Master’s Programs in *Management Science and Engineering (MGSE)*

**Department of Industrial and Systems Engineering**

## *Introduction*

The Management Science and Engineering program is directed toward integrating scientific methods with the functional aspects of organizations by investigating the application of quantitative methodology and systems analysis in the context of decision making, risk analysis, economics and cost analysis, production management, and supply chain logistics. This integration provides the students with a broader perspective toward managerial decision-making in both private enterprise and public administration.

Mid-career professionals and recent graduates with a background in engineering, mathematics, and physical sciences who intend to seek managerial, consulting or systems analyst positions are appropriate candidates. In particular, those candidates who intend to seek positions demanding both technical and management skills find the management science background advantageous in dealing with the complex problems of industrial, commercial, and public service organizations.

## *The Program*

The Department of Industrial and Systems Engineering administers the Management Science and Engineering program. To be admitted to the program a candidate must demonstrate basic competence in calculus, statistics, linear algebra, introductory operations research, accounting, production and economics. A candidate lacking a certain background may be required to take background courses. The minimum program consists of 30 credit hours, of which at least 18 credit hours must be in the 400-level. The ISE graduate faculty coordinator must approve all course work. No more than 9 credit hours may be taken from the college of business and economics (e.g., MKT, ECO, GBUS courses).

**Master of Science**

The minimum program for the Master of Science (M.S.) degree in Management Science and Engineering consists of 24 credit hours of approved courses and completion of a satisfactory 6 credit thesis. A faculty member must supervise the thesis. Courses from outside the ISE department usually include other engineering disciplines, mathematics, computer science, and business and economics.

***Master of Engineering***

The minimum program for the Master of Engineering (M.Eng.) degree in Management Science and Engineering consists of 27 credit hours of approved courses and completion of a satisfactory 3 credit project or, optionally, 30 credits of approved courses and no project. This program of study is for those students whose interests are geared toward engineering design rather than research. A faculty member must supervise the project.

Each student is required to complete at least 12 credit hours of courses selected from the set of *MGSE Core Courses*. At least 6 credits must be IE courses.

***MGSE Core Courses***

| **Course No.** | **Course Title** | **Prerequisite(s)** |
| --- | --- | --- |
| **ISE 358**  **(ECO 358)** | Game Theory  **(Cross listed course)** | ECO 105 or 146 and MATH 21, 31, or 51.  **(ECO 105 or 146 and MATH 21, 31 or 51).** |
| **ISE 404** | Simulation  (*graduate version of ISE 305*) | ISE 121 or ISE 328 and ISE 220 or equivalent. |
| **ISE 409** | Time Series Analysis | ISE 121 or equivalent. |
| **ISE 410** | Design of Experiments | ISE 121 or equivalent. |
| **ISE 414** | Heuristic Methods in Combinatorial Optimization |  |
| **ISE 416** | Dynamic Programming | ISE 426 or equivalent. |
| **ISE 419** | Sequencing and Scheduling | ISE 426 or equivalent. |
| **ISE 412** | Quantitative Models of Supply Chain Management | ISE 426 and ISE 429 or equivalents. |
| **ISE 426** | Optimization Models and Applications  (*graduate version of ISE 316*) | ISE 220 or equivalent background.  *Closed to students who have taken ISE 316*. |
| **ISE 429** | Stochastic Models and Applications  (graduate version of ISE 339) | ISE 220 or equivalent. |
| **ISE 439** | Queueing Systems | ISE 429 or equivalent. |
| **ISE 447** | Financial Optimization | ISE 426 or equivalent. |
| **ISE 458**  **(ECO 463)** | Topics in Game Theory  **(Cross listed course)** | Two semesters of calculus, ECO 412, or permission of instructor. |
| **MATH 311** | Graph Theory | MATH 163 or MATH/CSE 261 or MATH 205 or consent of instructor. |
| **MATH 312** | Statistical Computing and Applications | ISE 121 or equivalent, MATH 12 or MATH 231. |
| **MATH 334** | Mathematical Statistics | MATH 231 or 309. |
| **MATH 338/STAT 438** | Linear Models in Statistics with Applications | ISE 121 or equivalent, MATH 12 or MATH 231. |
| **MATH 467** | Financial Calculus I | ISE 111 or MATH 231 or equivalent and MATH 023. |
| **MATH 468** | Financial Calculus II | MATH 467. |
| **ECO 412** | Mathematical Economics | Consent of instructor. |
| **ECO 415** | Econometrics I | ISE 121 or equivalent, eco 401 or equivalent. |

*Areas of Concentration*

Each student may elect to concentrate course work in specific areas, but there is no requirement to do so. A set of recommended courses in each of eight areas are given below:

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| Areas of Concentration | A recommended course set |
| **Operations Research** | **ISE** 406, 411, 412, 414, 416, 417, 418, 419, 425, 439, 455.  **ECO** 402, 412. **MATH** 312, 338, 340 |
| **Decision and Risk Analysis** | **ISE** 358,458, 409, 410, 416, 419, 439, 442, 446  **MATH** 312, 338 |
| **Economics and Cost Analysis** | **ISE** 358, 458, 413. **GBUS** 414, 419, 420, 422. **MATH** 467, 468 |
| **Production and Operations Management** | **ISE** 319, 324, 332, 340, 410, 412, 419, 424, 442, 443, 445, 448, 449. **GBUS** 432, 450, 453, 456,  **ECO** 447. **MSE** 438, 446 |
| Logistics and Supply Chain Management | **ISE** 319, 341, 358, 362, 408, 409, 412, 414, 416, 419, 438, 442, 443, 458, **GBUS** 432, 450, 453, 456. **ECO** 447 |
| **Information Economics** | **ISE** 334, 442, **BIS** 311, 342. **ECO** 412, 413, 415, 447 |
| **Information Technology and Applications** | **ISE** 324, 332, 341, 345, 404, 408, 424, 437, 438, 443, 449, 451. **CSE** 313, 340, 403, 411, 432. **ECE** 401, 404 |
| **Quality Engineering** | **ISE** 332, 409, 410, 422, 442 |

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