

**BS in Industrial Engineering  
Degree Requirements, AY 2019-2020**

Major Program  
IE Methods Core

| Done   | Course                   | Course Name   | Notes   | Done  | Course                   | Course Name                                   | Notes   |
|--|--------------------------|---|---|---|--------------------------|---|---|
| <b>Mathematics Requirement (4 credits)</b>                       |                          |   |   | <b>IEMS Major Program: Methods Core + PL + Project (9 credits)</b>  |                          |   |   |
| <input type="checkbox"/>   | Math 220-1               | Single-variable Differential Calculus               |   | <input type="checkbox"/>  | COMP_SCI 111             | Fundamentals of Computer Programming I        | Prerequisite for COMP_SCI 211                         |
| <input type="checkbox"/>   | Math 220-2               | Single-variable Integral Calculus                   |   | <input type="checkbox"/>  | IEMS 202                 | Probability                                   | IE/OR Methods Core                                    |
| <input type="checkbox"/>   | Math 228-1               | Multivariable Diff. Calc. for Eng.                  |   | <input type="checkbox"/>  | IEMS 303                 | Statistics                                    |   |
| <input type="checkbox"/>   | Math 228-2               | Multivariable Int. Calc. for Eng.                   |   | <input type="checkbox"/>  | IEMS 304                 | Statistical Learning for Data Analysis        |   |
| <b>Engineering Analysis and Computer Proficiency (4 credits)</b> |                          |   |   | <input type="checkbox"/>  | IEMS 313                 | Foundations of Optimization                   |   |
| <input type="checkbox"/>   | Gen Eng 205-1            | EA 1  |   | <input type="checkbox"/>  | IEMS 315                 | Stochastic Models                             |   |
| <input type="checkbox"/>   | Gen Eng 205-2            | EA 2  |   | <input type="checkbox"/>  | IEMS 317                 | Discrete-Event Systems Simulation             |   |
| <input type="checkbox"/>   | Gen Eng 205-3            | EA 3  |   | <input type="checkbox"/>  | Prodn & Logistics        | Choose from IEMS 381, 382, 383, or 385        |   |
| <input type="checkbox"/>   | Gen Eng 205-4            | EA 4  |   | <input type="checkbox"/>  | IEMS 394                 | IE Client Project Challenge                   | Junior spring or Senior fall                          |
| <b>Basic Sciences (4 credits)</b>                                |                          |   |   | <b>IEMS Major Program: IE/OR Electives (2 credits)</b>              |                          |   |   |
| <input type="checkbox"/>   |                          |   | See reverse for details on acceptable courses | <input type="checkbox"/>  | IE/OR Elective           |   | May not count course used for Prodn & Logistics above |
| <input type="checkbox"/>   |                          |   |   | <input type="checkbox"/>  | IE/OR Elective           |   |   |
| <input type="checkbox"/>   |                          |   |   |   |                          | See reverse for details on acceptable courses |   |
| <input type="checkbox"/>   |                          |   |   |   |                          |   |   |
| <b>Design and Communications (3 credits)</b>                     |                          |   |   | <b>IEMS Major Program: Management Science Electives (2 credits)</b> |                          |   |   |
| <input type="checkbox"/>   | DSGN 106-1/Engl 106-1    | DTC 1   |   | <input type="checkbox"/>  | Elective-MS              |   | See reverse for details on acceptable courses         |
| <input type="checkbox"/>   | DSGN 106-2/Engl 106-2    | DTC 2   |   | <input type="checkbox"/>  | Elective-MS              |   |   |
| <input type="checkbox"/>   | Communications Course    | Chosen from COMM_ST 102, PERF_ST 103 or PERF_ST 203 |   | <b>IEMS Major Program: General Technical Electives (3 credits)</b>  |                          |   |   |
| <b>Basic Engineering (5 credits)</b>                             |                          |   |   | <input type="checkbox"/>  | Elective-GTE             |   | See reverse for details on acceptable courses         |
| <input type="checkbox"/>   | COMP_SCI 211             | Fund. Of Computer Programming II                    | Comp. Programming                             | <input type="checkbox"/>  | Elective-GTE             |   |   |
| <input type="checkbox"/>   | COMP_SCI 217             | Data Mgmt & Info Processing                         | Comp. Programming                             | <input type="checkbox"/>  | Elective-GTE             |   |   |
| <input type="checkbox"/>   | CIV ENV 205              | Eng. Econ   | Systems Eng.                                  | <b>Unrestricted Electives (5 credits)</b>                           |                          |   |   |
| <b>2 additional courses from two different areas</b>             |                          |   |   | <input type="checkbox"/>  |                          |   |   |
| <input type="checkbox"/>   | Basic Engineering Choice |   | See reverse for details on acceptable courses | <input type="checkbox"/>  |                          |   |   |
| <input type="checkbox"/>   | Basic Engineering Choice |   |   |   | <input type="checkbox"/> |   |   |
| <b>Theme Courses (7 credits)</b>                                 |                          |   |   | <input type="checkbox"/>  |                          |   |   |
| <input type="checkbox"/>   | Theme                    |   | See reverse for details on requirements       | <input type="checkbox"/>  |                          |   |   |
| <input type="checkbox"/>   | Theme                    |   |   |   | <input type="checkbox"/> |   |   |
| <input type="checkbox"/>   | Theme                    |   |   |   | <input type="checkbox"/> |   |   |
| <input type="checkbox"/>   | Theme                    |   |   |   | <input type="checkbox"/> |   |   |
| <input type="checkbox"/>   | Theme                    |   |   |   | <input type="checkbox"/> |   |   |
| <input type="checkbox"/>   | Theme                    |   |   |   | <input type="checkbox"/> |   |   |
| <input type="checkbox"/>   | Theme                    |   |   |   | <input type="checkbox"/> |   |   |

Full details can be found in the Undergraduate Catalog for 2019-2020 ([catalogs.northwestern.edu](http://catalogs.northwestern.edu))



### Basic Science Courses

Four units, including courses from at least two areas

At most 2 units from Earth Sciences and Astronomy; no more than 3 units from any other area

Lab courses may count only in combination with their corresponding lecture courses

#### Physics

|                       |                               |
|-----------------------|-------------------------------|
| PHYSICS 135-2 & 136-2 | General Physics & Laboratory  |
| PHYSICS 135-3 & 136-3 | General Physics & Laboratory  |
| PHYSICS 239           | Foundations of Modern Physics |

#### Chemistry

|                        |  |
|------------------------|--|
| CHEM 131 or 151 or 171 | (General/Accelerated/Advanced) Chemistry 1   |
| CHEM 141 or 161 or 181 | (Gen/Acc/Adv) General Chemistry Laboratory 1 |
| CHEM 132 or 152 or 172 | (General/Accelerated/Advanced) Chemistry 2   |
| CHEM 142 or 162 or 182 | (Gen/Acc/Adv) Chemistry Laboratory 2         |
| CHEM 210-1             | Organic Chemistry                            |
| CHEM 210-2             | Organic Chemistry                            |

#### Biological Sciences

|              |   |
|--------------|---|
| BIOL_SCI 215 | Genetics and Molecular Biology              |
| BIOL_SCI 217 | Physiology                                  |
| BIOL_SCI 219 | Cell Biology                                |
| BIOL_SCI 220 | Genetics and Molecular Processes Laboratory |
| BIOL_SCI 221 | Cellular Process Laboratory                 |
| BIOL_SCI 222 | Investigative Laboratory                    |

|              |  |
|--------------|--|
| CHEM_ENG 275 | Molecular & Cell Biology for Engineers |
| CIV_ENV 202  | Biological & Ecological Principles     |

#### Earth Sciences and Astronomy

|             |                              |
|-------------|------------------------------|
| ASTRON 220  | Introduction to Astrophysics |
| CIV_ENV 203 | Earth in the Anthropocene    |
| EARTH 201   | Earth Systems Revealed       |
| EARTH 202   | Earth's Interior             |
| EARTH 203   | Earth System History         |

### Basic Engineering Courses

Five basic engineering courses must come from four distinct areas.

COMP\_SCI 211 & COMP\_SCI 217, required, are in the Computer Programming area.

Civ\_Env 205, required, is in the Systems Engineering area

Two additional courses must be chosen from two of the areas below.

#### Computer Architecture & Numerical Methods

|              |                                   |
|--------------|-----------------------------------|
| COMP_ENG 203 | Intro to Computer Eng.            |
| COMP_ENG 205 | Fundamentals of Computer Software |
| ES_APPM 346  | Modeling & Computation            |

#### Electrical Science

|              |  |
|--------------|--|
| ELEC_ENG 202 | Intro to Electrical Eng.                     |
| ELEC_ENG 270 | Applications of Electronic Devices           |
| ELEC_ENG 221 | Fundamentals of Circuits                     |
| ELEC_ENG 222 | Fundamentals of Signals & Systems            |
| ELEC_ENG 223 | Fundamentals of Solid State Engineering      |
| ELEC_ENG 224 | Fundamentals of Electromagnetics & Photonics |
| MECH_ENG 233 | Electronics Design                           |

#### Fluids & Solids

|              |                          |
|--------------|--------------------------|
| CHEM_ENG 321 | Fluid Mechanics          |
| CIV_ENV 216  | Mechanics of Materials I |
| MECH_ENG 241 | Fluid Mechanics I        |
| BMD_ENG 270  | Fluid Mechanics          |
| BMD_ENG 271  | Intro to Biomechanics    |

#### Materials Science and Engineering

|             |                              |
|-------------|------------------------------|
| MAT_SCI 201 | Introduction to Materials    |
| MAT_SCI 301 | Materials Science Principles |

#### Thermodynamics

|              |                                   |
|--------------|-----------------------------------|
| BMD_ENG 250  | Thermodynamics                    |
| CHEM_ENG 211 | Thermodynamics                    |
| MAT_SCI 314  | Thermodynamics of Materials       |
| MAT_SCI 315  | Phase Equilibria and Diffusion    |
| MECH_ENG 222 | Thermo & Statistical Mechanics I  |
| MECH_ENG 322 | Thermo & Statistical Mechanics II |

### IE/OR Elective Options

|          |                                       |
|----------|---------------------------------------|
| IEMS 304 | Stat. Methods for Data Mining         |
| IEMS 307 | Quality Improvement by Exper. Des.    |
| IEMS 308 | Data Science and Analytics            |
| IEMS 351 | Optimization Methods for Data Science |
| IEMS 365 | Analytics for Social Good             |
| IEMS 373 | Intro. to Financial Engineering       |
| IEMS 381 | Supply Chain Modeling                 |
| IEMS 382 | Production Plan & Sched               |
| IEMS 383 | Service Opns. Mgmt.                   |
| IEMS 385 | Health Systems Eng.                   |

### Management Science Elective Options

|          |                                      |
|----------|--------------------------------------|
| IEMS 325 | Engineering Entrepreneurship         |
| IEMS 341 | Social Network Analysis              |
| IEMS 342 | Organizational Behavior              |
| IEMS 343 | Project Management for Engineers     |
| IEMS 344 | Leading Organizations and Teams      |
| IEMS 345 | Negotiations and Conflict Resolution |

### General Technical Elective Options

The following courses MAY BE USED as technical electives

Any 200-level or higher course in McCormick, excluding CRDV and PRDV courses

Any 200-level or higher course in Biology, Chemistry, or Physics

Any 300-level or higher course in Math, Statistics, or MMSS

|              |  |
|--------------|--|
| Econ 309     | Elements of Public Finance                   |
| Econ 331     | Economics of Risk and Uncertainty            |
| Econ 336     | Analytic Methods for Public Policy Analysis  |
| Econ 339     | Labor Economics                              |
| Econ 349     | Industrial Economics                         |
| Econ 350     | Monopoly, Competition, and Public Policy     |
| Econ 355     | Transportation Economics and Public Policy   |
| Econ 360-2   | Investments                                  |
| Econ 362     | International Finance                        |
| Econ 380-1,2 | Game Theory                                  |
| Econ 381-1,2 | Econometrics                                 |
| Econ 383     | Economic Forecasting                         |
| IMC 303      | Integrated Marketing Communications Strategy |
| ISEN 220     | Intro to Energy Systems for the 21st Century |
| ISEN 230     | Climate Change and Sustainability            |

The following courses MAY NOT BE USED as technical electives

|               |  |
|---------------|--|
| Chem 201      | Chemistry of Nature and Culture              |
| Math 310-1    | Probability and Stochastic Processes         |
| Math 311-1    | MENU: Probability & Stochastic Processes     |
| Math 314      | Probability and Statistics for Econometrics  |
| Math 385      | Probability and Statistics for MMSS          |
| Math 386-1    | Econometrics for MMSS                        |
| Physics 311-1 | Mathematical Tools for the Physical Sciences |
| Physics 311-2 | Mathematical Tools for the Physical Sciences |
| Physics 335   | Physics of Magic                             |
| Stat 320-1    | Statistical Methods I                        |
| Stat 383      | Probability and Statistics for ISP           |

### Theme Requirements

The theme requirement consists of seven courses in humanities and social sciences.

At least three courses (the "theme") must be related in content.

Requires at least two courses in social sciences, and at least two courses in humanities

See the McCormick Undergraduate Engineering website for information on eligible course:

Note that the following courses may NOT be used towards theme:

Any BUS\_INST or Kellogg course

|            |               |               |
|------------|---------------|---------------|
| ECON 281   | ECON 381-1    | ENGLISH 106-2 |
| ECON 380-1 | ECON 381-2    | GEOG 341      |
| ECON 380-2 | ENGLISH 106-1 | PSYCH 201     |

