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| For Academic Affairs and Research Use Only |
| Proposal Number | ECS17 |
| CIP Code:  |  |
| Degree Code: |  |

**New or Modified Course Proposal Form**

**[X] Undergraduate Curriculum Council**

**[ ] Graduate Council**

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| **[X]New Course, [ ]Experimental Course (1-time offering), or [ ]Modified Course (Check one box)** |

Signed paper copies of proposals submitted for consideration are no longer required. Please type approver name and enter date of approval.

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| Andre Possani Espinosa 3/8/2022**Department Curriculum Committee Chair** | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…**COPE Chair (if applicable)** |
| Andre Possani Espinosa 3/8/2022**Department Chair** | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…**Head of Unit (if applicable)**   |
| Jason Stewart 3/8/2022**College Curriculum Committee Chair** | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…**Undergraduate Curriculum Council Chair** |
| Mary Elizabeth Spence 2/28/2022**Director of Assessment (new courses only)** | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…**Graduate Curriculum Committee Chair** |
| Abhijit Bhattacharyya 3/8/2022**College Dean** | Alan Utter 3/14/2022**Vice Chancellor for Academic Affairs** |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…**General Education Committee Chair (if applicable)**   |  |

1. **Contact Person (Name, Email Address, Phone Number)**

 Andre Possani Espinosa, apossaniespinosa@astate.edu, +52 419 689 0354 ext. 2061

1. **Proposed starting term and Bulletin year for new course or modification to take effect**

Fall 2022.

**Instructions:**

*Please complete all sections unless otherwise noted. For course modifications, sections with a “Modification requested?” prompt need not be completed if the answer is “No.”*

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|  | **Current (Course Modifications Only)** | **Proposed (New or Modified)** *(Indicate “N/A” if no modification)* |
| **Prefix** |  | **ISE** |
| **Number\*** |  | **4312** |
| **Title** |  | **Systems Simulation** |
| **Description\*\*** |  | **Modeling and simulation in the design and analysis of industrial and service systems. Real-world applications of simulation modeling.** |

 ***\**** (Confirm with the Registrar’s Office that number chosen has not been used before and is available for use. For variable credit courses, indicate variable range. *Proposed number for experimental course is 9*. )

\*\*Forty words or fewer as it should appear in the Bulletin.

1. **Proposed prerequisites and major restrictions** **[Modification requested? Yes/No]**

(Indicate all prerequisites. If this course is restricted to a specific major, which major. If a student does not have the prerequisites or does not have the appropriate major, the student will not be allowed to register).

1. **Yes / No** Are there any prerequisites? **YES**
	1. If yes, which ones?

**C or better in ISE 3103 and ISE 3303.**

* 1. Why or why not?

 **Requires knowledge of modeling data and optimization technics**

1. **Yes / No** Is this course restricted to a specific major? **NO**
	1. If yes, which major? Enter text...
2. **Proposed course frequency [Modification requested? Yes/No]**

(e.g. Fall, Spring, Summer; if irregularly offered, please indicate, “irregular.”) *Not applicable to Graduate courses.*

**Fall**

1. **Proposed course type [Modification requested? Yes/No]**

Will this course be lecture only, lab only, lecture and lab, activity (e.g., physical education), dissertation/thesis, capstone, independent study, internship/practicum, seminar, special topics, or studio? Please choose one.

**Lecture only**

1. **Proposed grade type [Modification requested? Yes/No]**

What is the grade type (i.e. standard letter, credit/no credit, pass/fail, no grade, developmental, or other [please elaborate])

**Standard Letter**

1. **Yes / No** Is this course dual-listed (undergraduate/graduate)? **NO**
2. **Yes / No** Is this course cross-listed? **NO**

*(If it is, all course entries must be identical including course descriptions. Submit appropriate documentation for requested changes. It is important to check the course description of an existing course when adding a new cross-listed course.)*

**a.** – If yes, please list the prefix and course number of the cross-listed course.

 Enter text...

 **b.** – **Yes / No** Can the cross-listed course be used to satisfy the prerequisite or degree requirements this course satisfies?

 Enter text...

1. **Yes / No** Is this course in support of a new program?

a. If yes, what program?

 **BS in Industrial Systems Engineering**

1. **Yes / No** Will this course be a one-to-one equivalent to a deleted course or previous version of this course (please check with the Registrar if unsure)? **NO**

a. If yes, which course?

Enter text...

**Course Details**

1. **Proposed outline** **[Modification requested? Yes/No]**

(The course outline should be topical by weeks and should be sufficient in detail to allow for judgment of the content of the course.)

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| **Week** | Topic |
| 1 | Simulation, Random Numbers and Excel. |
| 2 | Simulation Modeling Methodology |
| 3 | Analysis of Inputs |
| 4-5 | Modeling Service Systems |
| 6-8 | Modeling manufacturing systems |
| 9 | Model Verification and Validation |
| 10-11 | Design of Experiments for simulation modeling |
| 12 | Analysis of outputs |
| 13-15 | Modeling Material Handling Systems |

1. **Proposed special features** **[Modification requested? Yes/No]**

(e.g. labs, exhibits, site visitations, etc.)

**Student will be using appropriate software to complete in class exercises and additional assignments.**

1. **Department staffing and classroom/lab resources**
* **25 licenses of either SIMIO, ARENA, or FLEXSIM.**
1. Will this require additional faculty, supplies, etc.?

**Yes, a full-time faculty in the area will be needed to teach several courses, including this one.**

1. **Yes / No** Does this course require course fees? **NO**

 *If yes: please attach the New Program Tuition and Fees form, which is available from the UCC website.*

**Justification**

**Modification Justification (Course Modifications Only)**

1. Justification for Modification(s)

Enter text...

**New Course Justification (New Courses Only)**

1. Justification for course. Must include:

 a. Academic rationale and goals for the course (skills or level of knowledge students can be expected to attain)

 **Industrial Systems Engineering graduates must have a strong foundation on stochastic modeling techniques, including computational methods, to design and assess production and service systems.**

b. How does the course fit with the mission of the department? If course is mandated by an accrediting or certifying agency, include the directive.

**This course is aligned with the goal of the BS in ISE to graduate professionals with a strong foundation in engineering principles to design, maintain, and optimize production, quality, and management systems that are economically efficient, sustainable, and yield high quality products.**

c. Student population served.

**Engineering students, in particular Industrial Systems Engineering students.**

d. Rationale for the level of the course (lower, upper, or graduate).

**Students must have a level of overall engineering maturity of at least 5th semester and modeling acquired in Introduction to Optimization.**

**Assessment**

**Assessment Plan Modifications (Course Modifications Only)**

1. **Yes / No** Do the proposed modifications result in a change to the assessment plan? **N/A**

 *If yes, please complete the Assessment section of the proposal*

**Relationship with Current Program-Level Assessment Process (Course modifications skip this section unless the answer to #18 is “Yes”)**

1. What is/are the intended program-level learning outcome/s for students enrolled in this course? Where will this course fit into an already existing program assessment process?

**This course contributes to PLO 1: an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.**

**This course is used for the assessment of PLO 6: an ability to develop and conduct appropriate experimentation, analyze, and interpret data, and use engineering judgment to draw conclusions.**

1. Considering the indicated program-level learning outcome/s (from question #19), please fill out the following table to show how and where this course fits into the program’s continuous improvement assessment process.

*For further assistance, please see the ‘Expanded Instructions’ document available on the UCC - Forms website for guidance, or contact the Office of Assessment at 870-972-2989.*

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| **Program-Level Outcome 1 (from question #19)** | **An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.** |
| Assessment Procedure Criterion | **Indirect Assessment****Surveys of graduating seniors (each semester)****Surveys of Alumni (every two years)****Surveys of Employers (every two years)****Direct Assessment****90% of students will score 3.0 or higher on portfolio evaluations (graded work, exams, papers, etc.) performed by faculty in ENGR 4482 Senior Design II, ISE 3303 Introduction to Optimization, and ISE 4303 Analytical Stochastic Modeling.** |
| Which courses are responsible for this outcome? | **ENGR 4482, ISE 3303 and ISE 4303** |
| Assessment Timetable | **Collect data whenever ENGR 4482, ISE 3303 and ISE 4303 are offered. Assess every 3 years according to the College of Engineering and Computer Science assessment schedule.** |
| Who is responsible for assessing and reporting on the results? | **Indirect assessment: the Director of Engineering at campus Queretaro.****Direct assessment: the Professors who teach ENGR 4482, ISE 3303 and ISE 4303.** |

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| **Program-Level Outcome 6 (from question #19)** | **An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.** |
| Assessment Procedure Criterion | **Indirect Assessment****Surveys of graduating seniors (each semester)****Surveys of Alumni (every two years)****Surveys of Employers (every two years)****Direct Assessment****90% of students will score 3.0 or higher on portfolio evaluations (graded work, exams, papers, etc.) performed by faculty in ENGR 4482 Senior Design II, ISE 3103 Modeling Engineering Data and ISE 4312 Systems Simulation** |
| Which courses are responsible for this outcome? | **ENGR 4482, ISE 3103 and ISE 4312** |
| Assessment Timetable | **Collect data whenever ENGR 4482, ISE 3103 and ISE 4312 are offered. Assess every 3 years according to the College of Engineering and Computer Science assessment schedule.** |
| Who is responsible for assessing and reporting on the results? | **Indirect assessment: the Director of Engineering at campus Queretaro.****Direct assessment: the Professors who teach ENGR 4482, ISE 3103 and ISE 4312.** |

 *(Repeat if this new course will support additional program-level outcomes)*

 **Course-Level Outcomes**

1. What are the course-level outcomes for students enrolled in this course and the associated assessment measures?

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| **Outcome 1** | **An ability to design and develop simulation models for service and manufacturing systems** |
| Which learning activities are responsible for this outcome? | **In-class discussion and illustrations****Demonstration of analysis results in presentations** |
| Assessment Measure  | **Course presentations, exams and projects** |

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| **Outcome 2** | **An ability to establish data models for the inputs of the model.**  |
| Which learning activities are responsible for this outcome? | **In-class discussion and illustrations****Demonstration of analysis results in presentations** |
| Assessment Measure  | **Course presentations, exams and projects** |

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| **Outcome 3** | **An ability to verify and validate simulation models** |
| Which learning activities are responsible for this outcome? | **In-class discussion and illustrations****Demonstration of analysis results in presentations** |
| Assessment Measure  | **Course presentations, exams and projects** |

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| **Outcome 4** | **An ability to analyze outputs from simulation experiment** |
| Which learning activities are responsible for this outcome? | **In-class discussion and illustrations****Demonstration of analysis results in presentations** |
| Assessment Measure  | **Course presentations, exams and projects** |

 *(Repeat if needed for additional outcomes)*

**Bulletin Changes**

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| **Instructions**  |
| **Please visit** [**http://www.astate.edu/a/registrar/students/bulletins/index.dot**](http://www.astate.edu/a/registrar/students/bulletins/index.dot) **and select the most recent version of the bulletin. Copy and paste all bulletin pages this proposal affects below. Please include a before (with changed areas highlighted) and after of all affected sections.** **\*Please note: Courses are often listed in multiple sections of the bulletin. To ensure that all affected sections have been located, please search the bulletin (ctrl+F) for the appropriate courses before submission of this form.**  |

**Page 538, before the heading “Law (LAW)”**

**Before:**

**ISBA 488V. Internship in ISBA** Provides practical information technology experience in a ISBA setting. Students will be assigned to work with an outside organization to gain real world training. Pre/Co-requisite, ISBA 3013. May be repeated for credit. Prerequisites, Permission of Department Chair and Internship Director required. Fall, Spring, Summer.

**Law (LAW)**

**LAW 2023. Legal Environment of Business** Introduction to the fundamental elements of the Anglo American legal system and its common law origins. The scope of the course will include the application and operation of the legal system in the remedy of business disputes, the development and operation of the court system, and the regulation of American business and industry by the United States government. Fall, Spring, Summer. (ACTS#: BLAW 2003)

**After:**

**ISBA 488V. Internship in ISBA** Provides practical information technology experience in a ISBA setting. Students will be assigned to work with an outside organization to gain real world training. Pre/Co-requisite, ISBA 3013. May be repeated for credit. Prerequisites, Permission of Department Chair and Internship Director required. Fall, Spring, Summer.

**Industrial Systems Engineering (ISE)**

**ISE 3103. Modeling Engineering Data** Statistical techniques and tools in engineering. Design of experiments and analysis of data obtained from engineering experiments and industrial systems. Use of modern statistical software. Prerequisites, C or better in MATH 2214 and ENGR 2401 or equivalent. Spring.

**ISE 3113. Quality Control** Fundamentals of statistical quality control, including development of quality control plans, analysis, and tracking. Prerequisite, C or better in ENGR 2401 or equivalent. Fall.

**ISE 3203. Methods Engineering** Introduction to work study, with applied strategies to assess work activities to optimize productivity and efficiency, with a focus on value, considering technological advances in industrial operations. Exploration of the factors that affect productivity. Prerequisite, C or better in MATH 2214. Fall.

**ISE 3303. Introduction to Optimization** Introduction to the fundamental principles of optimization, building linear models as they apply to industrial systems, and algorithms to solve these models. Prerequisites, C or better in MATH 2214 and CS 2114 or equivalent. Fall.

**ISE 4303. Analytical Stochastic Modeling** Stochastic modeling using Markov Chains, Queuing Theory, and Decision Analysis and their application in the design and analysis of engineering systems. Prerequisites, C or better in ISE 3103 and ISE 3303. Spring.

**ISE 4311. Systems Simulation Laboratory** Use of simulation packages to solve cases of real-world applications of simulation modeling. Prerequisites, C or better in ISE 3103 and ISE 3303. Corequisite, ISE 4312. Fall.

**ISE 4312. Systems Simulation** Modeling and simulation in the design and analysis of industrial and service systems. Real-world applications of simulation modeling. Prerequisites, C or better in ISE 3103 and ISE 3303. Fall.

**ISE 4323. Production Systems Planning and Control** Design and management of production and service systems through demand forecasting, capacity planning, master production planning, material requirements planning, lean, just-in-time, and theory of constraints. Prerequisite: C or better in ISE 3303. Spring.

**Law (LAW)**

**LAW 2023. Legal Environment of Business** Introduction to the fundamental elements of the Anglo American legal system and its common law origins. The scope of the course will include the application and operation of the legal system in the remedy of business disputes, the development and operation of the court system, and the regulation of American business and industry by the United States government. Fall, Spring, Summer. (ACTS#: BLAW 2003)