Masters Degree in Industrial and Operations Engineering
Occupational Safety Engineering and Ergonomics (OSE) Option

For more than 50 years, The University of Michigan’s Department of Industrial and Operations Engineering (IOE) has offered graduate education in ergonomics and occupational safety. During this time, over 300 Masters and 100 Ph.D. students have graduated specializing in Occupational Safety Engineering and Ergonomics (OSE).

The Masters degree is intended for students who hold a bachelor’s degree in engineering or physical science. Most students can complete the OSE option in 10-16 months. Students have flexibility in selecting course work to match specific interests, including cognitive ergonomics, physical ergonomics, safety engineering, and safety management. A list of commonly-elected classes is available on the following pages. Those wishing to pursue a Ph.D. degree will find that the M.S. program provides excellent preparation.

A limited number of traineeships (tuition and/or stipend support) are available from the National Institute for Occupational Safety and Health (NIOSH) for U.S. Citizens and Permanent Residents who are interested in OSE professional and research careers. All NIOSH trainees are required to take the following core courses in safety, ergonomics, and public health.

**Safety/Occupational Health Core - 12 credits**

EHS 600: Professional Perspectives in Environmental Health (2 credits)
EHS 658: Physical Hazards (1 credit)
IOE 438: Safety Management (2 credits)
IOE 539: Safety Engineering Methods (3 credits)
IOE 837: Occupational Health and Safety Engineering Seminar (1 credit)
EHS elective in either Exposure Science or Occupational Diseases (3 credits)

**Epidemiology and Statistics Core - 6 credits**

EPI 503: Strategies and Uses of Epidemiology (3 credits)
IOE 465 or IOE 570: Design of Experiments (3 credits)

**Seminars and Research - 4-5 credits**

IOE 836: Ergonomics Seminar (1 credit)
IOE 590: Directed Research (3-4 credits)

NIOSH trainees must complete a Master's research project (IOE 590) and must earn a minimum of 36 credit hours to receive financial assistance through the NIOSH grant.

Students who do not receive NIOSH funding can complete the M.S. degree with 30 credit hours and have more flexibility in course selection. Specific requirements for the IOE M.S. degree can be found at:


Many non-NIOSH students elect additional courses beyond the 30-credit minimum in order to enhance the breadth and depth of their education.
TYPICAL SCHEDULE OF COURSES FOR NIOSH TRAINEES:

MASTER OF SCIENCE IN
INDUSTRIAL AND OPERATIONS ENGINEERING
(Occupational Safety Engineering and Ergonomics Option)

FALL TERM

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<tr>
<th>Course</th>
<th>Credits</th>
<th>Instructor</th>
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<tr>
<td>EHS 604 – Professional Perspectives</td>
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<tr>
<td>EHS 658 – Physical Hazards in the Work Environment</td>
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<tr>
<td>IOE 539 – Safety Engineering Methods</td>
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<td>IOE 836 – Ergonomics Seminar</td>
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<td>Electives</td>
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TOTAL CREDITS 15-17

WINTER TERM

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<tr>
<th>Course</th>
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<tr>
<td>EPI 503 – Strategies and Uses of Epidemiology</td>
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<tr>
<td>IOE 438 – Safety Management</td>
<td>2</td>
<td>Frantz/Rhoades</td>
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<tr>
<td>IOE 570 – Design and Analysis of Experiments</td>
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<td>IOE 837 – Occupational Health/Safety Seminar</td>
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TOTAL CREDITS 15-17

SPRING HALF-TERM

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<tr>
<td>IOE 590/593 -- Directed Research/Professional Project</td>
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<td>Selected by topic</td>
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TOTAL PROGRAM CREDITS 34-36
Suggested and Elective Courses for
Master of Science in Industrial and Operations Engineering
(Occupational Safety Engineering and Ergonomics Emphasis)
Note: Departmental codes can be found at the bottom of the next page.

Occupational Safety and Health

EHS 500 – Principles of Environmental Health Sciences (3 cr.)
EHS 550 – Intro. to Occupational and Environmental Health (3 cr.)
EHS 581 – Principles of Radiological Health (1 cr.)
EHS 601 – Exposure Science and Health (3 cr.)
EHS 603 – Occupational Diseases (3 cr.)
EHS 604 – Professional Perspectives in Environmental Health (2 cr.)
EHS 651 – Occupational Health, Safety, and Environmental Program Management (2 cr.)
EHS 658 – Physical Hazards in the Work Environment (1 cr.)
EPI 503 – Strategies and Uses of Epidemiology (3 cr.)
EPI 651 – Epidemiology and Public Health Management of Disasters (2 cr.)
IOE 438 – Occupational Safety Management (2 cr.)
IOE 539 – Safety Engineering Methods (3 cr.)
NAME 582 – Systems Reliability and Safety (3 cr.)
NERS 484 – Radiological Health Engineering Fundamentals (4 cr.)

Physical Ergonomics (Biomechanics, Anthropometry, Physiology, Work Measurement)

BME 430 – Rehabilitation Engineering and Assistive Technology (3 cr.)
BME 533 – Neumomechanics (3 cr.)
BME 646 – Mechanics of Human Movement (3 cr.)
IOE 463 – Measurement and Design of Work (3 cr.)
IOE 533 – Human Motor Behavior and Engineering Systems (3 cr.)
IOE 534 – Occupational Biomechanics (3 cr.)
IOE 537 – Ergonomics for Inclusive Design (3 cr.)
IOE 591 – Research Methods in Biomechanics (2 cr.)

Cognitive Ergonomics (Human Factors Engineering, HCI):

EECS 493 – User Interface Development (4 cr.)
IOE 430 – Global Cultural Systems Engineering (3 cr.)
IOE 434 – Human Error & Complex System Failures (3 cr.)
IOE 436 – Human Factors in Computer Systems (3 cr.)
IOE 437 – Automatic Human Factors (3 cr.)
IOE 491 – Multi-modal Display Systems (3 cr.)
IOE 536 – Cognitive Ergonomics (3 cr.)
IOE 691 – Computational Cognitive Ergonomics (3 cr.)
Psych 449 – Decision Processes (3 cr.)
Psych 643/EECS 643 – Theory of Neural Computation (2-4 cr.)
SI 531 – Human Interaction in Information Retrieval (3 cr.)
SI 649 – Information Visualization (3 cr.)
Engineering Breadth

BME 456 – Biomechanics (3 cr.)
BME 458 – Biomedical Instrumentation and Design (4 cr.)
IOE 425 – Manufacturing Strategies (2 cr.)
IOE 432 – Instrumentation (3 cr.)
IOE 465 – Experimental Design (3 cr.)
IOE 466 – Statistical Quality Control (3 cr.)
IOE 562 – Reliability (3 cr.)
IOE 570 – Experimental Design (3 cr.)
ME 452 – Design for Manufacturability (3 cr.)
ME 481 – Manufacturing Processes (3 cr.)
ME 587 – Global Manufacturing (3 cr.)

Management/Legal/Finance Breadth

BME 550 – Ethics and Enterprise (1 cr.)
IOE 421 – Work Organizations (3 cr.)
IOE 452 – Corporate Finance (3 cr.)
IOE 522 – Theories of Administration (3 cr.)
IOE 551 – Benchmarking, Productivity Analysis, and Performance Measurement (3 cr.)

Comment: In addition to the above, students may elect from an extensive list of courses offered by the Ross School of Business

Projects, Research, and Seminars:

IOE 590 – Directed Research (2-4 cr.)
IOE 593 – Ergonomics Professional Project (2-4 cr.)
IOE 836 – Seminar in Human Performance (1 cr.)
IOE 837 – Seminar in Occ. Health and Safety Engineering (1 cr.)

Department Codes:  BME – Biomedical Engineering  
CEE – Civil and Environmental Engineering  
EECS – Electrical Engineering and Computer Science  
EHS – Environmental Health Science (Public Health)  
EPI – Epidemiology (Public Health)  
IOE – Industrial and Operations Engineering  
ME – Mechanical Engineering  
NAME – Naval Architecture and Marine Engineering  
NERS – Nuclear Engineering and Radiological Science  
PSYCH – Psychology  
SI – School of Information

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