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| For Academic Affairs and Research Use Only |
| Proposal Number | ECS10 |
| CIP Code:  |  |
| Degree Code: |  |

**Reconfiguration of Existing Degree Program Proposal Form**

(Also requires Arkansas Department of Higher Education (ADHE) approval)

**[X] Undergraduate Curriculum Council**

**[ ] Graduate Council**

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** |

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**COPE Chair (if applicable)** |
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| Andre Possani Espinosa | 3/8/2022 |

**Department Chair** |

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**Head of Unit (if applicable)**   |
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| Mary Elizabeth Spence | 2/28/2022 |
| **Office of Assessment** |  |

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**Undergraduate Curriculum Council Chair** |
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| Jason Stewart | 3/8/2022 |

**College Curriculum Committee Chair** |

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**Graduate Curriculum Committee Chair** |
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| Abhijit Bhattacharyya | 3/8/2022 |

**College Dean** |

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| Alan Utter | 3/14/2022 |

**Vice Chancellor for Academic Affairs** |
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**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. **Title(s) of degree programs to be consolidated/reconfigured:**

BSME in Mechanical Engineering, BSEE in Electrical Engineering and BS in Engineering Management Systems

1. **Proposed title of consolidated/reconfigured program:**

 Bachelor of Science in Industrial Systems Engineering

1. **Proposed Effective Date:** Fall 2022
2. **Reason for proposed program consolidation/reconfiguration:**

*(Indicate student need/demand (projected enrollment) for the proposed program and document that the program meets employer needs using the ADFA Workforce Analysis Form)*

The State of Queretaro has been experiencing an upward industrial growth over the past 10 years. This growth is expected to continue for another decade as the State continues to purpose industrial foreign investment for the state. 3 new industrial parks have been deployed in the past 5 years. This growth has increased the demand of engineering graduates in the state, especially, industrial engineering in all its various facets (manufacturing, quality, human factors, modeling and design, etc.) [Alianza FiiDEM – CONACYT, 2018]. In response to this, Universidad Autonoma de Queretaro began the major of BS in Industrial and Manufacturing Engineering in 2017.

According to Alianza FiiDEM – CONACYT (/2018), in the 2017-18 academic cycle about 230,000 students were enrolled in industrial engineering, which represented about 24% of all engineering enrollment in Mexico, and about 20% of the engineering enrollment in the Central Region of Mexico with less than 10% for Queretaro. Of this enrollment, about 7-% complete the degree. A significant characteristic that Queretaro companies are looking for in an engineering graduate is fluency in the English language. In this criterion, most universities in Queretaro are failing industry as they teach in Spanish and English fluency is not a requirement for graduation. ASUCQ is poised to fulfill this need with ease.

In regard to enrollment, although the BS in ISE is a popular degree in Mexico, at ASUCQ we can only attract those who meet the English language requirement. Thus, the estimates below are conservative numbers based on the figures for overall enrollment and for engineering in particular:



1. **Provide current and proposed curriculum outline by semester.**

*For undergraduate programs, please use Appendix A-8-semester plan form*

 *Indicate total semester credit hours required for the proposed program. If new courses are needed for the reconfiguration, approval for the courses must be requested prior to approval for the new degree. Underline any new courses. Identify required general education core courses with an asterisk. If utilizing courses from other departments, please color-code them and provide a key.*

 The creation of the Bachelor of Science in Industrial Systems Engineering involves 3 programs from the College of Engineering and Computer Science as well as the College of Liberal Arts and Communication and College of Mathematics and Science since it has the general education component. The curriculum includes a general education component of 38 credits, and engineering core component of 20 credits, a program specific core of 51 credits, and a program electives component of 19 credits.

 The general education component matches the general education requirements for all other engineering programs. The same thing happens with the engineering core. The program core offers additional support in science (8 credits), mathematics (3 credits), general engineering (11 credits), and 30 credits to establish the bases for the foundations of industrial engineering areas of optimization, human factors/ergonomics, production systems, and engineering project management. The 19 credits of elective course provide additional breadth and depth in the areas of management systems, quality systems, and engineering. 12 of these 19 credits could be used by the student to gain experience in one of these areas: Automotive, Electrical Engineering, Energy Systems, Engineering Management, Environmental Policy, Logistics, Management, Mechanical Engineering, and Occupational Safety.

The proposed program follows the established guidelines of 128 credits for engineering programs, of which 104 credits (81.3%) are from existing courses in the engineering programs or the general education areas, 21 credits are new courses, and 3 credits are from an elective that can be covered with a new or an existing course.

The suggested semester by semester plan is as follows:



**Total Degree Hours 128**

Some of the pools of proposed electives are:





1. **Will the proposed degree be offered:**
	1. **Traditional/Face-to-face** Yes (at ASUCQ only)
	2. **Distance/Online** No
		1. **If yes, indicate mode of distance delivery, and the percentage of courses offered via this modality (<50%, 50-99%, or 100%).**

 Enter text...

* + 1. **If online, will it be offered through Global Initiatives/Academic Partnerships (AP)?**

 Enter text...

1. **Will the proposed degree be offered off-campus?** Yes
	1. **If yes, identify the off-campus location**

Arkansas State University campus Queretaro

1. **Provide documentation that proposed program has received full approval by licensure/certification entity, if required.**

 *(A program offered for teacher/education administrator licensure must be reviewed/approved by the Arkansas Department of Education prior to consideration by the Coordinating Board; therefore, the Education Protocol Form also must be submitted to ADHE along with the Letter of Notification).*

The BSISE program will be accredited by ABET. However, the ABET accreditation process requires that the program produces at least 1 graduate before the accreditation evaluation can take place.

1. **List institutions offering similar program and identify the institutions used as a model to develop the proposed program.**

University of Arkansas at Fayetteville (BS in Industrial Engineering). This program was reviewed to identify opportunities for commonalities and distinctiveness. UArk offers BSIE at the three levels: Bachelor’s, Master’s, and PhD.

There are no other BSIE or BSISE programs in Arkansas, public or private institutions.

In Mexico, there are 10 universities offering similar ABET accredited programs. The most well-know is Monterrey’s Tech (ITESM) that offers a BS in Industrial Engineering with minor in Systems Engineering in 8 of its campuses (including the one in Queretaro).

1. **Provide scheduled program review or specialized accreditation initial review date (within 10 years of program implementation).**

No earlier than Fall 2024; no later than Fall 2027

1. **Is there differential tuition requested?** *If yes, please fill out the New Program/Tuition and Fees Change Form.*

 No

**Student Learning Outcomes**

Provide outcomes that students will accomplish during or at completion of this reconfigured degree. Fill out the following table to develop a 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.*

**University Outcomes**

Please indicate the university-level student learning outcomes for which this new program will contribute. Please complete the table by adding program level outcomes (PLO) to the first column, and indicating the alignment with the university learning outcomes (ULO). If you need more information about the ULOs, go to the [University Level Outcomes Website](http://www.astate.edu/a/assessment/student-learning-outcomes/files/ULOs%20for%20Website2.pdf).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **ULO 1: Creative & Critical Thinking** | **ULO 2: Effective Communi-cation** | **ULO 3: Civic & Social Responsibility** | **ULO 4: Globalization & Diversity** |
| **PLO 1**: An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. | **X** |  |  |  |
| **PLO 2:** An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. | **X** |  | **X** |  |
| **PLO 3**: An ability to communicate effectively with a range of audiences. |  | **X** |  |  |
| **PLO 4:** An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts. | **X** |  | **X** | **X** |
| **PLO 5:** An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives. | **X** | **X** | **X** | **X** |
| **PLO 6:** An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions. | **X** | **X** |  |  |
| **PLO 7:** An ability to acquire and apply new knowledge as needed, using appropriate learning strategies. | **X** |  |  | **X** |

***Note: Best practices suggest 4-7 outcomes per program; minors would have 1 to 4 outcomes.***

|  |  |
| --- | --- |
| **Outcome 1** | 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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| **Outcome 2** | An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. |
| 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 3433 Engineering Economics and ENGR 4482 Senior Design II |
| Which courses are responsible for this outcome? | ENGR 3433 and ENGR 4482 |
| Assessment Timetable | Collect data whenever ENGR 3433 and ENGR 4482 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 3433 and ENGR 4482. |

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| **Outcome 3** | An ability to communicate effectively with a range of audiences. |
| 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 EGRM 3013 Project Management and Practice, and ENGR 4482 Senior Design II |
| Which courses are responsible for this outcome? | EGRM 3013 and ENGR 4482 |
| Assessment Timetable | Collect data whenever EGRM 3013 and ENGR 4482 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 EGRM 3013 and ENGR 4482. |

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| **Outcome 4** | An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts. |
| 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 EGRM 3013 Project Management and Practice, ENGR 4482 Senior Design II, and ISE 3113 Quality Control |
| Which courses are responsible for this outcome? | EGRM 3013, ENGR 4482 and ISE 3113 |
| Assessment Timetable | Collect data whenever EGRM 3013, ENGR 4482 and ISE 3113 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 EGRM 3013, ENGR 4482 and ISE 3113. |

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| **Outcome 5** | An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives. |
| 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 EGRM 3013 Project Management and Practice, ENGR 4482 Senior Design II, and ISE 4311 Systems Simulation Laboratory |
| Which courses are responsible for this outcome? | EGRM 3013, ENGR 4482 and ISE 4311 |
| Assessment Timetable | Collect data whenever EGRM 3013, ENGR 4482 and ISE 4311 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 EGRM 3013, ENGR 4482 and ISE 4311. |

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| **Outcome 6** | 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. |

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| **Outcome 7** | An ability to acquire and apply new knowledge as needed, using appropriate learning strategies. |
| 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 and ISE 4323 Production Systems Planning and Control |
| Which courses are responsible for this outcome? | ENGR 4482 and ISE 4323 |
| Assessment Timetable | Collect data whenever ENGR 4482 and ISE 4323 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 and ISE 4323. |

**Appendix A, 8-Semester Plan**

(**Referenced in #9** - **Undergraduate Proposals Only)**

*Instructions: Please identify new courses in italics*.



**Total Degree Hours 128**

**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.**  |

**From the 2021-2022 undergraduate catalog**

**From Page 71**

**Before:**

**Bachelor of Science in Electrical Engineering (B.S.E.E.)**

|  |
| --- |
| Electrical Engineering  |

**Bachelor of Science in Mechanical Engineering (B.S.M.E.)**

|  |
| --- |
| Mechanical Engineering  |
|  |

**After:**

**Bachelor of Science in Electrical Engineering (B.S.E.E.)**

|  |
| --- |
| Electrical Engineering  |

**Bachelor of Science in Industrial Systems Engineering (B.S.I.S.E.)**

|  |
| --- |
| Industrial Systems Engineering  |

**Bachelor of Science in Mechanical Engineering (B.S.M.E.)**

|  |
| --- |
| Mechanical Engineering  |
|  |

**From Page 87**

**Before:**

**COLLEGE OF ENGINEERING AND COMPUTER SCIENCE**

Department of Computer Science

Program for Civil Engineering

Program for Data Science and Data Analytics

Program for Electrical Engineering

Program for Engineering Management Systems

Program for Mechanical Engineering

Program for Engineering Technology

**After:**

**COLLEGE OF ENGINEERING AND COMPUTER SCIENCE**

Department of Computer Science

Program for Civil Engineering

Program for Data Science and Data Analytics

Program for Electrical Engineering

Program for Engineering Management Systems

Program for Industrial Systems Engineering

Program for Mechanical Engineering

Program for Engineering Technology

**From Page 185**

**Before:**

**College of Engineering and Computer Science**

*Professor Abhijit Bhattacharyya, Dean*

*Associate Professor Yeonsang Hwang, Associate Dean*

**PROGRAMS OF STUDY**

The College of Engineering and Computer Science offers undergraduate degree programs in a broad spectrum of areas, including a Bachelor of Arts and a Bachelor of Science in Computer Science; a Bachelor of Science in Civil Engineering degree; a Bachelor of Science in Data Science and Data Analytics; a Bachelor of Science in Electrical Engineering degree; a Bachelor of Science in Engineering Management Systems; a Bachelor of Science and an Associate of Science in Engineering Technology a Bachelor of Science and Associate of Applied Science in Land Surveying and Geomatics; and a Bachelor of Science in Mechanical Engineering degree. Minors are available in Computer Science, Electrical Engineering, Land Surveying and Geomatics, and Renewable Energy Technology. Two undergraduate certificates in Data Analytics and Controls and Automation are also available.

**After:**

**College of Engineering and Computer Science**

*Professor Abhijit Bhattacharyya, Dean*

*Associate Professor Yeonsang Hwang, Associate Dean*

**PROGRAMS OF STUDY**

The College of Engineering and Computer Science offers undergraduate degree programs in a broad spectrum of areas, including a Bachelor of Arts and a Bachelor of Science in Computer Science; a Bachelor of Science in Civil Engineering degree; a Bachelor of Science in Data Science and Data Analytics; a Bachelor of Science in Electrical Engineering degree; a Bachelor of Science in Engineering Management Systems; a Bachelor of Science and an Associate of Science in Engineering Technology a Bachelor of Science and Associate of Applied Science in Land Surveying and Geomatics; a Bachelor of Science in Industrial Systems Engineering, and a Bachelor of Science in Mechanical Engineering degree. Minors are available in Computer Science, Electrical Engineering, Land Surveying and Geomatics, and Renewable Energy Technology. Two undergraduate certificates in Data Analytics and Controls and Automation are also available.

