IMSE Cognate Policy

The Industrial and Management Systems Engineering (IMSE) skill set is valuable in a wide range of contexts, from manufacturing to healthcare, from transportation to finance, from government to small business entrepreneur. Consequently, one can expect IMSE students to have varied career aspirations. The IMSE cognate requirement is designed to enable students to enhance their IMSE education with a multidisciplinary focus in a complementary subject area. By pursuing the cognate, students will also enhance their abilities to work in multidisciplinary environments, communicate effectively, assess the impact of their work in a larger context, and engage in life-long learning.

Requirements

To meet the cognate requirement, the student will take a minimum of 9 credits outside the required IMSE coursework that represent a coherent area of study relevant to some aspect of Industrial and Management Systems Engineering as a discipline or practice. Courses taken to satisfy required courses or core requirements for the BS degree in IMSE cannot be used to meet the cognate requirement. At least 6 credits of the cognate must be at the 300-level or above. Undergraduate research or independent study[1] credits, consistent with the cognate topic, are allowed (and encouraged) up to a maximum of 3 credits.

Sample Cognates

Students are free to design a cognate of their own choosing, subject to the requirements outlined above and approval by the student's advisor and the IMSE Program Coordinator.

A student automatically satisfies the cognate requirement by completing a non-teaching minor.[2] Typical minors used to satisfy the cognate include: engineering minors, business administration, computer science, economics, entrepreneurship, foreign languages, mathematics, or statistics.

Students who do not wish to complete a minor, but nevertheless have an interest in that area, could select a subset of courses from an approved minor program to define a cognate area. For example, a student with an interest in economics may decide to take ECNS 202 (3 cr.), ECNS 309 (3 cr.), and ECNS 313 (3 cr.) for their cognate; which are a subset of an Economics minor. *Note that ECNS 204IS could not be used for the cognate if it is used to satisfy university core requirements.*

The faculty has created several *example* cognate areas outlined in the table below, to aid students in designing a cognate aligned with their interests. Other cognate designs are possible. Students are responsible to check the MSU Catalog for current course descriptions and prerequisites.

Manufacturing ETME 217 Manufacturing Process Laboratory (1 cr.) ETME 310 Machining and Industrial Safety (3 cr.) ETME 410 CNC & CAM Technology (3 cr.) ETME 415 Design for Mfg and Tooling (3 cr.)	**Design** ART 145RA Web Design (3 cr.) EMEC 403 CAE IV-Design Integration (3 cr.) EMEC 465 Bio-inspired Engineering (3 cr.) *Take ARCH 121IA to satisfy university core requirement.*
Human Factors PSYX 360 Social Psychology (3 cr.) PSYX 380 Memory & Cognition (3 cr.) PSYX 481 Judgment & Decision Making (3 cr.) *Take PSYX100IS to satisfy university core requirement.*	**Optimization Techniques** M 274 Intro to Differential Eq. (4 cr.) M 386 Software Applications in Mathematics (3 cr.) EIND 455 Design of Experiments for Engrs[3] (3 cr.) or EIND 457 Reg & Applied Multvar Analysis[3] (3 cr.)
Ergonomics/Biomechanics HDPE 221 Health Anatomy and Physiology (3 cr.) KIN 322 Anatomical Kinesiology (4 cr.) KIN 325R Biomechanics (4 cr.)	**Database Systems** CSCI 132 Basic Data Structures and Algorithms (4 cr) CSCI 232 Data Structures and Algorithms (4 cr.) CSCI 440 Database Systems (3 cr.) CSCI 446 Artificial Intelligence (3 cr.)
Healthcare CHTH 210 Foundations of Community Health (3 cr.) HADM 445 Managing Healthcare Orgs (3 cr.) EIND 506 Design of Healthcare Delivery Sys. (3 cr.)	**Inventory Management** BMGT 405 Supply Chain Analytics (3 cr.) EIND 373 Prod Inventory Cost Analysis (3 cr.) EIND 468 Mgr Forecast & Decision Analysis (3 cr.)

Sustainability
ECNS 132 Econ & the Environment (3 cr.)
   or
ECNS 332 Econ of Natural Resources (3 cr.)
MGMT 410 Sustainable Business Practices (3 cr)
SOCI 470 Environmental Sociology (3 cr.)
Take ECNS 101IS or ECNS 251IS to satisfy university core requirement.
	Supply Chain Management
	BMGT 405 Supply Chain Analytics (3 cr.)
	EIND 468 Mgr Forecast & Decision Analysis (3 cr.)
	EIND 457 Reg & Applied Multvar Analysis[3] (3 cr.)
	   or
	STAT 431 Nonparametric Statistics (3 cr.)
	   or
	STAT 448 Mixed Effects Models (3 cr.)

Leadership UC 202 Leadership Foundations (3 cr.) BMGT 406 Human Resources Management (3 cr.) BMGT 420 Leadership and Motivation (3 cr.)	

Notes:

1 – Independent study credits may be utilized in a variety of ways to support the cognate. Examples include: attend a conference or other training in the area of the cognate and write a paper that summarizes the knowledge gained; after completing cognate course work, write a reflective paper that summarizes how the cognate supports the student's industrial engineering education experience; etc.

2 – Available non-teaching minors at http://catalog.montana.edu/undergraduate/#undergraduateminorstext.

3 – If course is NOT used to satisfy another IMSE degree requirement.