# Systems Engineering: Minor Courses Selection Guideline

**1. General Guideline**

Systems Engineering requires an **engineering minor** or **thematic minor**.

Students must complete 18 ___unique units___ to satisfy this requirement.  This means…

- If you complete a minor that shares coursework with your major (ex. ECE 175 applies to the major and the ECE minor), you must take an additional technical elective units to reach 18 total units not used anywhere else in the major.
    - The additional technical electives can be SIE electives, upper level math (if you are completing a math minor), or chosen from coursework in any of the approved engineering minors listed below.
    - 3 units of internship, SIE 493 or SIE 496, may also apply to minor units with pre-approval from your faculty advisor.

The 18 units of minor coursework must meet the following course levels:

| Systems Engineering |
| :---: |
| No more than 9 units 200-level<br>A minimum of 9 units 300/400-level |

You can choose a minor from the following approved minors, Except for the Thematic Minor (See Note 3 at the end of the list) that you have to consult with faculty advisor, our department has approved all of these minors and you do not need to get an approval from your faculty advisor. If you like to choose a minor that is not listed in this list, please contact the faculty advisor at the end of this document for suggestions and approval.

| Minor | Link to minor requirements |
| --- | --- |
| Aerospace Engineering | http://aprr.web.arizona.edu/data-minors/174/UGRD.AEEMINU.pdf |
| Biosystems Engineering | http://aprr.web.arizona.edu/data-minors/174/UGRD.BEMINU.pdf |
| Chemical Engineering | http://aprr.web.arizona.edu/data-minors/174/UGRD.CHEMINU.pdf |
| Civil Engineering | http://aprr.web.arizona.edu/data-minors/174/UGRD.CVEMINU.pdf |
| Computer Science | http://aprr.web.arizona.edu/data-minors/174/UGRD.COSCMINU.pdf |
| Electrical and Computer Engineering | http://aprr.web.arizona.edu/data-minors/174/UGRD.ECEMINU.pdf |
| Engineering Management (Systems majors only) | See "SIE Minor Requirements for SIE majors" below |

| Industrial Engineering | See "SIE Minor Requirements for SIE majors" below |
| --- | --- |
| Materials Science Engineering | http://aprr.web.arizona.edu/data-minors/174/UGRD.MSEMINU.pdf |
| Mechanical Engineering | http://aprr.web.arizona.edu/data-minors/174/UGRD.MEEMINU.pdf |
| Mining Engineering | http://aprr.web.arizona.edu/data-minors/174/UGRD.MNEMINU.pdf |
| Optical Sciences and Engineering | http://aprr.web.arizona.edu/data-minors/174/UGRD.OSEMINU.pdf |
| Software Engineering | See "Software Engineering Requirements for SIE majors" below |
| Systems Engineering (Engr Mgmt majors only) | See "SIE Minor Requirements for SIE majors" below |
| Thematic Minor [3] | https://www.registrar.arizona.edu/academics/thematic-minors |

Note 1: Some minors may require more than 18 units

Note 2: In case some web links are not working, please consult with Mildred Curran in our department.

Note 3: You may choose a **thematic minor** in consultation with your faculty advisor, Dr. Jian Liu. The thematic minor must consist of coursework from two or more engineering disciplines, meet the required course levels, and should be developed around a central and unified theme (e.g., Cybersecurity, Data Analytics, Biomedical, Construction Management, etc.).

## 2. How to Declare your Minor

Once you have decided on a minor, please follow instructions in the table below to officially declare it.

| Minor | How to declare |
| --- | --- |
| All Engineering Minors | Complete the online form here: http://engineering.arizona.edu/academic-policies/declare-minor |
| Computer Science Minor | Complete info session and online form here: https://www.cs.arizona.edu/minor-cs |
| Thematic Minor | Complete this form: https://www.registrar.arizona.edu/sites/registrar.arizona.edu/files/forms/Thematic%20Minor%20Form%203-17.pdf <br> Obtain faculty advisor signature and return to SIE Advisor for processing |

## 3. SIE Minor Requirements for SIE majors

If you would like to complete one of the SIE minors (Engineering Management or Industrial Engineering), *we do not allow double use of coursework between your major and minor*. As a result of this departmental policy, the SIE minor requirements are slightly different for students pursuing a major in SIE. Please follow one of following options A1 or A2 to choose courses.

## 4. Faculty Advisor

If you need help choosing your minor, making minor course selections or need thematic minor OR SIE 493 approval, please contact the faculty advisor for Systems Engineering:

**Professor Alejandro Salado**
**Office:** ENGR 268
**Email:** alejandrosalado@arizona.edu
**Phone:** 520.626.0728

**Option A1. If you are System Engineering Major, you can choose <u>Industrial Engineering Minor</u>**

| Industrial Engineering minor, if you are a Systems Engineering major… | | | |
|---|---|---|---|
| **Course #** | **Title** | **Prerequisite Adv Stand in Engineering +** | **Typically offered** |
| **Choose 6 courses from:** | | | |
| SIE 377 | Software for Engineers | ECE 175 or CSC 110 | fall |
| SIE 383 | Integrated Manufacturing Systems | | spring |
| SIE 408 | Reliability Engineering | SIE 305 | fall |
| SIE 433 OR SIE 432 | Fundamentals of Data Science for Engineers | SIE 305 | spring (starting sp 2023) |
| | Sports Analytics | SIE 305 | summer |
| SIE 440 | Survey of Optimization Methods | SIE 340 | spring |
| SIE 465 | Supply Chain Management | SIE 305 & SIE 340 | spring |
| SIE 481 | Design for Additive Manufacturing | SIE 383 or BE 221 | fall |
| SIE 482 | Lean Operations and Manufacturing Systems | SIE 305 | spring |
| SIE 492 OR SIE 493 | Directed Research | Faculty Approval | fall, spring, summer |
| | Internship | Faculty Approval | fall, spring, summer |

**Option A2. If you are a Systems Engineering Major, you can choose <u>Engineering Management Minor</u>:**

| Engineering Management minor, if you are a Systems Engineering major… | | | |
|---|---|---|---|
| **Course #** | **Title** | **Prerequisite AdvStand in Engineering +** | **Typically offered** |
| **Required:** | | | |
| SIE 457 | Project Management | | fall/spring |
| **Choose 5 courses from:** | | | |
| SIE 367 | Engineering Management II | SIE 265 | spring |
| SIE 406 | Quality Engineering | SIE 305 | spring (fall starting fall 2022) |
| SIE 408 | Reliability Engineering | SIE 305 | fall |
| SIE 414 | Law for Engineers and Scientists | | spring |
| SIE 415 | Technical Sales and Marketing | | fall/spring |
| SIE 422 | Engineering Decision Making Under Uncertainty | SIE 305 | fall |
| SIE 432 OR SIE 433 | Sports Analytics or Fundamentals of Data Science for Engineers | SIE 305 | summer fall (spring starting sp 2023) |
| SIE 462 | Production Systems Analysis | SIE 305 & 340 | spring |
| SIE 464 | Cost Estimation | SIE 305 | spring |
| SIE 465 | Supply Chain Management | SIE 305 & 340 | spring |
| SIE 492 OR SIE 493 | Directed Research Internship | Faculty Approval | fall/spring/sum |

**Option A3. If you are Systems Engineering Major, you can choose <u>Software Engineering Minor</u>:**

| Course # | Title | Prerequisite AdvStand in Engineering + | Typically offered |
|---|---|---|---|
| **Software Engineering minor, if you are an Systems Engineering major…** | | | |
| **Required:** | | | |
| SFWE 101 | Intro to Software Engineering | MATH 122A/B or MATH 125 | fall/spring |
| ECE 275 | Computer Programming II | ECE 175 | fall/spring |
| **Choose 4 courses from:** | | | |
| CSC 355 or CS 345 | Discrete Structure & Basic Algorithms | CSC 275, MATH 243 (CSC 345 requires addt'l pre-reqs) | fall |
| SFWE 301 | SW Requirements Analysis & Test | ECE 275 | fall |
| SFWE 302 | SW Design Process | SFWE 301 | spring |
| SFWE 401 | SW Assurance & Security | ECE 275 | spring |
| SFWE 402 | SW DevOps | SFWE 301 & 302 | TBD |
| SFWE 403 | SW Project Management | SIE 464 | TBD |