



NEW INDUSTRIAL ENGINEERING CURRICULUM








Starting Academic year 2023-2024

University of Puerto Rico
Mayagüez, PR



ingeniería

IE Program Facts

- 696 students (Fall 2021)
Enrollment 2021-2022 
- 15 professors
Faculty 
- ABET, September 30, 2027
Accreditation 
- 175 credits
Current Curriculum 
- 5- year (10 semesters)
Program 
- 7.2 years (2015-2021)
Average Time Completion Time 
- 75% (at the time of graduation)
Employment Rate 

UPRM Fall 2021-2022

Programa Académico	Cantidad Estudiantes Matriculados
Ingeniería Mecánica - BC	1038
Biología - BC	772
Ingeniería Industrial - BC	696
Ingeniería Eléctrica - BC	642
Ingeniería Química - BC	631
Ingeniería Civil - BC	589
Ciencia Animal (Industria Pecuaria) - BCA	558
Ingeniería Computadoras - BC	544
Ingeniería de Software - BC	419
Microbiología Industrial - BC	410
Psicología - BA	340
Contabilidad - BCAE	277
Química - BC	269
Enfermería - BC	237
Mercadeo - BCAE	228
Agrimensura y Topografía - BC	228
Pre-Médica - BC	193
Agricultura General - BCA	161
Sistemas Computadorizados de Información	158
EDFI-Adiestramiento y Arbitraje - BA	157
Ciencias e Ingeniería de la Computación - B	157



National ASEE 2020 - 2021 Engineering by the Numbers

Top 50 Institutions by Total Bachelor's Degrees awarded in Industrial/Manufacturing Engineering

Table 21: Top 50 Institutions by Total Bachelor's Degrees awarded in Industrial/Manufacturing Engineering

No	Institutions	Degrees Awarded
1	University of California, Berkeley	735
2	Georgia Institute of Technology	338
3	Purdue University	264
4	Texas A&M University	212
5	Virginia Polytechnic Institute and State University	205
6	University of Michigan	186
7	The Pennsylvania State University	183
8	Arizona State University	162
9	Clemson University	160
10	University of Illinois at Urbana-Champaign	152
11	University of Arizona	147
12	University of Florida	140
13	University of Central Florida	138
14	The Ohio State University	129
15	California Polytechnic State University, San Luis Obispo	126
16	West Virginia University	125
17	Auburn University	123
18	California State Polytechnic University, Pomona	120
19	Iowa State University	117
20	University of Virginia	108
21	University of Wisconsin-Madison	105
22	North Carolina State University	103
23	Lehigh University	102
24	University of Puerto Rico, Mayaguez Campus	94
25	Oregon State University	89
26	University of Southern California	87
27	Cornell University	86
28	University of Pittsburgh	85
29	University of Minnesota - Twin Cities	81
30	The University of Texas at El Paso	79
31	San Jose State University	73
32	Northwestern University	72
32	University of Oklahoma, Gallogly College of Engineering	72
34	Mississippi State University	69
35	Stanford University	67
36	Rutgers, The State University of New Jersey, School of Engineering	64
36	Texas State University	64
36	The State University of New York at Binghamton	64
39	University of Arkansas	63
40	Fu Foundation School of Engineering and Applied Science - Columbia University	62
41	Worcester Polytechnic Institute	59
42	Louisiana State University	56

146 Institutions included



Highlights of proposed curriculum

- Keeps the same graduates' profile
- Complies with ABET Criteria
- Provides necessary coursework to pass the Fundamental and Professional exams.
- Offers no reduction in free electives (12 credit hours)
- Complies with engineering common criteria (“parámetros comunes”)
- Reduces from 175 to 149 the number of total credits (15%)
- Reduces from 194 to 164 the number of contact hours (15%)

Sources of Information

Systematic Course
Assessment Process –
Course Modules

Accreditation Process
Feedback - ABET

Departmental
Meetings – professors
and student
representatives

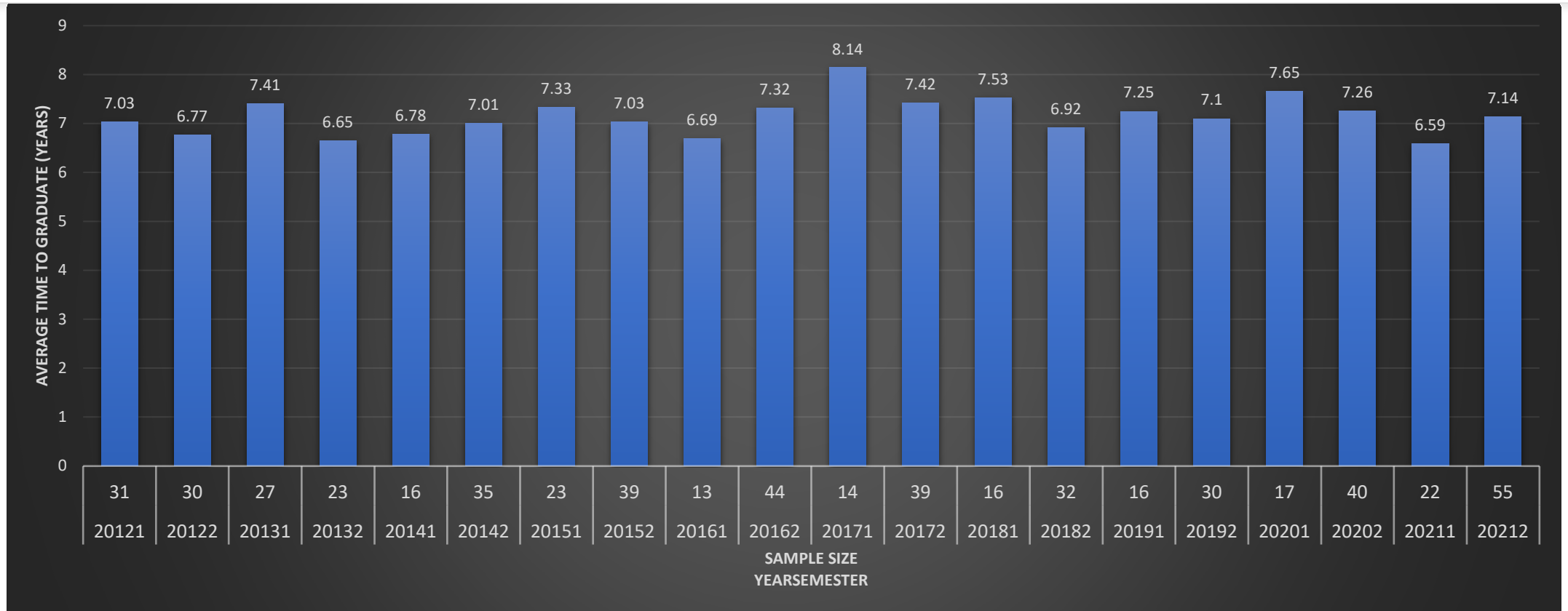
Feedback from
employers – surveys &
one-on-one
conversations

IE Industry
Advisory Board
Meetings

A blue ballpoint pen is positioned diagonally across the upper left portion of the image. The background is a document featuring a bar chart with several blue bars of varying heights. The overall image has a soft, slightly blurred aesthetic with a blue color palette.

Relevant Program Statistics

Time to graduate (in years)



Data from IE graduates, excluding “programa articulado”

Issues related to the “time-to-graduate” statistic

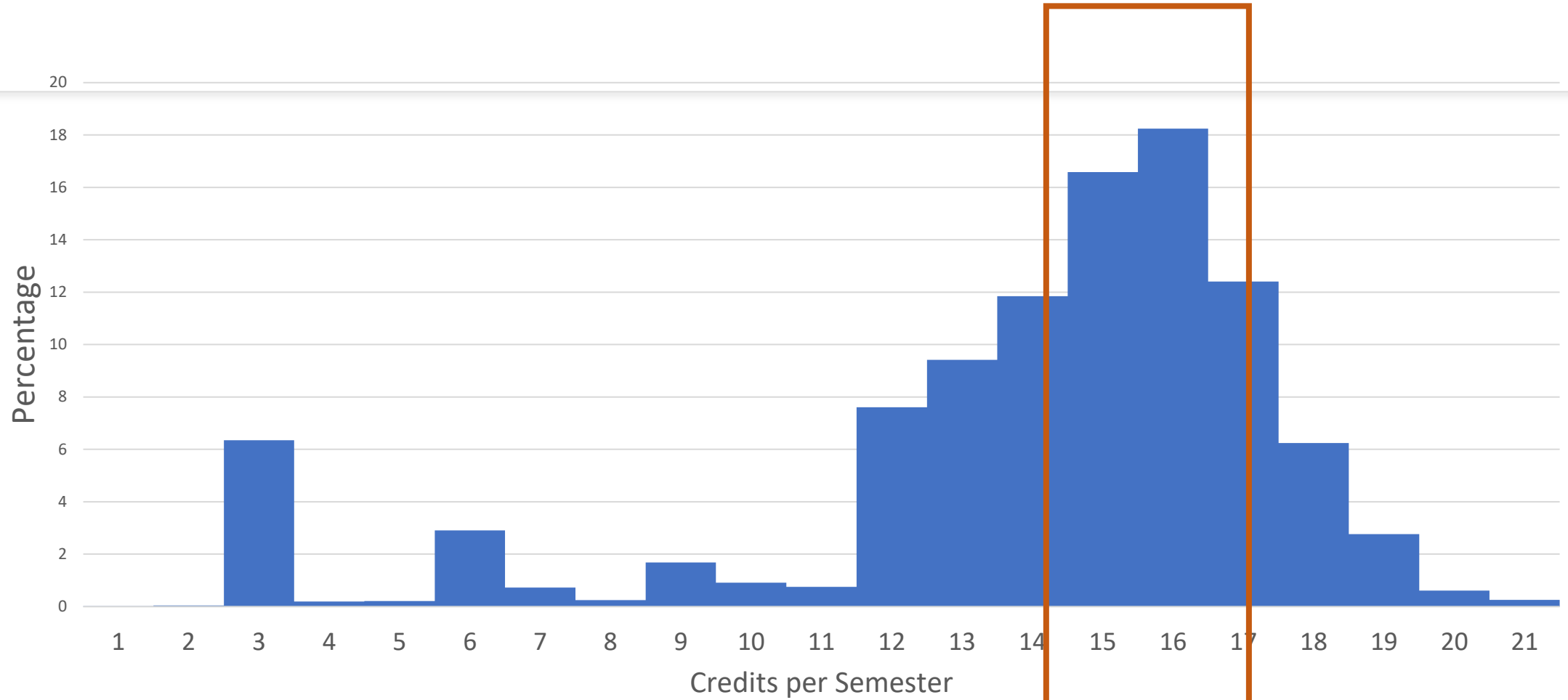


PERCENT OF STUDENT OBTAINING THE DEGREE ON-TIME (5 YEARS) OR IN OR LESS THAN 150% OF THE TIME (7.5 YEARS)
(80%-85% IN 7.5 YEARS OR LESS, 2%-3% IN 5 YEARS OR LESS)



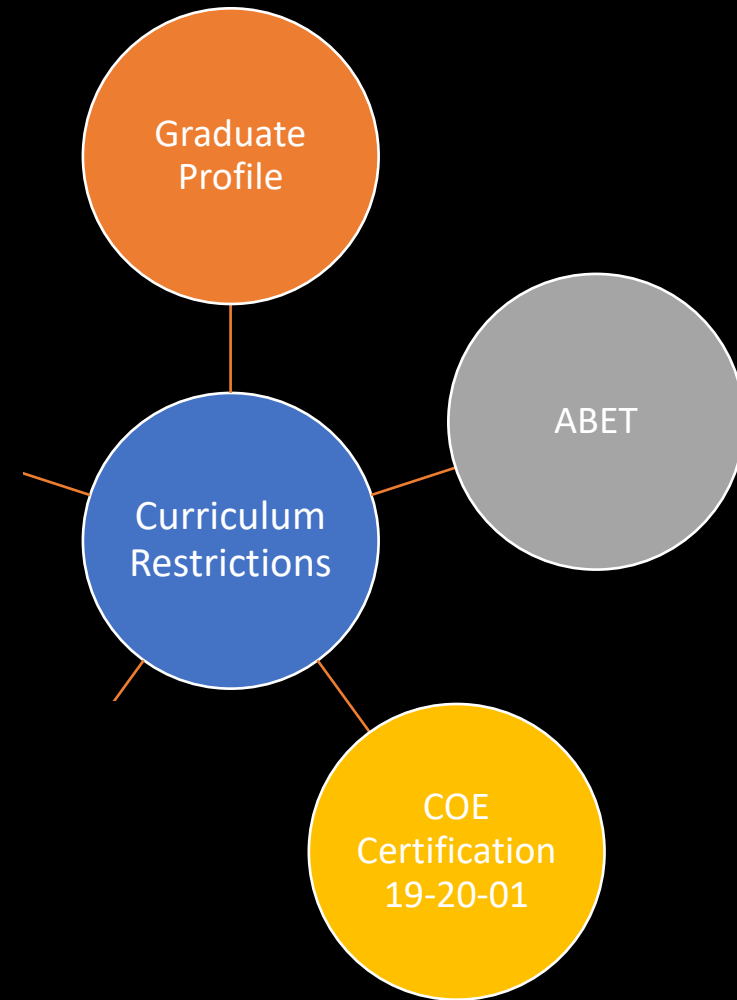
COST OF THE DEGREE FOR STUDENTS
(24-27 CREDIT HOURS: \$3,915 IN CREDITS, \$18K-\$22K IN LIVING EXPENSES)

Credits per Semester

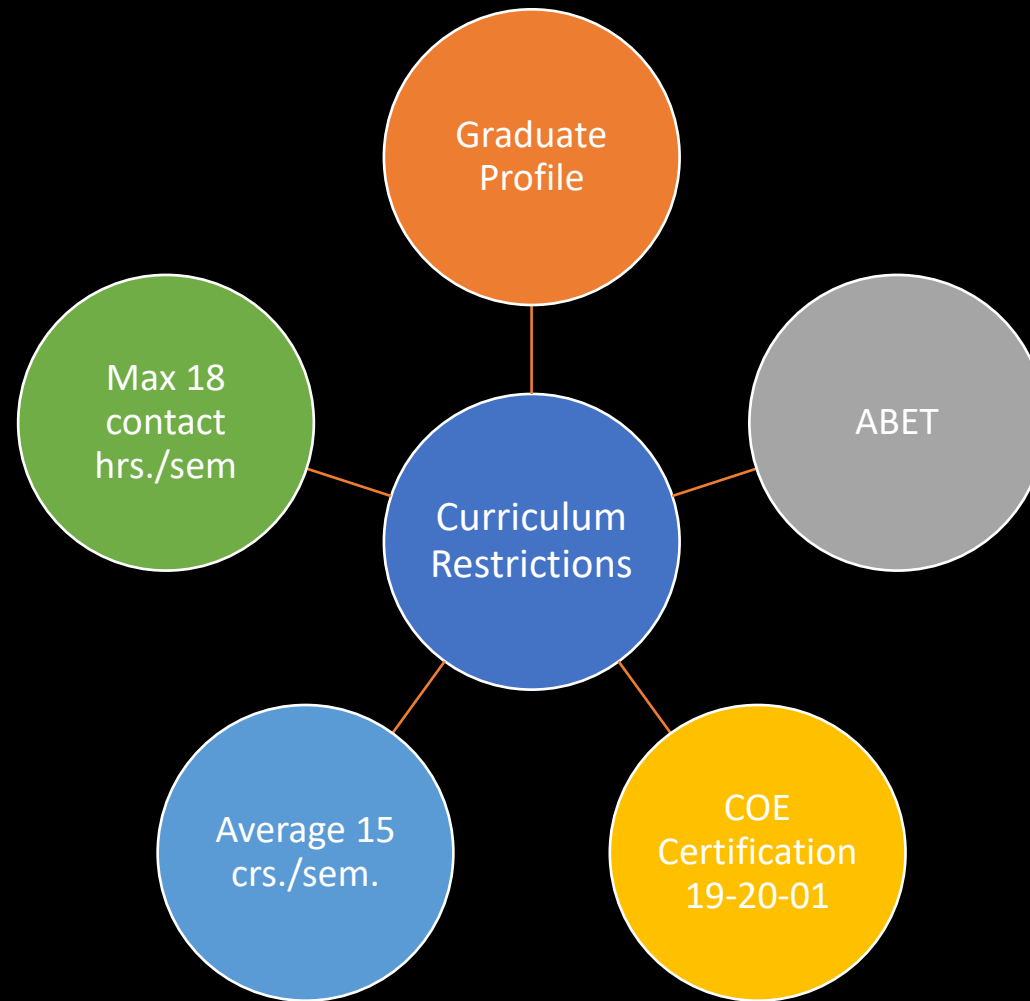


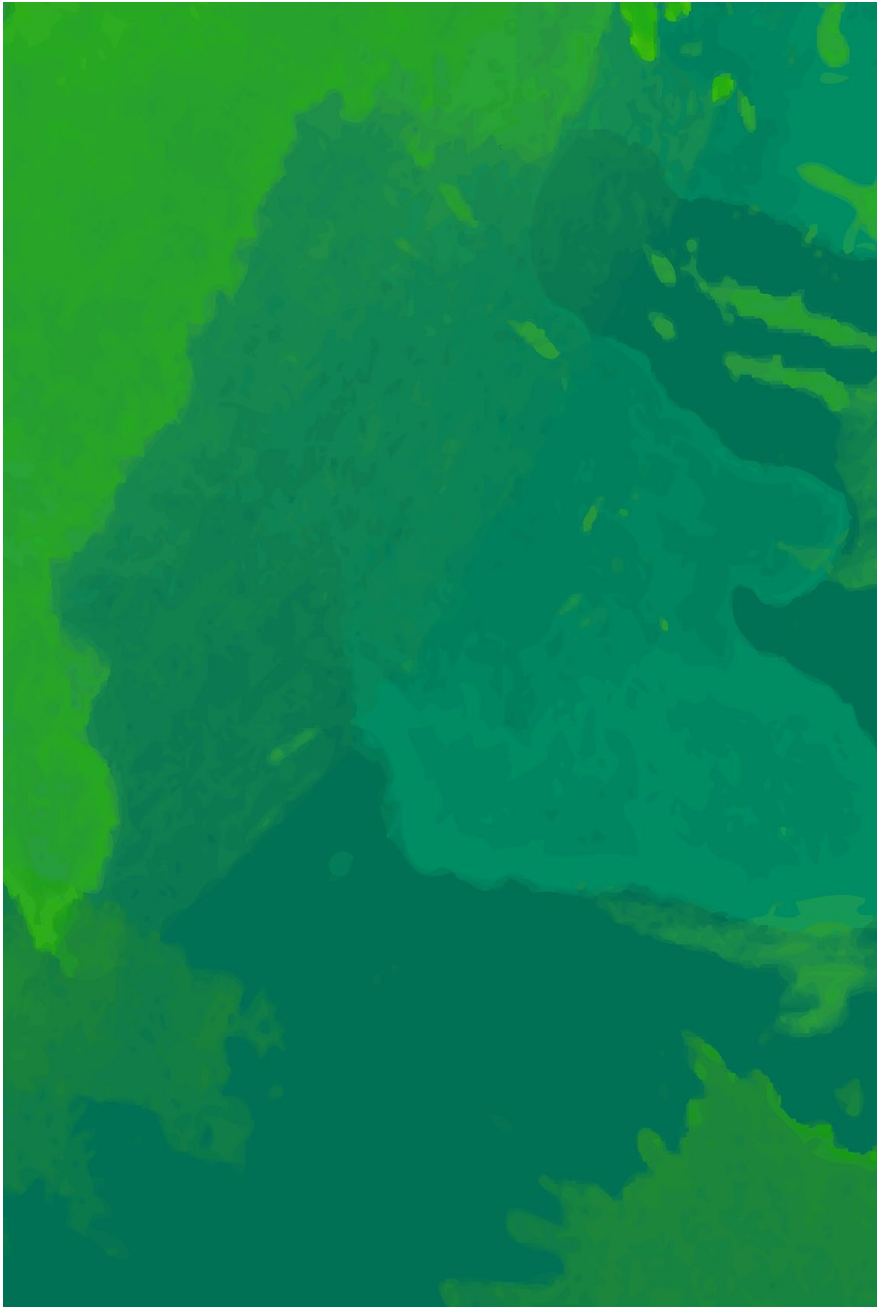
Data from academic years 2011-2021

Curriculum Hard Restrictions



Curriculum Restrictions Used in the Design





Changes per Area

Mathematics

No changes proposed



20 Credits total

Sciences

Chemistry

Eliminate QUIM 3132 General Chemistry II and QUIM 3134 General Chemistry Laboratory II, from the list of required courses

Chemistry

Current

QUIM 3131 + QUIM
3133 GENERAL
CHEMISTRY I + LAB



QUIM 3132 + QUIM
3134 GENERAL
CHEMISTRY II + LAB

Credits: 8

Proposed

QUIM 3131 + QUIM
3133 GENERAL
CHEMISTRY I + LAB

Credits: 4

Sciences

Physics
No change

Physics

Current

FISI 3171 + FISI
3173 PHYSICS I
+ LAB



FISI 3172 + FISI
3174 PHYSICS
II + LAB

Credits: 10

Proposed

FISI 3171 + FISI
3173 PHYSICS I
+ LAB



FISI 3172 + FISI
3174 PHYSICS
II + LAB

Credits: 10

Social sciences, humanities, behavioral sciences, and education

Decrease the number of required
electives in social sciences,
humanities, behavioral sciences,
and education to 6 credits (from
15), and increase the number of
required electives in ethics to 3
(from 0).

Electives

Electives in social
sciences, humanities,
behavioral sciences,
and education

Credits: 15

Current

Ethics

Elective in
ethics

Credits: 0

Proposed

Electives in social
sciences, humanities,
behavioral sciences,
and education

Credits: 6

Elective in
ethics

Credits: 3

Languages

Require students in the
“intermediate sequence” to have
at least 3 credits in INGL 3250
Public Speaking or INGL 3236
Technical Communication

Sequence

Proposed

Basic

Same

Intermediate

Require 3 credits from:

INGL 3250 Public Speaking

INGL 3236 Technical Communication

Advanced

Same

Credits: 12

Languages

Spanish
Additional options

Current

ESPA 3101:
Basic Spanish I



ESPA 3102:
Basic Spanish II

Credits: 6

Proposed

ESPA 3131:
Academic
Literacy I
or
ESPA 3101



ESPA 3132:
Academic
Literacy II
or
ESPA 3102

Credits: 6

Engineering Fundamentals

Divide engineering fundamental courses in 19 required credits and 6 elective credits. This reduces the credits in the area from a total of 37, to a total of 25.

General Idea

Move from a strict set of required courses to a smaller set of required courses and a list of elective courses

Engineering Fundamentals

Divide engineering fundamental courses in 19 required credits and 6 elective credits. This reduces the credits in the area from a total of 37, to a total of 25.

Current required courses kept as **required**

Course	Cr.
INGE 3011 ENGINEERING GRAPHICS I	2
INGE 3031 ENGINEERING MECHANICS STATICS	3
ININ 4010 PROBABILITY AND STATISTICS FOR ENGINEERS	3
ININ 4015 ENGINEERING ECONOMIC ANALYSIS	3
INGE 3016 ALGORITHMS AND COMPUTER PROGRAMMING OR CIIC 3015 INTRODUCTION TO COMPUTER PROGRAMMING I	3 - 4



Required



Elective
(pick 6
credits)

Engineering Fundamentals

Divide engineering fundamental courses in 19 required credits and 6 elective credits. This reduces the credits in the area from a total of 37, to a total of 25.

Current required
coursework kept as required,
but modified

Current Courses	Cr.
INEL 4075 FUNDAMENTALS OF ELECTRICAL ENGINEERING	3
INEL 4076 FUNDAMENTALS OF ELECTRONICS	3
INEL 4077 BASIC ELECTRONICS LABORATORY	1

Proposed Course	Cr.
INEL 4078 CIRCUITS AND ELECTRONICS	4



Required



Elective
(pick 6
credits)

Engineering Fundamentals

Divide engineering fundamental courses in 19 required credits and 6 elective credits. This reduces the credits in the area from a total of 37, to a total of 25.

Proposed required coursework summary



Required

Course	Cr.
INGE 3011 ENGINEERING GRAPHICS I	2
INGE 3031 ENGINEERING MECHANICS STATICS	3
ININ 4010 PROBABILITY AND STATISTICS FOR ENGINEERS	3
ININ 4015 ENGINEERING ECONOMIC ANALYSIS	3
INGE 3016 ALGORITHMS AND COMPUTER PROGRAMMING OR CIIC 3015 INTRODUCTION TO COMPUTER PROGRAMMING I	3 - 4
INEL 4078 CIRCUITS AND ELECTRONICS	4

Engineering Fundamentals

Divide engineering fundamental courses in 19 required credits and 6 elective credits. This reduces the credits in the area from a total of 37, to a total of 25.

Current required courses moved to elective course

Course	Cr.
INGE 3032 ENGINEERING MECHANICS DYNAMICS	3
INGE 4001 ENGINEERING MATERIALS	3
INGE 4011 MECHANICS OF MATERIALS I	3
INME 4045 GENERAL THERMODYNAMICS FOR ENGINEERS	3
INME 4055 MANUFACTURING PROCESSES	3
INME 4056 MANUFACTURING PROCESSES LABORATORY	1



Required



Elective
(pick 6
credits)

Engineering Fundamentals

Divide engineering fundamental courses in 19 required credits and 6 elective credits. This reduces the credits in the area from a total of 37, to a total of 25.

Courses not currently required and added to elective course list

Course

CIIC 3075 FUNDAMENTALS OF COMPUTING

CIIC 4010 ADVANCED PROGRAMMING

INGE 4019 INTRODUCTION TO MECHANICS OF MATERIALS (ALT. INGE 4011)

INGE 4015 FLUID MECHANICS

INGE 4035 NUMERICAL METHODS APPLIED TO ENGINEERING

INGE 5015 THEORY AND MANAGEMENT OF SYSTEMS

INME 4108 MATERIAL SCIENCE AND ENGINEERING (ALT. INGE 4001)

INME 4001 THERMODYNAMICS I (ALT. INME 4045)

INME 4065 PRODUCT DESIGN

INEL 4205 LOGIC CIRCUITS

INCI 4005 AGRICULTURAL SURVEYING



Required



Elective
(pick 6
credits)

Engineering Fundamentals

Divide engineering fundamental courses in 19 required credits and 6 elective credits. This reduces the credits in the area from a total of 37, to a total of 25.

Proposed elective course list, summary



Elective
(pick 6
credits)

Course

INGE 3032 ENGINEERING MECHANICS DYNAMICS

INGE 4001 ENGINEERING MATERIALS

INGE 4011 MECHANICS OF MATERIALS I

INME 4045 GENERAL THERMODYNAMICS FOR ENGINEERS

INME 4055 MANUFACTURING PROCESSES

INME 4056 MANUFACTURING PROCESSES LABORATORY

CIIC 3075 FUNDAMENTALS OF COMPUTING

CIIC 4010 ADVANCED PROGRAMMING

INGE 4019 INTRODUCTION TO MECHANICS OF MATERIALS (ALT. INGE 4011)

INGE 4015 FLUID MECHANICS

INGE 4035 NUMERICAL METHODS APPLIED TO ENGINEERING

INGE 5015 THEORY AND MANAGEMENT OF SYSTEMS

INME 4108 MATERIAL SCIENCE AND ENGINEERING (ALT. INGE 4001)

INME 4001 THERMODYNAMICS I (ALT. INME 4045)

INME 4065 PRODUCT DESIGN

INEL 4205 LOGIC CIRCUITS

INCI 4005 AGRICULTURAL SURVEYING

Engineering Specialty

Redistribution of topics in two subspecialty areas and addition of Capstone seminar course

Courses in Current Curriculum		
Course	Cr.	Hrs.
ININ 4077 Work Systems Design	4	5
ININ 4009 Work Measurement	4	5



Courses in Proposed Curriculum		
Course	Cr.	Hrs.
ININ 4071 Ergonomics and Human Factors in Work Systems Design	3	4
ININ 4072 Methods and Work Measurement	3	4

ABET Accreditation Criteria 2022-2023 > Industrial and Similarly Named Engineering Programs > Curriculum

“The curriculum must include the topical areas of productivity analysis, operations research, probability, statistics, engineering economy, and **human factors.**”

Engineering Specialty

Redistribution of topics in two subspecialty areas and addition of Capstone seminar course

Courses in Current Curriculum		
Course	Cr.	Hrs.
ININ 4150 Introduction to Models in Operations Research	4	4
ININ 4018 Discrete-Event System Simulation	3	3



Courses in Proposed Curriculum		
Course	Cr.	Hrs.
ININ 4021 Deterministic Models in Operations Research	3	3
ININ 5025 Queueing Systems and Simulation	4	4

OR – Related

Redistribution of areas.

Deterministic topics: ININ 4021

Stochastic topics: ININ 5025

Engineering Specialty

Redistribution of topics in two subspecialty areas and addition of Capstone seminar course

Courses in Current Curriculum			
Course		Cr.	Hrs.
ININ 4079 Design Project		3	3



Courses in Proposed Curriculum			
Course		Cr.	Hrs.
ININ 4999 Introduction to Design Project		1	1
ININ 4079 Design Project		3	3

Capstone – Related

A seminar course in preparation of Capstone Project will be required.
Purpose: Student preparation for a Capstone project (industry experience)

Physical Education, Kinesiology

No changes proposed

Courses in Proposed Curriculum

Course	Cr.
Physical education elective	2

Free Electives

No changes proposed

Courses in Proposed Curriculum

Course	Cr.
Free Electives	12

Microeconomy Requisite

Removed from required course

ECON 3021 not required, added to
elective in social sciences,
humanities, behavioral sciences and
economics elective

Cr. 3

FIRST YEAR

CURRENT First Semester

Δ	Number	Credits	Contact	Course
	* MATE 3005	5	5	Pre-Calculus
	QUIM 3131	3	3	General Chemistry I
	QUIM 3133	1	3	General Chemistry Laboratory I
	* INGL 3---	3	3	First year course in English
	* ESPA 3101	3	3	Basic course in Spanish I
	INGE 3011	2	4	Engineering Graphics I
		17	21	

Second Semester

Δ	Number	Credits	Contact	Course
	MATE 3031	4	4	Calculus I
II	QUIM 3132	3	3	General Chemistry II
II	QUIM 3134	1	3	General Chemistry Laboratory II
	* INGL 3---	3	3	First year course in English
	* ESPA 3102	3	3	Basic course in Spanish II
	** ELECTIVE	3	3	Socio-Humanistic Elective
	EDFI ----	1	1	Physical Education Elective
		18	20	

PROPOSED First Semester

Δ	Number	Credits	Contact	Course
	* MATE 3005	5	5	Pre-Calculus
II	QUIM 3131	3	3	General Chemistry I
II	QUIM 3133	1	3	General Chemistry Laboratory I
	* INGL 3---	3	3	First year course in English
	* ESPA 3131 or ESPA 3101	3	3	Academic Literacy I or Basic Spanish I
		15	17	

Second Semester

Δ	Number	Credits	Contact	Course
	MATE 3031	4	4	Calculus I
	INGE 3011	2	4	Engineering Graphics I
	* INGL 3---	3	3	First year course in English
	** ELECTIVE	3	3	Socio-Humanistic Elective
	* ESPA 3132 or ESPA 3102	3	3	Academic Literacy II or Basic Spanish II
		15	17	

SECOND YEAR

CURRENT First Semester

Δ	Number	Credits	Contact	Course
	MATE 3032	4	4	Calculus II
	FISI 3171	4	4	Physics I
	FISI 3173	1	2	Physics Laboratory I
	INGL 3---	3	3	Second year course in English
V	INGE 3016	3	3	Algorithms and Computer Programming
	INGE 3031	3	3	Engineering Mechanics-Static
		18	19	

Second Semester

Δ	Number	Credits	Contact	Course
	MATE 3063	3	3	Calculus III
	FISI 3172	4	4	Physics II
	FISI 3174	1	2	Physics Laboratory II
V	INGE 3032	3	3	Engineering Mechanics-Dynamics
	ININ 4010	3	4	Probability and Statistics for Engineers
V	INGE 4001	3	3	Engineering Materials
	EDFI ----	1	1	Physical Education Elective
		18	20	

PROPOSED First Semester

Δ	Number	Credits	Contact	Course
	MATE 3032	4	4	Calculus II
	FISI 3171	4	4	Physics I
	FISI 3173	1	2	Physics Laboratory I
V	CIIC 3015	4	5	Introduction to Computer Programming I
	INGL 3---	3	3	English Second Year or Elective
		16	18	

Second Semester

Δ	Number	Credits	Contact	Course
	MATE 3063	3	3	Calculus III
	FISI 3172	4	4	Physics II
	FISI 3174	1	2	Physics Laboratory II
	ININ 4010	3	4	Probability and Statistics for Engineers
	INGL 3---	3	3	English Second Year or Elective
	EDFI ----	1	1	Physical Education Elective
		15	17	

THIRD YEAR

CURRENT

First Semester

Δ	Number	Credits	Contact	Course
	MATE 4145	4	5	Linear Algebra and Differential Equations
	ININ 4020	3	3	Applied Industrial Statistics
VI	ININ 4077	4	5	Work Systems Design
V	INEL 4075	3	3	Fundamentals of Electrical Engineering
V	INME 4055	3	3	Manufacturing Processes
		17	19	

Second Semester

Δ	Number	Credits	Contact	Course
V	INME 4056	1	3	Manufacturing Processes Laboratory
V	INEL 4076	3	3	Fundamentals of Electronics
	ININ 4015	3	3	Engineering Economic Analysis
VI	ININ 4150	4	4	Introduction to Models in Operations Research
	INGL 3---	3	3	Second year course in English
VI	ININ 4009	4	5	Work Measurement
		18	21	

PROPOSED

First Semester

Δ	Number	Credits	Contact	Course
VI	ININ 4071	3	4	Ergonomics and Human Factors in Work Systems Design
	ININ 4020	3	3	Applied Industrial Statistics
	MATE 4145	4	5	Linear Algebra and Differential Equations
	INGE 3031	3	3	Engineering Mechanics Statics
	ININ 4015	3	3	Engineering Economic Analysis
		16	18	

Second Semester

Δ	Number	Credits	Contact	Course
VI	ININ 4021	3	3	Deterministic Models in Operations Research
VI	ININ 4072	3	4	Methods and Work Measurement
V	INEL 4078	4	5	Circuits and Electronics
	EDFI ----	1	1	Physical Education Elective
V ***	INGE/INME	3	3	Elective in General or Mechanical Engineering
		14	16	

FOURTH YEAR

CURRENT First Semester

Δ	Number	Credits	Contact	Course
V	INGE 4011	3	3	Mechanics of Materials I
V	INME 4045	3	3	General Thermodynamics for Engineer
V	INEL 4077	1	3	Basic Electronics Laboratory
IX	ECON 3021	3	3	Principles of Economics I
	ININ 4155	4	4	Design and Analysis of Production Systems and Inventory Management
	ININ 4087	4	4	Cost Management
		18	20	

Second Semester

Δ	Number	Credits	Contact	Course
VI	ININ 4018	3	3	Discrete-Event System Simulation
	ININ 4027	3	3	Design and Analysis of Engineering Experiments
	ININ 4040	3	4	Facilities Layout and Design
	ININ 4078	3	4	Statistical Quality Control
**	ELECTIVE	3	3	Socio-Humanistic Elective
		15	17	

PROPOSED First Semester

Δ	Number	Credits	Contact	Course
VI	ININ 5025	4	4	Queueing Systems and Simulation
	ININ 4155	4	4	Production and Inventory Management
	ININ 4078	3	4	Statistical Quality Control
	ININ ----	3	3	Industrial Engineering Elective
		14	15	

Second Semester

Δ	Number	Credits	Contact	Course
	ININ 4017	3	3	Computer-Based Information Systems
	ININ 4027	3	3	Design and Analysis of Engineering Experiments
	ININ 4040	3	4	Facilities Layout and Design
**	ELECTIVE	3	3	Socio-Humanistic Elective
VI	ININ 4999	1	1	Introduction to Design Project
	ELECTIVE	3	3	Free Elective
		16	17	

FIFTH YEAR

CURRENT First Semester

Δ	Number	Credits	Contact	Course
	ININ 4017	3	3	Computer-based Information Systems
	ININ 4057	3	4	Real Time Process Control
	ININ 4079	3	3	Design Project
	ININ ----	3	3	Industrial Engineering Elective
**	ELECTIVE	3	3	Socio-Humanistic Elective
	ELECTIVE	3	3	Free Elective
		18	19	

Second Semester

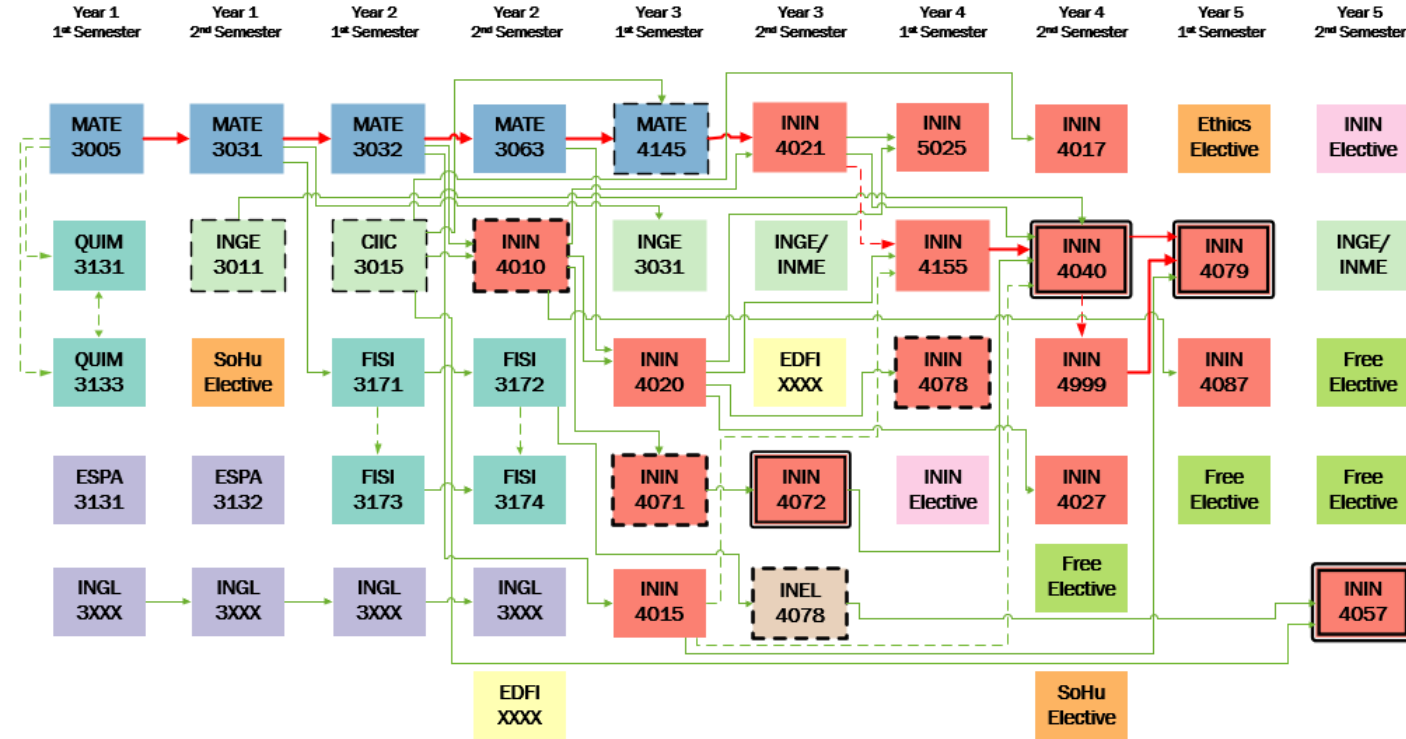
Δ	Number	Credits	Contact	Course
	ININ ----	3	3	Industrial Engineering Elective
III	** ELECTIVE	6	6	Socio-Humanistic Elective
	ELECTIVE	9	9	Free Electives
		18	18	

PROPOSED First Semester

Δ	Number	Credits	Contact	Course
	ININ 4079	3	3	Design Project
III	** ELECTIVE	3	3	Elective in Ethics
	ELECTIVE	3	3	Free Elective
	ININ 4087	4	4	Cost Management
		13	13	

Second Semester

Δ	Number	Credits	Contact	Course
	ININ 4057	3	4	Real Time Process Control
	ININ ----	3	3	Industrial Engineering Elective
V	*** INGE/INME	3	3	Elective in General or Mechanical Engineering
	ELECTIVE	3	3	Free Elective
	ELECTIVE	3	3	Free Elective
		15	16	



where: EDFI = elective in physical education, INEL = electrical engineering, INGE/INME = elective in general or mechanical engineering, ININ = industrial engineering, and SoHu = elective in social sciences and humanities.

LEGEND

- | | | | | | |
|--|--|--|---------------|--|---------------|
| ---> | Co-requisite | | EDFI | | ININ Elective |
| → | Pre-requisite | | Free Elective | | Languages |
| — | Critical Path | | INEL | | Math |
| | Courses with Integrated Lab. | | Engineering | | Sciences |
| | Courses with Integrated Lab. & Project | | ININ | | SoHu / Ethics |

An alternative math sequence is given by:

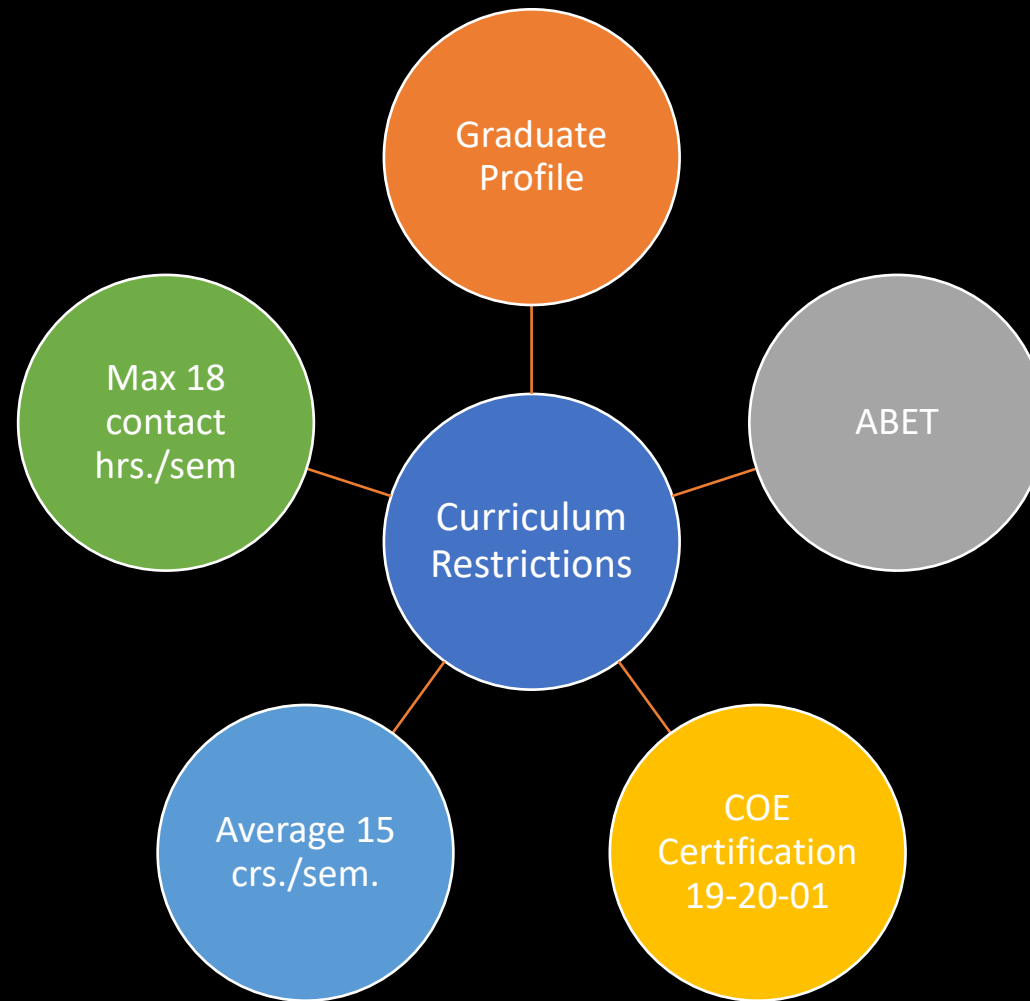
- MATE 3143 - MATE 3144 or
- MATE 3171 - MATE 3172 - MATE 3031

The elective in ethics must be selected from the following list: ADMI 3009, FILO 3155, FILO 3156, FILO 3178, FILO 3185, FILO 4025, FILO 4026, FILO 4027, FILO 4045, FILO 4046, FILO 4160, SOCI 3007, SOCI 3010, SOCI 4027, SOCI 4157, and SOCI 5015.

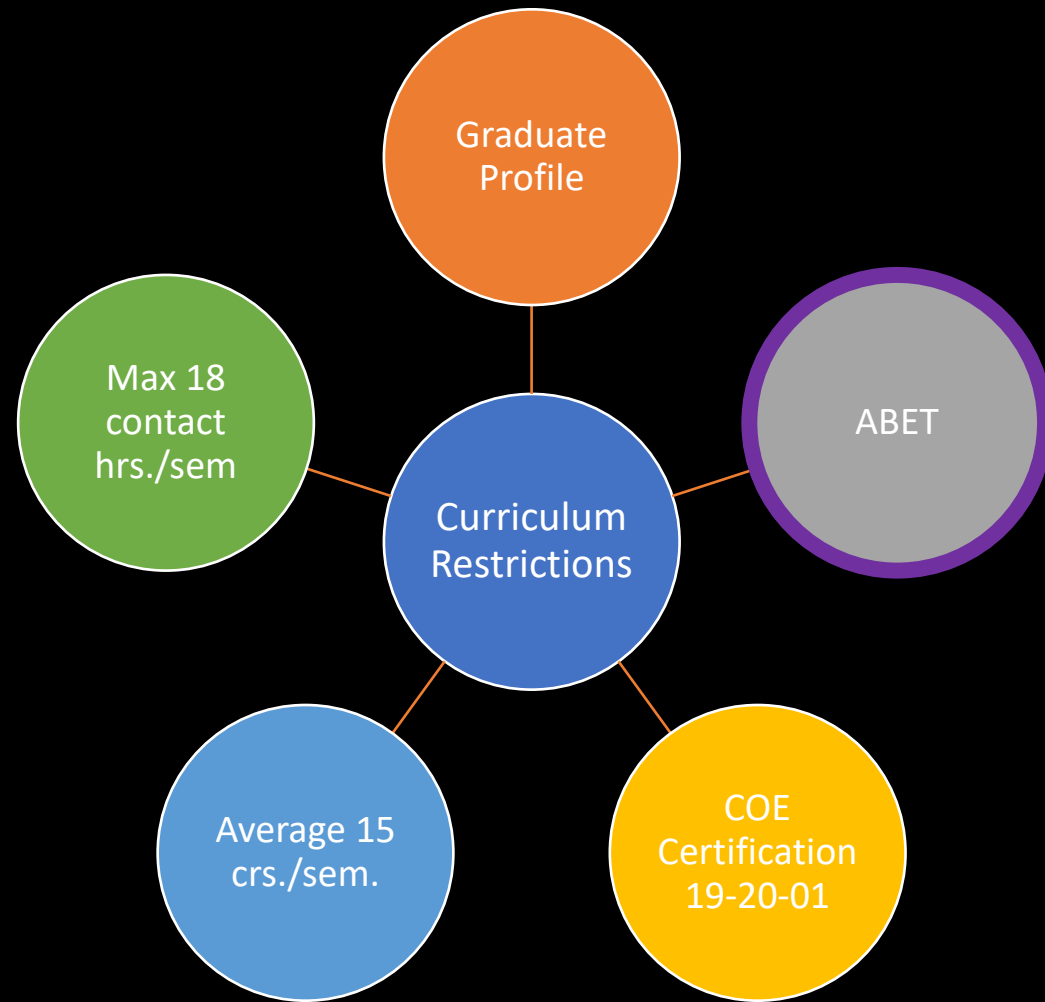
For a list of accepted electives in social sciences, behavioral sciences, education, economics, kinesiology, or the humanities (General Education), Refer to:
[https:// www.uprm.edu/engineering/academic-affairs/accepted-socio-humanistics-2/](https://www.uprm.edu/engineering/academic-affairs/accepted-socio-humanistics-2/)

Revision History		
Revision	Date	Change Description
➤ A	01/2023	

Curriculum Restrictions Used in the Design- Verification



Curriculum Restrictions Used in the Design- Verification

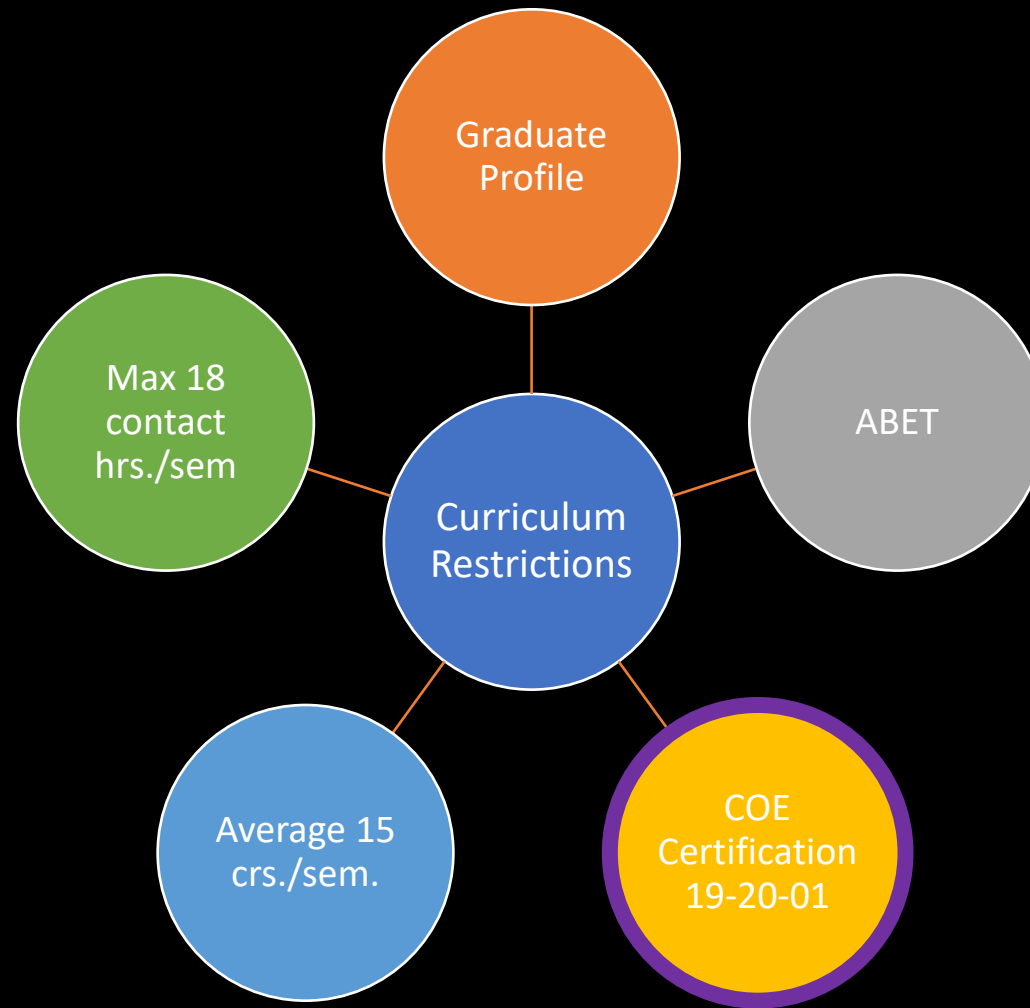


Accreditation ABET, Check

Criterion 5. Engineering Curriculum	Proposed	Credits	
a. a minimum of 30 semester credit hours (or equivalent) of a combination of college-level mathematics and basic sciences with experimental experience appropriate to the program.	MATE 3031; MATE 3032; MATE 3063; MATE 4145; ININ 4010; QUIM 3131; QUIM 3132; FIS1 3171; FIS1 3172; FIS1 3173; FIS1 3174	32	
b. a minimum of 45 semester credit hours (or equivalent) of engineering topics appropriate to the program, consisting of engineering and computer sciences and engineering design, and utilizing modern engineering tools.	INGE 3011; INGE 3016 OR CIIC 3015; INGE 3031; INEL 4078; ININ 4015; ENG. Electives (6)	22	67
	ININ 4017; ININ 4020; ININ 4021; ININ 5025; ININ 4027; ININ 4040; ININ 4057; ININ 4071; ININ 4072; ININ 4078; ININ 4087; ININ 4155; ELECTIVES (6)	45	
c. a broad education component that complements the technical content of the curriculum and is consistent with the program educational objectives.	Social sciences and humanities electives (9); Free electives (12); Phy. Edu. (2); Languages (18)	41	
d. a culminating major engineering design experience that 1) incorporates appropriate engineering standards and multiple constraints, and 2) is based on the knowledge and skills acquired in earlier course work.	ININ 4079; ININ 4999	4	

IE Curriculum	
The curriculum must include design, analysis, operation and improvement of integrated systems that produce or supply products or services in an effective, efficient, sustainable and socially responsible manner.	ININ 4071, ININ 4072, ININ 4155, ININ 4040, ININ 5025, ININ 4078, ININ 4079
The curriculum must utilize real-world experiences and business perspectives.	ININ 4040, ININ 5025, ININ 4079
The curriculum must include the topical areas of	
productivity analysis	ININ 4155
operations research	ININ 4021, ININ 5025
probability	ININ 4010
statistics	ININ 4010, ININ 4020
engineering economy	ININ 4015
human factors	ININ 4071

Curriculum Restrictions Used in the Design- Verification



“Parámetros comunes”

Hoja de Cotejo (CERTIFICACION NÚMERO 19-20-01) de Parámetros Comunes para los Programas Académicos del Colegio de Ingeniería

Programa académico bajo consideración: Bachillerato en Ciencias en Ingeniería Industrial (0503)

Evaluación de Cursos y Horas Crédito del Currículo Propuesto		
Codificación y Título de Cursos en Ciencias Básicas	Créditos	Tipo ⁴ (R,E)
QUIM 3131: General Chemistry I	3	R
QUIM 3133: General Chemistry Laboratory I	1	R
FISI 3171: Physics I	4	R
FISI 3172: Physics II	1	R
FISI 3173: Physics Laboratory I	4	R
FISI 3174: Physics Laboratory II	1	R
Total de Horas Crédito para Cursos en Ciencias Básicas	14	
Codificación y Título de Cursos de Matemáticas	Créditos	Tipo (R,E)
MATE 3005: Pre-Calculus	5	R
MATE 3031: Calculus I	4	R
MATE 3032: Calculus II	4	R
MATE 3063: Calculus III	3	R
MATE 4145: Differential Equations & Linear Algebra	4	R
Total de Horas Crédito para Cursos de Matemáticas	20	
Codificación y Título de Cursos de Áreas Temáticas	Créditos	Tipo (R,E)
Probabilidad y estadísticas	ININ 4010	3 R
Economía ingenieril	ININ 4015	3 R
Diseño creativo, visualización o gráficas en diseño ingenieril	INGE 3011	2 R
Algoritmos y programación de computadoras	INGE 3016 o CIIC 3015	3 - 4 R
Total de Horas Crédito para Cursos de Áreas Temáticas	11-12	
Cursos relacionados a las ciencias sociales, ciencias de la conducta, educación, economía, kinesiología o las humanidades (Educación General)	Créditos	Tipo (R,E)
Ciencias Sociales, Humanidades y Filosofía	6	E
Educación Física	2	R
Idiomas	18	R
Electivas libre	12	E
Total de Horas Crédito para Cursos de Educación General	26	
Total de Horas Crédito para Cursos de Electivas Libres	12	
Codificación y Título de Cursos en el tema de ética	Créditos	Tipo (R,E)
La lista de cursos para satisfacer los créditos de ética está disponible en el siguiente enlace:	3	R

“Parámetros comunes”

Hoja de Cotejo (CERTIFICACION NÚMERO 19-20-01) de Parámetros Comunes para los Programas Académicos del Colegio de Ingeniería

Programa académico bajo consideración: Bachillerato en Ciencias en Ingeniería Industrial (0503)

Evaluación de Cursos y Horas Crédito del Currículo Propuesto			
Codificación y Título de Cursos en Ciencias Básicas		Créditos	Tipo ¹ (R,E)
QUIM 3131: General Chemistry I		3	R
QUIM 3133: General Chemistry Laboratory I		1	R
FISI 3171: Physics I		4	R
FISI 3172: Physics II		1	R
FISI 3173: Physics Laboratory I		4	R
FISI 3174: Physics Laboratory II		1	R
Total de Horas Crédito para Cursos en Ciencias Básicas		14	
Codificación y Título de Cursos de Matemáticas		Créditos	Tipo (R,E)
MATE 3005: Pre-Calculus		5	R
MATE 3031: Calculus I		4	R
MATE 3032: Calculus II		4	R
MATE 3063: Calculus III		3	R
MATE 4145: Differential Equations & Linear Algebra		4	R
Total de Horas Crédito para Cursos de Matemáticas		20	
Codificación y Título de Cursos de Áreas Temáticas		Créditos	Tipo (R,E)
Probabilidad y estadísticas	ININ 4010	3	R
Economía ingenieril	ININ 4015	3	R
Diseño creativo, visualización o gráficas en diseño ingenieril	INGE 3011	2	R
Algoritmos y programación de computadoras	INGE 3016 o CIIC 3015	3 - 4	R
Total de Horas Crédito para Cursos de Áreas Temáticas		11-12	
Cursos relacionados a las ciencias sociales, ciencias de la conducta, educación, economía, kinesiólogía o las humanidades (Educación General)		Créditos	Tipo (R,E)
Ciencias Sociales, Humanidades y Filosofía		6	E
Educación Física		2	R
Idiomas		18	R
Electivas libre		12	E
Total de Horas Crédito para Cursos de Educación General		26	
Total de Horas Crédito para Cursos de Electivas Libres		12	
Codificación y Título de Cursos en el tema de ética		Créditos	Tipo (R,E)
La lista de cursos para satisfacer los créditos de ética está disponible en el siguiente enlace:		3	R

“Parámetros comunes”

https://www.uprm.edu/engineering/accepted-ethics-courses-faculty-of-engineering/		
Total de Horas Crédito para Cursos de Ética	3	
Codificación y Título de Cursos en la ruta crítica (acompañe anejo)	Créditos	Año/ Semestre
MATE 3005: Pre-Calculus	5	1er/1er
MATE 3031: Calculus I	4	1er/2ndo
MATE 3032: Calculus II	4	2ndo/1er
MATE 3063: Calculus III	3	2ndo/2ndo
MATE 4145: Linear Algebra and Differential Equations	4	3er/1er
ININ 4021: Deterministic Models in Operations Research	3	3er/2ndo
ININ 4155: Production and Inventory Management	4	4to/1er
ININ 4040: Facilities Layout and Design	4	4to/2ndo
ININ 4999: Intro to Design Project	1	4to/2ndo
ININ 4079: Design Project	3	5to/1er
Total de Cursos en la Secuencia de la(s) Ruta(s) Crítica(s)	10	
Cotejo de elementos incluidos en la propuesta de revisión curricular		
Indique si la propuesta de revisión curricular incluye cada uno de los siguientes elementos:	Sí	No
▪ Ruta crítica de los cursos correspondientes al programa de estudio	✓	
▪ Un curso de Experiencia Capstone	✓	
▪ Un total de al menos 12 horas-crédito para cursos de áreas temáticas	✓	
▪ La secuencia de cursos de matemáticas comienza con Cálculo I, en el segundo semestre del primer año de estudios (sugerido).	✓	
▪ El programa cumple con el parámetro mínimo (24 horas-crédito para programas de agrimensura y topografía o 30 horas-crédito para programas de ingeniería) en destrezas cuantitativas en matemáticas y ciencias básicas.	✓	
▪ La revisión curricular requiere modificaciones de cursos o creación de cursos nuevos en su departamento. Si aplica, incluya una tabla con la codificación, título y créditos de estos cursos.	✓	
▪ La revisión curricular requiere modificaciones de cursos o creación de cursos nuevos de otros departamentos (Eg. INGE, MATE, QUIM). Si aplica, incluya una tabla con la codificación, título y créditos de estos cursos.	✓	
▪ Un total de al menos 6 horas-crédito en cursos relacionados a las ciencias sociales, ciencias de la conducta, educación, economía o las humanidades.	✓	

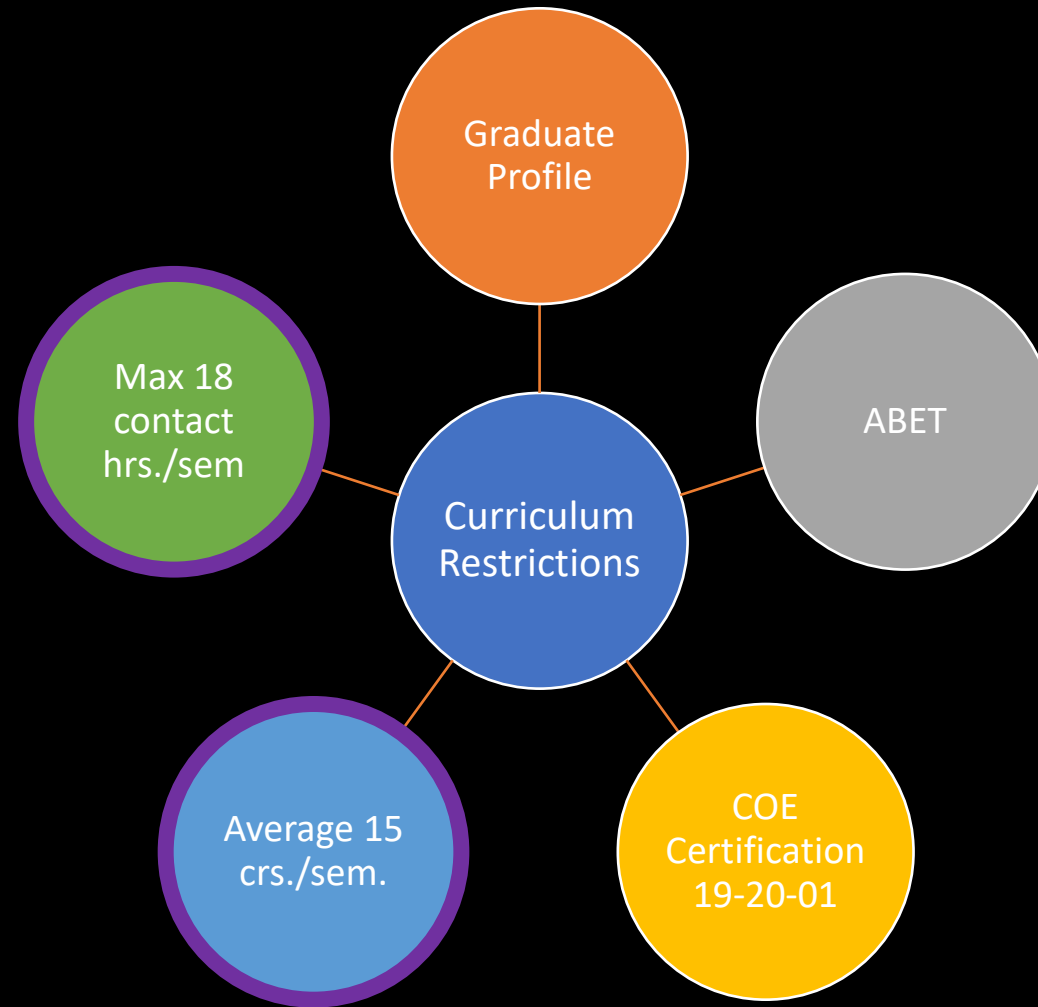
“Parámetros communes”

Colegio de Ingeniería
Comité de Asuntos Académicos
Call Box 9000, Mayagüez, PR 00681-9000
<https://www.uprm.edu/engineering/>

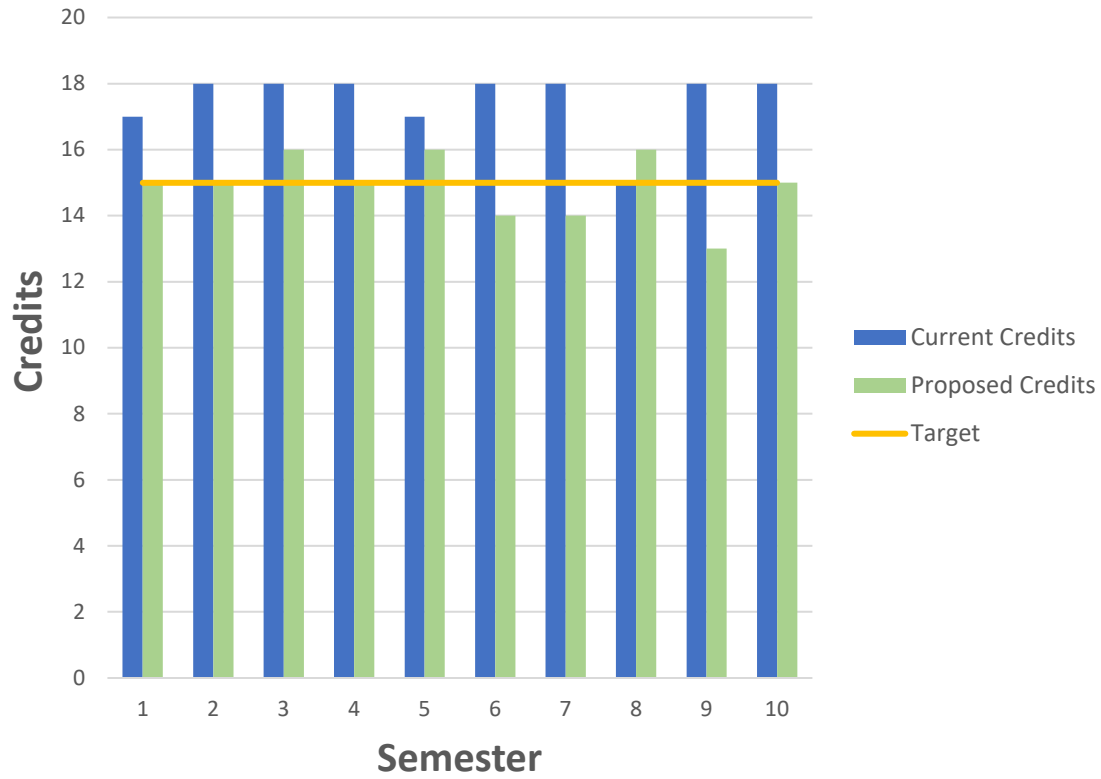


<ul style="list-style-type: none">▪ Un total de al menos 3 horas-crédito adicionales del mínimo de cursos establecido anteriormente en un curso en el tema de la ética, a seleccionarse del siguiente enlace: https://www.uprm.edu/engineering/accepted-ethics-courses-faculty-of-engineering/ <p>*La lista de cursos se irá modificando según se actualice la lista de cursos electivos en ética para la Facultad de Ingeniería.</p>	✓	
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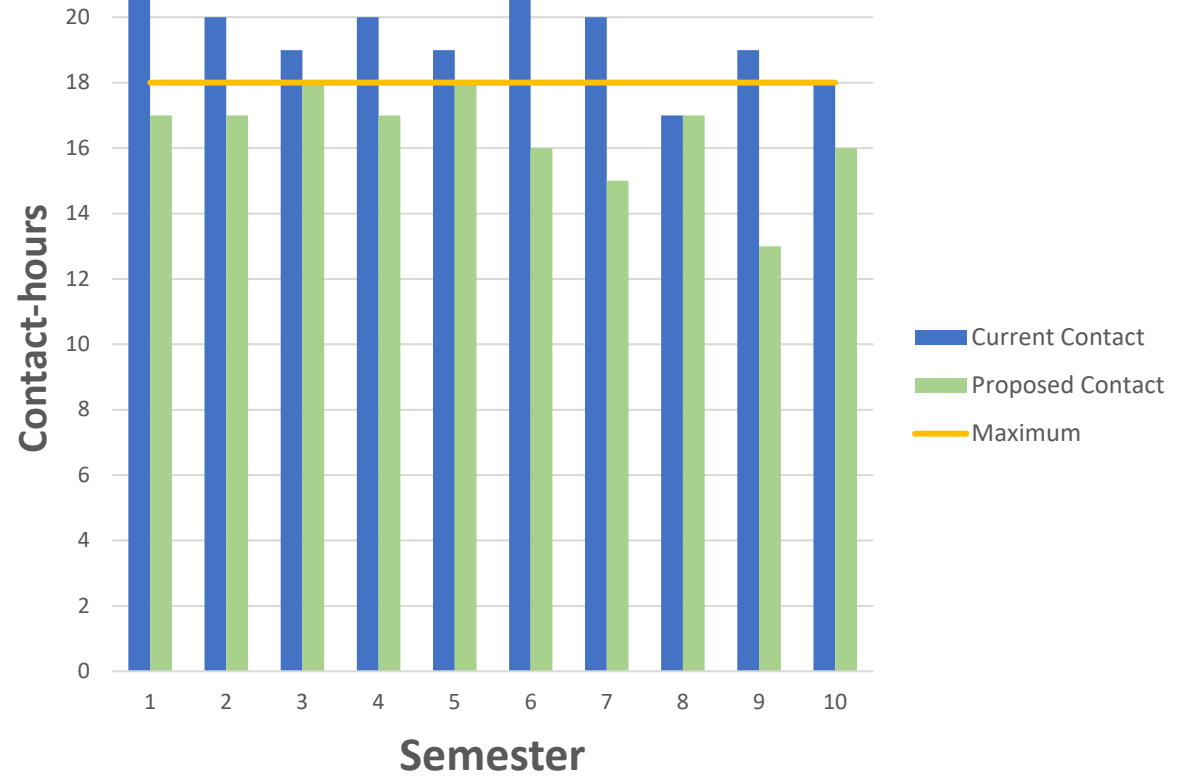
Curriculum Restrictions Used in the Design- Verification



Credits per Semester



Contact-Hours per Semester



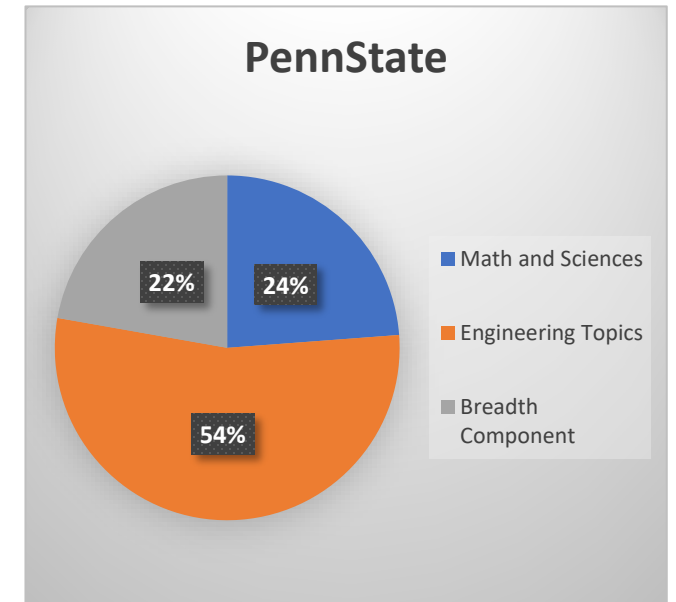
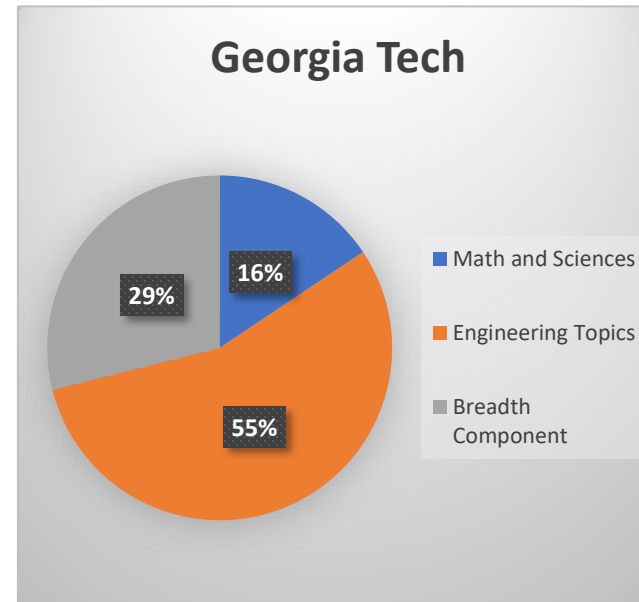
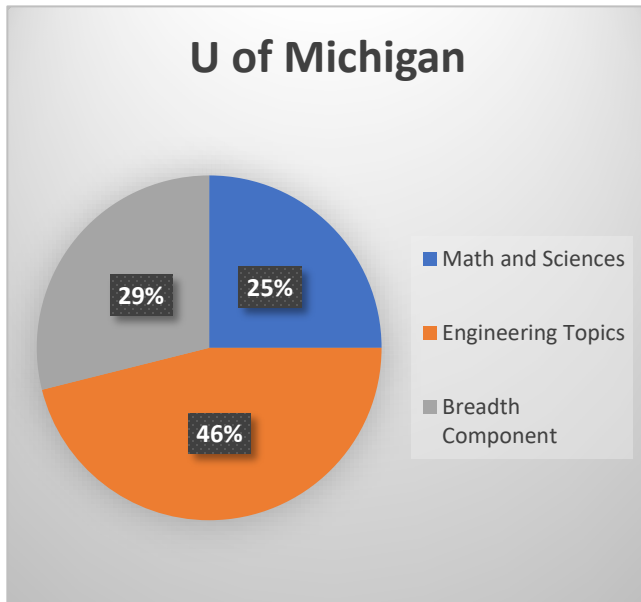
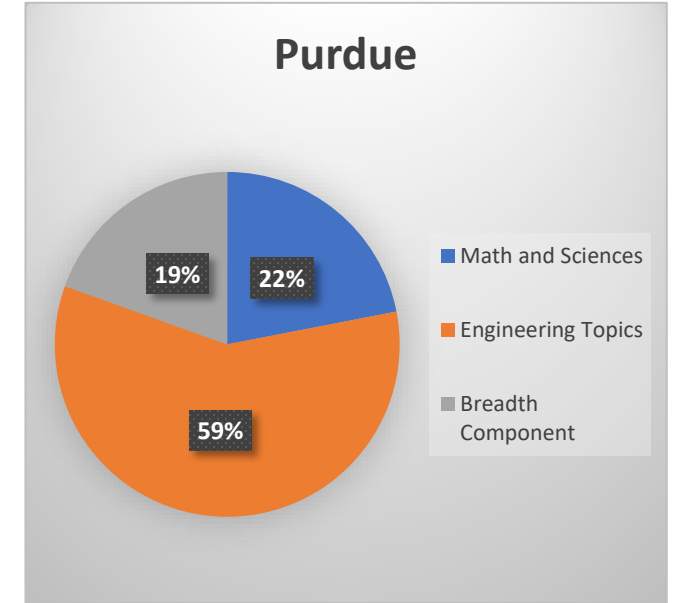
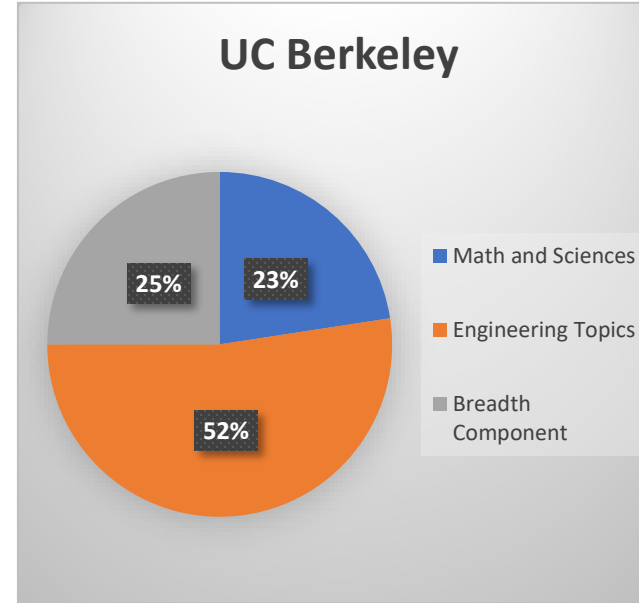
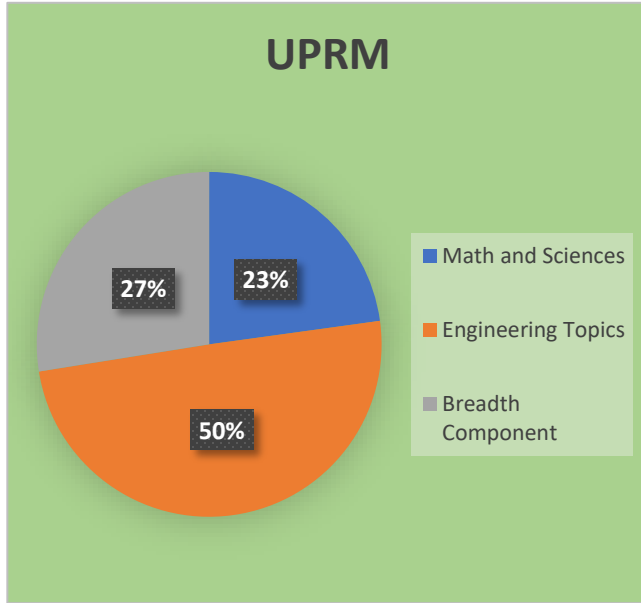
Benchmark

Requisitos	Propues to UPRM	UC Berkeley	Purdue	Georgia Tech	U of Michigan	Penn State
Matemática de Nivel Universitario y Ciencias Básicas						
Math	20	16	18	12	16	15
Física	10	8	6	8	8	8
Química	4	4	3	0	8	4
Otra	0	0	0	0	0	3
Sub-Total	34	28	27	20	32	30
Temas de Ingeniería						
Temas de Ingeniería Fundamentales	25	20	32	26	18	29
Temas de Concentración en Ingeniería Industrial	45	41	36	41	37	36
Capstone	4	4	4	4	4	3
Sub-Total	74	65	72	71	59	68
Componente Educacional Amplio						
Libres	12	12	0	11	0	0
Profesionales fuera de concentración	0	0	0	0	13	1
Kinesiología	2	0	0	2	0	3
Sociohumanísticas (incluyendo lenguaje)	27	19	24	24	24	27
Sub-Total	41	31	24	37	37	31
Total	149	124	123	128	128	129

Credits Allocation

Benchmark

Percentage distribution per area



FE Industrial and Systems Exam knowledge areas covered by required coursework, NCEES

Knowledge	No. of Questions	Covered in the required coursework	
		Current Curriculum	Proposed Curriculum
1. Mathematics	6-9		
A. Analytic geometry (e.g., areas, volumes)		Fully	Fully
B. Calculus (e.g., derivatives, integrals, progressions, series)		Fully	Fully
C. Linear algebra (e.g., matrix operations, vector analysis)		Fully	Fully
2. Engineering Sciences	4-6		
A. Thermodynamics and fluid mechanics		Not covered	Not covered
B. Statics, dynamics, and materials		Fully	Partially
C. Electricity and electrical circuits		Fully	Fully
3. Ethics and Professional Practice	4-6		
A. Codes of ethics and licensure		Partially	Fully
B. Agreements and contracts		Not covered	Not covered
C. Professional, ethical, and legal responsibility		Partially	Fully
D. Public protection and regulatory issues		Partially	Partially

FE Industrial and Systems Exam knowledge areas covered by required coursework, NCEES

Knowledge	No. of Questions	Covered in the required coursework	
		Current Curriculum	Proposed Curriculum
4. Engineering Economics	9-14		
A. Discounted cash flows (e.g., nonannual compounding, time value of money)		Fully	Fully
B. Evaluation of alternatives (e.g., PW, EAC, FW, IRR, benefit-cost)		Fully	Fully
C. Cost analyses (e.g., fixed/variable, break-even, estimating, overhead, inflation, incremental, sunk, replacement)		Fully	Fully
D. Depreciation and taxes (e.g., MACRS, straight line, after-tax cash flow, recapture)		Fully	Fully
5. Probability and Statistics	10-15		
A. Probabilities (e.g., permutations and combinations, sets, laws of probability)		Fully	Fully
B. Probability distributions and functions (e.g., types, statistics, central limit theorem, expected value, linear combinations)		Fully	Fully
C. Estimation, confidence intervals, and hypothesis testing (e.g., normal, t, chi-square, types of error, sample size)		Fully	Fully
D. Linear regression (e.g., parameter estimation, residual analysis, correlation)		Fully	Fully
E. Design of experiments (e.g., ANOVA, factorial designs)		Fully	Fully

FE Industrial and Systems Exam knowledge areas covered by required coursework, NCEES

Knowledge	No. of Questions	Covered in the required coursework	
		Current Curriculum	Proposed Curriculum
6. Modeling and Quantitative Analysis	9-14		
A. Data, logic development, and analytics (e.g., databases, flowcharts, algorithms, data science techniques)		Fully	Fully
B. Linear programming and optimization (e.g., formulation, solution, interpretation)		Fully	Fully
C. Stochastic models and simulation (e.g., queuing, Markov processes, inverse probability functions)		Fully	Fully
7. Engineering Management	8-12		
A. Principles and tools (e.g., planning, organizing, motivational theory, organizational structure)		Partially	Partially
B. Project management (e.g., WBS, scheduling, PERT, CPM, earned value, agile)		Partially	Partially
C. Performance measurement (e.g., KPIs, productivity, wage scales, balance scorecard, customer satisfaction)		Partially	Partially
D. Decision making and risk (e.g., uncertainty, utility, decision trees, financial risk)		Not covered	Not covered

FE Industrial and Systems Exam knowledge areas covered by required coursework, NCEES

Knowledge	No. of Questions	Covered in the required coursework	
		Current Curriculum	Proposed Curriculum
8. Manufacturing, Service, and Other Production Systems	9-14		
A. Manufacturing processes (e.g., machining, casting, welding, forming, dimensioning, new technologies)		Fully	Not covered
B. Manufacturing and service systems (e.g., throughput, measurement, automation, line balancing, energy management)		Fully	Fully
C. Forecasting (e.g., moving average, exponential smoothing, tracking signals)		Fully	Fully
9. Facilities and Supply Chain	9-14		
A. Flow, layout, and location analysis (e.g., from/to charts, layout types, distance metrics)		Fully	Fully
B. Capacity analysis (e.g., number of machines and people, trade-offs, material handling)		Fully	Fully
C. Supply chain management and design (e.g., pooling, transportation, network design, single-level/multilevel distribution models)		Fully	Fully

FE Industrial and Systems Exam knowledge areas covered by required coursework, NCEES

Knowledge	No. of Questions	Covered in the required coursework	
		Current Curriculum	Proposed Curriculum
10. Human Factors, Ergonomics, and Safety	8-12		
A. Human factors (e.g., displays, controls, usability, cognitive engineering)		Partially	Fully
B. Safety and industrial hygiene (e.g., workplace hazards, safety programs, regulations, environmental hazards)		Not covered	Not covered
C. Ergonomics (e.g., biomechanics, cumulative trauma disorders, anthropometry, workplace design, macroergonomics)		Fully	Fully
11. Work Design	7-11		
A. Methods analysis (e.g., charting, workstation design, motion economy)		Fully	Fully
B. Work measurement (e.g., time study, predetermined time systems, work sampling, standards)		Fully	Fully
C. Learning curves		Fully	Fully
12. Quality	9-14		
A. Quality management, planning, assurance, and systems (e.g., Six Sigma, QFD, TQM, house of quality, fishbone, Taguchi loss function)		Fully	Fully
B. Quality control (e.g., control charts, process capability, sampling plans, OC curves, DOE)		Fully	Fully

FE Industrial and Systems Exam knowledge areas covered by required coursework, NCEES

		Covered in the required coursework	
Knowledge	No. of Questions	Current Curriculum	Proposed Curriculum
		13. Systems Engineering, Analysis, and Design	8-12
A. Requirements analysis and system design		Fully	Fully
B. Functional analysis and configuration management		Partially	Partially
C. Risk management (e.g., FMEA, fault trees, uncertainty)		Not covered	Not covered
D. Life-cycle engineering		Not covered	Not covered
E. Reliability engineering (e.g., MTTF, MTBR, availability, parallel and series failure)		Partially	Partially