**After Page 206 and before the heading on “Mechanical Engineering Program”**

**(Before: N/A (this section is new)).**

**After:**

Industrial Systems Engineering Program

**Professor:** *Centeno*

The Bachelor of Science in Industrial Systems Engineering (BS ISE) program at ASU Campus Querétaro seeks to provide its graduates 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. Its curriculum combines courses in mathematics, physical science, management sciences, and behavioral sciences. This combination provides its graduates with a high degree of flexibility in career choices.

**PROGRAM EDUCATIONAL OBJECTIVES**

The educational objectives for the Industrial Systems Engineering program are:

1. Graduates have successfully advanced in industrial engineering practice as evidenced by their achievements and contributions to their employers and the greater engineering community.
2. Graduates have pursued graduate degrees or completed professional development activities in continuing to advance their knowledge base in the industrial engineering or related professional fields.
3. Graduates have made a broader contribution to local and national economic development by providing an industrial engineering perspective on the challenges and opportunities of society.

The Industrial Systems Engineering program’s outcomes define the knowledge, skills, attitudes, and behaviors that program graduates are expected to have by the time of graduation from the program. Graduates of the Industrial Systems Engineering program will have:

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics;
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environ­mental, and economic factors;
3. An ability to communicate effectively with a range of audiences;
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts;
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives;
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions; and
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

**Major in Industrial Systems Engineering**

**Bachelor of Science**

A complete 8-semester degree plan is available at <https://www.astate.edu/info/academics/degrees/>

|  |
| --- |
| **University Requirements:**  |
| See University General Requirements for Baccalaureate degrees (p. 47)  |
| **First Year Making Connections Course:**  | **Sem. Hrs.**  |
| ENGR 1402, Concepts of Engineering (See Engineering Core Courses)  | **-**  |
| **General Education Requirements:**  | **Sem. Hrs.**  |
| See General Education Curriculum for Engineering  | **38**  |
| **Engineering Core Courses:**  | **Sem. Hrs.**  |
| Refer to Engineering Core Courses  | **20**  |
| **Major Requirements:** Electives denoted by an asterisk (\*) must be chosen from a list of approved electives which is available from Industrial Systems Engineering advisors and through the faculty office.In addition to the University requirements for all Baccalaureate Degrees, a Bachelor of Science in Industrial Systems Engineering requires that one of the two following conditions be met: 1. “C” or better in each course in the major courses; **OR** 2. 2.5 (or greater) grade point average in the major courses listed below.  | **Sem. Hrs.**  |
| CS 2114, Structured Programming | 4 |
| EGRM 3013, Project Management and Practice | 3 |
| ENGR 2411, Mechanics of Materials Laboratory | 1 |
| ENGR 2413, Mechanics of Materials | 3 |
| ENGR 2421, Electric Circuits I Laboratory | 1 |
| ENGR 2423, Electric Circuits I | 3 |
| ENGR 3443, Engineering Thermodynamics I | 3 |
| ISE 3103, Modeling Engineering Data | 3 |
| ISE 3113, Quality Control | 3 |
| ISE 3203, Methods Engineering | 3 |
| ISE 3303, Introduction to Optimization | 3 |
| ISE 4303, Analytical Stochastic Modeling | 3 |
| ISE 4311, Systems Simulation Laboratory | 1 |
| ISE 4312, Systems Simulation | 2 |
| ISE 4323, Production Systems Planning and Control | 3 |
| ME 2502, Solid Modeling for Mechanical Engineers | 2 |
| ME 4563, Introduction to Manufacturing Processes | 3 |
| \* ISE Approved General Elective | 3 |
| \* Management Systems Elective | 3 |
| \* Upper-Level Engineering Electives | 12 |
| \* General Elective | 1 |
| **Sub-total**  | 63 |
| **Additional Support Courses:**  | **Sem. Hrs.**  |
| MATH 4403, Differential Equations  | 3  |
| PHYS 2044, University Physics II  | 4  |
| **Total Required Hours:**  | **128** |

**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)