Eastern Illinois University

New/Revised Course Proposal Format

(Approved by CAA on 4/3/14 and CGS on 4/15/14, Effective Fall 2014)

Banner/Catalog Information (Coversheet)

1. **__X__New Course or ____Revision of Existing Course**
2. **Course prefix and number:** ___MAT 5010_____
3. **Short title:** __ Operations Research_____
4. **Long title:** __ Applied Operations Research
   _____
5. **Hours per week:** __4_ Class __0_ Lab __4_ Credit
6. **Terms:** ___ Fall ___ Spring ___ Summer __X_ On demand
7. **Initial term**: __X_ Fall ___ Spring ___ Summer Year: __2023____
8. **Catalog course description:** Construction and use of mathematical models in applied problem solving; linear programming via the simplex algorithm, integer programming, goal programming, queuing theory, PERT-CPM, and simulation
9. **Course attributes:**

   General education component: _N/A_____

   ___ Cultural diversity ___ Honors ___ Writing centered ___ Writing intensive ___Writing active

   ___ Department Capstone as Senior Seminar

10. **Instructional delivery**
    Type of Course:

    __X_ Lecture ___ Lab ___ Lecture/lab combined ___ Independent study/research

    ___ Internship ___ Performance ___ Practicum/clinical ___ Other, specify: _____

    Mode(s) of Delivery:

    _X__ Face to Face ___ Online Synchronous _X__ Online Asynchronous ___ Study Abroad

    ___ Hybrid, specify approximate amount of on-line and face-to-face instruction_____
11. **Course(s) to be deleted from the catalog once this course is approved:** ___MAT 4750 and MAT 4850_____
12. **Equivalent course(s):** __N/A_____

    a. Are students allowed to take equivalent course(s) for credit? ___ Yes __X_ No
13. **Prerequisite(s):** ___MAT 2442; MAT 2550 or MAT 4760_____

a. **Can prerequisite be taken concurrently?** ___ Yes _X__ No

b. **Minimum grade required for the prerequisite course(s)? _C__**

c. **Use Banner coding to enforce prerequisite course(s)?** _X__ Yes ___ No

d. **Who may waive prerequisite(s)?**

___ No one __X_ Chair _X__ Instructor ___ Advisor ___ Other (specify)

14. **Co-requisite(s):** __N/A_____

15. **Enrollment restrictions**

a. **Degrees, colleges, majors, levels, classes which <u>may</u> take the course:** __ Graduate students in Mathematics – Secondary Mathematics Education option _____

b. **Degrees, colleges, majors, levels, classes which may <u>not</u> take the course:** _Everyone else_____

16. **Repeat status:** _X__ May not be repeated ___ May be repeated once with credit

17. **Enter the limit, if any, on hours which may be applied to a major or minor:** _4__

18. **Grading methods:** _X__ Standard ___ CR/NC __ Audit ___ ABC/NC

19. **Special grading provisions:**

_N/A__ Grade for course will <u>not</u> count in a student's grade point average.

_ N/A __ Grade for course will <u>not</u> count in hours toward graduation.

_ N/A __ Grade for course will be removed from GPA if student already has credit for or is registered in: _____

_ N/A __ Credit hours for course will be removed from student's hours toward graduation if student already has credit for or is registered in: _____

20. **Additional costs to students:**
Supplemental Materials or Software___N/A_____

Course Fee _X__No ___Yes, Explain if yes_____

21. **Community college transfer:**

___ A community college course may be judged equivalent.

_X__ A community college may <u>not</u> be judged equivalent.

Note: Upper division credit (3000+) will <u>not</u> be granted for a community college course, even if the content is judged to be equivalent.

