



Memo

To: Randy Smith, Vice Provost for Academic Programs

From: Rosie Quinzon-Bonello, Assistant Dean for Curriculum and Assessment

Date: January 11, 2024

Re: Informational Item – Revision to the ISE (BS) Manufacturing Technical Elective Track

On January 10, 2024, The College of Engineering Committee for Academic Affairs approved the curriculum change proposal submitted by the Industrial and Systems Engineering BS program to revise its Manufacturing Technical Elective Track .

Item	Is now...	Changing to...
Item 1: Required Elective	ISE 3500	ISE 4510
Item 2: Minimum 6 hrs of manufacturing electives	10 course options, pick 2 (see Table above)	3 course options (pick 2), includes ISE 3500, ISE 5520/5525 (from 'Is now' list), and ISE 5570 (new course)
Item 3: Minimum 6 hrs of technical electives (manufacturing-related or other)	Open structure - any approved ISE manufacturing, or other ISE technical elective, or outside ISE technical elective	2 structured option groups to choose from: Group 1: 'Manufacturing Processes' (choose 2 courses from the list) Or Group 2: 'Connected Skills' (choose 2 courses from provided list of ISE technical electives or outside

There is no change to the number of credit hours required for the degree, and a plan in place for students who are enrolled in the Manufacturing TE track in its current state. Attached is the proposal.

Yours sincerely,

Rosie Quinzon-Bonello

29 Nov. 2023

Rosario (Rosie) Quinzon-Bonello, M.Ed.
Assistant Dean for Curriculum and Assessment
College of Engineering
122 Hitchcock Hall, 2070 Neil Ave.
Columbus, OH 43210

Re: Modifications to the Manufacturing Technical Elective Track in the Industrial and Systems Engineering Undergraduate Program

Dear Assistant Dean Quinzon-Bonello,

In 2021 the ISE undergraduate technical elective track system was formalized within the SIS, in order to make planning and tracking progress to graduation much easier for students and our academic advisors.

At this point in time we wish to make some changes to the Manufacturing Technical Elective Track. This reflects changes and evolution in our faculty's expertise and the nature of manufacturing (Industry 4.0, 5.0,....). The changes to the track were developed by the department's manufacturing faculty and were reviewed and approved by the ISE Undergraduate Studies Committee.

The proposed revision maintains our technical elective structure: 9 hours of 'in department' technical elective courses concentrated in a particular relevant area of focus for ISEs + 6 hours of technical electives from in or outside the department.

Students who are following the current Manufacturing TE plan will be able to complete that plan. Students who have not started taking any of the courses in the track yet, will have the option to follow the current plan or to switch to the new plan. Students who enter the ISE major in Spring 2024 or later will follow the new plan (should they choose the Manufacturing TE track).

Please let me know if you have any questions.

Sincerely,



Carolyn Sommerich
Chair, ISE Undergraduate Studies Committee

cc. Steven A. Lavender, Associate Chair, ISE Undergraduate Program
Farhang Pourboghrat, PhD, ISE Department Chair

Current ISE Manufacturing Technical Elective Track

REQUIRED ELECTIVE (3 hours)

ISE 3500	3	Process Engineering for Machining Operations
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MINIMUM SIX HOURS FROM THE FOLLOWING ELECTIVES (6 hours)

MATSCEN 5451	3	Molten Metal Processing
ISE 5501	3	Fundamentals of Solid State Processing
ISE 5520	1.5	Industrial Automation I
ISE 5525	1.5	Industrial Robotics
ISE 5521	1.5	Advanced Sheet Forming Laboratory
ISE 5540	3	Polymer Processing Fundamentals
ISE 5550	3	Principles of Precision Engineering
ISE 5555	3	Manufacturing Processes and Machine Tools
MECHENG 5682.01	3	Fundamentals of Product Design Engineering
ISE 5683	1	Fundamentals of Product Design Engineering Lab

MINIMUM SIX HOURS FROM THE FOLLOWING ELECTIVES (6 hours)

Any ISE technical elective from this track (*listed above*)

Any ISE technical elective from another track

Any outside approved elective

What is changing?

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ISE Manufacturing Technical Elective Track

Proposed Revision - 2023

Goals:

The ISE manufacturing faculty have revised the structure of the manufacturing sub-specialty track to achieve the following goals:

- 1) Strengthen the theory, simulation, processing science, automation and data analytic abilities of our Manufacturing Track students.
- 2) Create more opportunities for our Manufacturing Faculty to engage with our students and pass on their expertise in a forum they are excited about.
- 3) Provide students that elect to follow the specialized ISE Manufacturing Track the opportunity to tailor the track, while packaging courses to help students select courses that will prepare them based on career interests.

Track Structure:

The ISE Manufacturing Track consists of 15 credit hours of technical electives (in addition to ISE 2500 – which is a core ISE course taken by all ISE undergraduate students). 3 credit hours are a required technical elective, 6 hours can be selected from a set of 3 courses, and the remaining 6 credit hours can come from numerous options of manufacturing-related courses. The vision for the flexible portions of the track is to let students take a deeper dive into select fundamentals, processes, and connected skills of interest. This gives the students a core and some flexibility to tailor, while ensuring some technical focus. The following outlines the structure:

Required MFG Track Course (1 course; total of 3 credit hours):

The combination of ISE 2500 (an ISE core course) and ISE 4510 will provide students in the Manufacturing Technical Elective Track with knowledge of key manufacturing processes and the fundamental mathematics that govern those processes.

- **ISE 4510 (Theory of Manufacturing Processes)**

Introduces mathematical theory of fluid and solid mechanics in the context of manufacturing processes (already covered in ISE 2500) through analytic equations. This course will introduce numerical and data analytic methods for solving manufacturing problems.

MFG Track Required Elective Group – “Fundamentals” (Select 2; total of 6 credit hours):

The vision for this elective group, of which two must be selected, is that the students in this track should have hands-on experience operating common manufacturing processes, performing analysis of data from monitoring manufacturing processes, and/or automating manufacturing process controls.

- **ISE 3500 (Process Engineering for Machining Operations)**

Introduction to the machines, tooling, set-ups, processing sequences, processing times, metrology, and safety issues for traditional and selected non-traditional metal cutting operations.

- **ISE 5570 (Manufacturing Data Processing and Analysis) *introduced as 5194 in AU21; proposal has been submitted for permanent course number**

This is a newly developed course that focuses on the introduction of sensors and monitoring systems in manufacturing processes, along with the data they collect. The course introduces data analytic approaches to handling and manipulating data to monitor, control, and optimize manufacturing processes. Course is project focused with projects working with real world or simulated data to give hands-on experience. Interaction with industry partners to get relevant data sets is a possibility.

- **ISE 5520 + ISE 5525 (Intro to Industrial Automation)**

This is a full-semester combination of ISE 5520 and ISE 5525. Introduces the design, application, and computer logic and control of various mechanical, pneumatic, electrical, and electronic sensors and actuator devices for industrial systems.

And, Students also choose 1 of the Option Groups below; within their selected Option Group, students choose 2 courses (=6 credit hours):

MFG Track Elective Options Group – Option 1: “Manufacturing Processes” (Select up to 2 courses = 6 credit hours):

The vision for this elective group is that students in this track should have the opportunity for deeper knowledge of 1 or more manufacturing processes of which they could potentially be a process engineer.

- **Molten Metal Processing (MSE 5451/ISE 5502)**
- **Introduction to Additive Manufacturing (WE 5027)**
- **Polymer Processing Fundamentals (ISE 5540)**

MFG Track Elective Options Group – Option 2: “Connected Skills” (Select up to 2 courses = 6 credit hours):

The vision for this elective group is that students in this track should have opportunity for developing connected skills in design, modeling, controls, safety/ergonomics, cognitive systems, process design, business, etc. that would benefit a manufacturing engineer.

- **Fundamentals of Product Design Engineering (MAE 5682.01)**
- **Cognitive Engineering Systems: Design and Evaluation (ISE 5770)**
- **Ergonomics in the Product Design Process (ISE 5610)**
- **Occupational Safety: Analysis and Design of Work Environments (ISE 5640)**
- **Advanced Project Management (ISE 5800)**

- **Select Business courses****
- **Select Design Courses****
- **Select Sensors and Data Analytics courses****

***A list of approved ‘outside of ISE’ technical elective courses is accessible through the ISE website*