve such problems using these models.

Prerequisite(s): Calculus II; AMS161, or MAT 127, or MAT132, or MAT142, or MAT171, Permission of the department. EST 342 may not be taken for credit along with credit for AMS 341.

COURSE LEARNING OBJECTIVES:

This is a course in Industrial Engineering operations research.

1. The student will demonstrate the ability to apply technical tools and knowledge to practical systems and problem solving.
2. The student will design, understand, and analyze selected aspects of the human-made world, as defined for this purpose as "artifacts of our surroundings that are conceived, designed, and/or constructed using technological tools and methods" of typical operations research concepts.

Course Learning Objectives:

The learning objectives of this course will ensure the student can apply Quantitative & Qualitative Problem Solving methods and techniques to: solve problems associated with the concepts listed in the syllabus above,

- Verbally, and visually present these mathematical concepts, numerically and symbolically.
- Utilize mathematical methods to solve these problems.
- Estimate and check the results of their computations.
- Become acquainted with the limits of statistical & mathematical methods taught in this course.

3. Establish a functional understanding of optimization, concepts application.
4. Attain functional, scientific, mathematical and technical knowledge, and critical thinking skills, of operations research as it related to industrial engineering profession, and potential preparation for graduate studies.
5. Develop a balanced and integrated understanding of the concepts, theories, and methodologies used to plan, design, analyze, develop, organize, and industrial engineering operational tasks.
6. Acquire a proficient knowledge of the key areas of industrial engineering listed within this document.

The student will perform the following to achieve this:

1. There will be homework assignments throughout the semester. The purpose of the HW is to give the student the opportunity to apply these industrial engineering operation concepts discussed in class. These exercises may involve minor experiments, internet searches, and the application of software such as Excel. Each assignment will be posted on Blackboard through the Assignments section. Assignment may be reviewed in class as time allows. The student will prepare a brief operations report (using MS Word) that summarizes the assigned problems or task. You may be asked to work in a group of three or four students on the exercises. The project will be submitted via Black Board turned in on the required due date will be accepted. Each missed exercise will be assigned a grade of zero.

2. Exams will be given during the course consisting of written problems and true/false multiple choice questions live or in Black Board. Tests may be computer graded as appropriate.
3. Evaluate the aspects of engineering alternatives in the operational decision making process and use these concepts and evaluation techniques to perform the analysis.
4. The student will also develop an understanding of the roll of operations research within the organization, and the management decision making process,

TEXT: Hillier, F. S. and Lieberman, G. J. Introduction to Operations Research, 10th ed., New York: McGraw-Hill, 2015.

GRADES: Exams (2) - (50%); Homework (assignments- 30%), Project (15%), Participation (5%);
a. - In class participation and Black Board discussion boards,
b. - Random exercises for participation credit (exercise counts for participation point),

CONTENT COURSE SYLLABUS:

Week 1. Intro to Operations Research
Optimization methods, Constrained
Week 2. *Maximizing income subject to supply constraints;
* Minimizing costs subject to minimum requirements;
*Linear Programming
∗ Model formulation
∗ Graphical approach
Week 3. Simplex method
∗ Variations of the simplex method
Computer analysis with excel (Sensitivity)
Test 1 - (25%)
Week 4. Integer programing
Transportation problem
Week 5. Assignment problem
Project management (PERT/CPM)
Week 6. Networks, shortest path problem Euler, Dijkstra model, Queuing theory
Test 2 - (25%)

Course Outline: The following chapters will be covered:

Learning Outcomes: Students in this course will be able to display and relate the principles of OR concepts, requirements and constraints, through a scientific management decision process involving adjustments, and transactions of the industrial engineering design process. The learning objectives of this course will ensure the student can apply Qualitative & Quantitative Problem Solving methods and techniques to: solve problems associated with the concepts listed in the syllabus above,

- Verbally, and visually present these mathematical concepts, numerically and symbolically.
- Utilize mathematical methods to solve these problems and check the results of their computations.
- Become acquainted with the limits of the mathematical methods taught in this course.

(a) Gain the ability to apply knowledge of mathematics, science, and engineering to real world problems.
(b) Demonstrate the ability to create systems, components, or processes to meet realistic models of operational needs within given constraints,
(c) Areas of skill development include socio-economic, ecological, operational, ethical
(d) The ability to work within multidisciplinary groups
(d) The ability to recognize, create, and solve operations research problems relating to industrial engineering
(e) Understand the professional and ethical obligations of an industrial engineer
(f) Successfully communicate OR concepts as they relate to industrial engineering

Note: This is a guideline of the course content and syllabus. This outline is subject to change as determined by the instructor during the semester.

GENERAL NOTES: The course will be conducted using lecture and open discussions during scheduled classes. Homework, solutions to engineering problems will be required. This provides ample opportunity for learning, and also evaluation of the student's performance. Homework assignments will be due as posted on the course Black Board page on Assignments. The problem solutions should be presented in a clear format so computations can be evaluated easily. Prepared spreadsheet solutions and graphics will be accepted. Any notes and assumptions or summary comments should be included.

All homework and tests will be promptly graded. Late home works will not be accepted.

Two exams; a mid-tern a final examination will be given under academic conditions, and will be administered in class and during finals week.

Homework assignments should be prepared individually, if not specifically designated as a group assignment. Although it is understood that collaboration with others on the homework may be educationally beneficial, when designated as an individual assignment each student must submit their own individual assignment material.

Fundamental Engineering Ethics require engineers to give proper credit for engineering work where credit is due. Therefore, references should be cited on all written work to acknowledge the aid of other individuals and both published and unpublished references. "Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Any suspected instance of academic dishonesty will be reported to the Academic Judiciary. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at http://www.stonybrook.edu/uaa/academicjudiciary/ "

"The University at Stony Brook expects students to maintain standards of personal integrity that are in harmony with the educational goals of the institution; to observe national, state, and local laws and University regulations; and to respect the rights, privileges, and property of other people. Faculty is required to report disruptive behavior that interrupts faculty's ability to teach, the safety of the learning environment, and/or students' ability to learn to Judicial Affairs."

The University Senate Undergraduate and Graduate Councils have authorized that the following required statements appear in all teaching syllabi (graduate and undergraduate courses) on the Stony Brook Campus.

Americans with Disabilities Act:

If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Disability Support Services, ECC (Educational Communications Center) Building, room128, (631) 632-6748. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential.

Academic Integrity:

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty are required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at http://www.stonybrook.edu/uaa/academicjudiciary/

Critical Incident Management:

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures.