

## Operations Research Emphasis Area

Operations Research (OR) is the discipline of applying advanced analytical methods to support decision making. It is also sometimes referred to as Management Science or Decision Science. The discipline draws on knowledge from mathematical and computing sciences to analyze complex decision-making problems with the goal of creating optimal solutions.

Operations Research finds application to a wide variety of problems such as: determining what petroleum products to make out of which crude oils, selecting the best path to take in transportation networks, identifying the best product placements in retail establishments, scheduling operating rooms in hospitals, optimizing financial plans for investment companies, ensuring appropriate inventory levels for spare parts manufacturers, and many, many more.

Operations Research techniques are applied to a variety of different business functions ranging from finance to manufacturing and marketing, and they provide significant benefits in almost every industry. As such, Industrial Engineers with an OR focus have a wealth of career opportunities. OR Specialists can be found in healthcare, automotive, energy, metals, and discrete parts manufacturing industries, to name a few; they are also prevalent in the government sector helping analyze issues relating to defense, health, environment, and other issues.

It should be noted that many OR-focused careers require students to possess an advanced degree. The courses listed below help to prepare students for advanced studies in OR.

### **Operations Research specialists have extensive knowledge of**

- Mathematical modeling and analysis
- Probability and statistics
- Optimization
- Simulation

### **Operations Research specialists have effective technical skills in**

- Programming
- Data manipulation and analysis
- Modeling and problem-solving

### **Courses**

Courses taken from the following groupings help to provide students with a deeper understanding of Operations Research. More information on each of these courses can be obtained by logging onto [myPurdue](#), navigating to the course catalog page for that department and clicking on the link for the course.

The courses listed below are listed in the course catalog for each department. They are meant to provide guidance as to what a student might take if they are interested in this emphasis area. The list of courses below is not exhaustive. In addition, the regularity of offerings of the listed courses is not guaranteed. Some courses are offered every semester, every other semester, or every other year. Other courses may have been offered at some point, but may not be offered again for a while, and we keep them in this list in

hopes they will be offered again. *Therefore, the courses listed here should be considered an unreliable source of information.* A student wishing to take a particular course should always check the course schedule (via "Look Up Classes" in myPurdue) to see what is available.

**Legend:**

REQ: Required for IE majors

TE: Technical Elective

GE: General Education Elective

\*: Course has not yet been pre-approved by the IE faculty as a TE, but approval is pending. A student may wish to petition for the immediate approval.

**Simulation**

- IE 580: System Simulation (TE)
- IE 581: Simulation Design and Analysis (TE)

**Optimization**

- IE 335: Operations Research – Optimization (REQ)
- IE 535: Linear Programming (TE)
- IE 538: Nonlinear Optimization Algorithms and Models (TE)
- IE 634: Integer Programming (TE)

**Mathematical Modeling and Analysis**

- IE 336: Operations Research – Stochastic Models (REQ)
- IE 536: Stochastic Models in Operations Research (TE)
- MA 341: Foundations of Analysis (TE)
- MA 375: Introduction to Discrete Mathematics (TE)
- MA 446: Introduction to Real Analysis \*

**Programming and Problem-solving**

- CS 314: Numerical Methods (TE)

**Compatible Minors**

- Mathematics

**Related faculty in IE**

- Agostino Capponi
- Hong Wan
- Andrew Liu
- Nelson Uhan
- Mihailo Stojnic
- Thomas Morin
- Omid Nohadani
- Abhijit Deshmukh
- Nagabhushana Prabhu

**Relevant links**

- [The Institute for Operations Research and the Management Sciences](#)
- [Occupational Outlook Handbook, 2010-11 Edition](#)

DISCLAIMER: The emphasis area document is intended for use as an aid to students for developing a coherent curriculum plan. The courses listed are a representation of the courses that may be taken (or are taken as part of the IE curriculum) that develop skills that are needed for a career in a field focusing on this emphasis area. While we list required IE courses, students should strongly consider enhancing their base IE coursework with more advanced courses in one or more of the areas.