Rationale, Justifications, and Assurances (Part I)

1. ___Course is required for the major(s) of _____
   ___Course is required for the minor(s) of _____
   ___Course is required for the certificate program(s) of _____
   _X__ Course is used as an elective
2. **Rationale for proposal**: The department currently offers two courses, MAT 4750 – Linear Programming and MAT 4850-Operations Research which are each rarely offered but both focus on different optimization techniques. Additionally, advances in technology and modeling has resulted in some content between the two courses being deemphasized. This new course combines aspects of those two classes into one 4-credit course covering the more broad spectrum of applied optimization techniques all of which still fall under the umbrella of Operations Research.
3. **Justifications for (answer N/A if not applicable)**
   Similarity to other courses: N/A
   Prerequisites: This class requires knowledge of Calculus-based optimization techniques, as well as some fundamental ideas of vector spaces.
   Co-requisites: N/A
   Enrollment restrictions: This is a graduate level class and requires an undergraduate background in mathematics.
   Writing active, intensive, centered: N/A
   Capstone as Senior Seminar: N/A
4. **General education assurances (answer N/A if not applicable)**
   General education component: N/A
   Curriculum: N/A
   Instruction: N/A
   Assessment: N/A
5. **Online/Hybrid delivery justification & assurances (answer N/A if not applicable)**
   Online or hybrid delivery justification: Most often, students taking this class will be located off-campus. Other similar classes have been offered online successfully.
   Instruction: Online delivery of the class will be facilitated through the EIU Learning Management System. Materials will include professor-recorded/selected videos, notes,

discussions and other components. Faculty teaching the class online will have the appropriate OCDI training.

The EIU LMS provides various ways for work to be securely given and collected. Assignments will be checked for integrity using available tools.
Interaction: The EIU LMS allows for discussion boards to be posted on and video collaboration. The professor will give feedback and interact with students via these methods, online office hours, and online class meetings if and when necessary. The discussion board tools also allow students to interact with each other.

Model Syllabus (Part II)

1. Course number and title

MAT 5010 – Applied Operations Research

2. Catalog description

Construction and use of mathematical models in applied problem solving; linear programming via the simplex algorithm, integer programming, goal programming, queuing theory, PERT-CPM, and simulation

3. Learning objectives.

The student will be able to:

(a) mathematically model close to real life scenarios and use technology in solution processes. (1, 2)
(b) use techniques for solving linear programming problems. (1, 2)
(c) use techniques for solving integer and goal programming problems. (1, 2)
(d) use duality and engage in post-optimal analysis. (1, 2)
(e) create models appropriate for queuing theory. (1, 2)
(f) distinguish between different simulation scenarios. (1, 2)
(g) create models for timing networks using PERT and CPM. (1, 2)

4. Course materials.

Text: "Operations Research: An Introduction" by Hamady A. Taha (Pearson, 2017)

5. Weekly outline of content.

Week 1: Introduction/Review of Calculus-based Applied Optimization techniques

Week 2: Modeling with Linear Programming

Week 3: Graphical Solution Methods

Week 4: Simplex Algorithm

Week 5: Sensitivity Analysis

Week 6: Special Cases

Week 7: Canonical Form of a Linear Program

Week 8: Duality and Post-Optimal Analysis

Week 9: Goal Programming & Integer Programming

Week 10: Goal Programming & Integer Programming

Week 11: Queuing Systems

Week 12: Monte Carlo Simulations

Week 13: Other Simulations

Week 14: PERT and CPM

Week 15: PERT and CPM

Week 16: Final Exam

6. Assignments and evaluation, including weights for final course grade.

   Homework 25%
   Discussions/Participation 25%
   Written Exams 50%

7. Grading scale.

   100% - 90%A, 80-89.9% B, 70-79.9% C, 60-69.9% D, < 60% F.

8. Correlation of learning objectives to assignments and evaluation.

	Homework (25%)	Discussion (25%)	Exams (50%)
(a) mathematical model close to real life scenarios and use technology in solution processes (1, 2)	x	x	x
(b) use techniques for solving linear programming problems (1, 2)	x		x
(c) use techniques for solving integer and goal programming problems (1, 2)	x		x
(d) use duality and engage in post-optimal analysis (1, 2)	x		x
(e) create models appropriate for queuing theory (1, 2)	x		x
(f) distinguish between different simulation scenarios (1, 2)	x	x	x
(g) create models for timing networks using PERT and CPM (1, 2)	x		x

Date approved by the department or school: 12/6/21
Date approved by the college curriculum committee: 1/19/22
Date approved by the Honors Council *(if this is an honors course):*
Date approved by CAA: CGS: