UF UNIVERSITY of FLORIDA

UCC2: Course Change Transmittal Form

Department Name and Number: Industrial and Systems Engineering 011906000

Current SCNS Course Identification

Prefix: E S I Level: 4 Course Number: 3 1 2 Lab Code:

Course Title: Operations Research 1

Effective Term and Year: Fall 2013

Terminate Current Course: ☐ Other Changes (specify below): ■

Change Course Identification to:

Prefix: ___ ___ ___ Level: ___ Course Number: ___ ___ ___ Lab Code:

Course Title (please limit to 21 characters): _____

Credit Hours: From 3 To 4

Contact Hours: ■ Base or ☐ Headcount From 3 To 4

Rotating Topic: From ☐ yes ☐ no To ☐ yes ☐ no

S/U Only: From ☐ yes ☐ no To ☐ yes ☐ no

Variable Credit: From ☐ yes ☐ no To ☐ yes ☐ no

If yes, ___ minimum and ___ maximum credits/semester

Repeatable Credit: From ☐ yes ☐ no To ☐ yes ☐ no

If yes, _____ total repeatable credit allowed

Prerequisites	Co-requisites
From C++ computer programming & matrix and numerical methods	From
To ESI 4327C(C)	To

Course Description (50 words or less; if requesting a change, please attach a syllabus)

From	To
Introduction to the use of linear decision models, particularly linear programming and related decision-analysis optimization software, to aid in the analysis and solution of complex, large-scale decision problems. Consideration of related network modeling concepts.	Introduction to optimization modeling, algorithms and software to aid in the analysis and solution of decision-making problems.

Rationale /Place in Curriculum/Impact on Program

Raising the number of credit hours from 3 to 4 allow more topics to be covered.
The modified list of topics is more consistent with our peer and other high ranking institutions.

Department Contact: Name Siriphong Lawphongpanich; Phone 392-1464x2015; Email Lawphong@ise.ufl.edu

College Contact: Name Mark Law; Phone 392-0943; Email mlaw@eng.ufl.edu

ESI 4312: Operations Research 1

1) **Catalog Description**: Introduction to optimization modeling, algorithms and software to aid in the analysis and solution of decision-making problems. (4 Credit Hours)

2) **Pre-requisites**: A grade of C or better in ESI 4327C: Matrix and Numerical Methods in Systems Engineering
Co-requisites: none

3) **Course Objectives**: This is the first of a two-course sequence that introduces students to models and algorithms commonly used in the analysis of complex decision-making problems. This course explores optimization modeling and solution techniques for linear, nonlinear, network, and integer optimization problems.

4) **Contribution of course to meeting the professional component**: Students will enhance their preparation for professional careers in Industrial and Systems Engineering by learning to take a comprehensive view of complex decision systems. Students will develop skills in system modeling and improvement, analytic problem solving, process improvement, and economic analysis. They will learn how to use multiple software tools and will practice communicating their engineering knowledge in a non-technical manner.

5) **Relationship of course to program outcomes**: Students will be able to do the following:

   - Apply knowledge of mathematics, science, and engineering to real-world problems.
   - Design a system, component, or process to meet desired needs. Identify, formulate, and solve engineering problems.
   - Use the techniques, skills, and modern engineering tools necessary for engineering practice.

6) **Instructor:** Dr. Joseph Geunes

   Office location: 450 Weil Hall
   Telephone: 392-1464
   E-mail address: Geunes@ise.ufl.edu
   Class Web site: https://lss.at.ufl.edu/
   Office hours: Monday: 3 – 4 PM, Wednesday: 2 – 4 PM

7) Teaching Assistant: Yiqiang Su

   Office location: 202 Weil Hall
   Telephone: 392-1464
   E-mail address: ysu1987@ufl.edu
   Office hours: Tuesday: 3 – 4 PM, Thursday: 2 – 4 PM

8) **Meeting Times:** Tuesday: 4:05 – 6:00 PM, Thursday: 4:05 – 6:00 PM

9) **Class/laboratory schedule**: Two meetings, each for 100 minutes.

10) **Meeting Location**: To be announced.

11) **Material and Supply Fees**: None

12) Textbooks and Software Required

Title: Optimization in Operations Research
Author: Ronald L. Rardin
Publication date and edition: 1997, 1st Edition
ISBN number: 0023984155

13) **Recommended Reading**: None

14) **Course Outline**:

Modeling Methodologies:

Week 1: Methodology for modeling real-life problems into mathematical programs

Week 2: Examples and applications: Linear, Integer, Network, Nonlinear, Multi-Objective and Stochastic Programs

Week 3: Algebraic modeling, Algebraic modeling software, Debugging models, Debugging model implementations, Optimization software.

Nonlinear Programming:

Week 4: Review of calculus (gradient, Hessian, Taylor expansion)

Week 5: Solution methodologies for optimization problems, Outcomes of optimization problems, Graphical solution of optimization problems, The improving search paradigm

Week 6: Local and global optima, Convexity, Improving feasible directions, Finding initial feasible solutions, Optimality conditions (KKT).

Linear Programming:

Week 7: Modeling strategies and assumptions for linear programs, Graphical solutions to linear programs.

Week 8: Polytopes, Extreme points and extreme rays, Simplex algorithm, Convergence of Simplex

Week 9: Degeneracy, Primal and dual bounds for Linear Programming,

Week 10: Duality theory, Sensitivity analysis and post-optimal analysis with Simplex.

Integer Programming

Week 11: Modeling strategies and assumptions for Integer Programs, Difficulty of Integer Programs, Graphical solutions of IPs

Week 12: Total enumeration, LP relaxations, Rounding techniques

Week 13: Divide-and-Conquer schemes, Branch-and-Bound for the knapsack problem.

Network Programming

Week 14: Introduction to networks, Modeling strategies and assumptions for network programs

Week 15: Total unimodularity, Matching and assignment problems, Shortest paths modeling, Dijkstra's algorithm

Week 16: Maximum flow modeling, Ford-Fulkerson algorithm, Max-Flow-Min-Cut Theorem.

15) **Attendance and Expectations**:

- Attendance required.
- Cell phones must be turned off during class.
- Every homework assignment must be submitted at the beginning of the class on its due date. There is 10% grade penalty per day for late submissions.

16) **Grading**: Exam 1: 30%, Exam 2: 30%, Exam 3: 30%, Assignments: 10%

17) **Grading Scale**:

A : 100 - 96
A–: 95 – 91
B+: 90 – 86
B : 85 – 81
B–: 80 – 76
C+: 75 – 71
C : 70 – 66
C–: 65 – 61
D+ : 60 – 57
D: 56 – 53
D– : 52 – 51
E : 50 – 0

"A C- will not be a qualifying grade for critical tracking courses. In order to graduate, students must have an overall GPA and an upper-division GPA of 2.0 or better (C or better). Note: a C- average is equivalent to a GPA of 1.67, and therefore, it does not satisfy this graduation requirement. For more information on grades and grading policies, please visit:
https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

18) Requirements for class attendance and make-up exams, assignments, and other work are consistent with university policies that can be found at:
https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx

19) **Honesty Policy**: All students admitted to the University of Florida have signed a statement of academic honesty committing themselves to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. This statement is a reminder to uphold your obligation as a UF student and to be honest in all work submitted and exams taken in this course and all others.
Note that failure to comply with this commitment will result in disciplinary action

compliant with the UF Student Honor Code Procedures.
See http://www.dso.ufl.edu/sccr/procedures/honorcode.php

20) **Accommodation for Students with Disabilities**: Students Requesting classroom accommodation must first register with the Dean of Students Office. That office will provide the student with documentation that he/she must provide to the course instructor when requesting accommodation.

21) **UF Counseling Services**: Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:

- UF Counseling & Wellness Center, 3190 Radio Rd, 392-1575, psychological and psychiatric services.
- Career Resource Center, Reitz Union, 392-1601, career and job search services.

22) **Software Use**: All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

UF UNIVERSITY of FLORIDA

UCC: Syllabus Checklist

All UCC1 forms and each UCC2 form that proposes a change in the course description or credit hours must include this checklist in addition to a complete syllabus. Check the box if the attached syllabus includes the indicated information.

Syllabus MUST contain the following information:

- ☑ Instructor contact information (and TA if applicable)
- ☑ Course objectives and/or goals
- ☑ A topical outline (at least tentative) of subjects to be covered
- ☑ Required and recommended textbooks
- ☑ Methods by which students will be evaluated and their grades determined
- ☑ Policy related to class attendance
- ☑ Policy related to make-up exams or other work
- ☑ Statement related to accommodations for students with disabilities
- ☑ Information on current UF grading policies for assigning grade points

It is recommended that syllabi contain the following information:

1. Critical dates for exams and other work
2. Class demeanor expected by the professor (e.g., tardiness, cell phone usage)
3. UF's honesty policy
4. Contact information for university counseling and mental health services

The University's complete Syllabus Policy can be found at:

http://www.aa.ufl.edu/policy/SyllabiPolicy.pdf