MICROELECTRONIC MANUFACTURING, BACHELOR OF APPLIED SCIENCE

Curriculum Code #9601

Effective May 2022

Division of Engineering, Business and Information Technologies (http://catalog.lorainccc.edu/academic-programs/engineering-business-information-technologies/)

The Microelectronic Manufacturing program prepares individuals to apply basic engineering principles and technical skills to design, assembly, prototyping, and manufacturing of printed circuit boards (PCB) used in electronic assembly as well microelectronic packaging and MEMS sensors. Includes hands-on machine operation of equipment used in high volume electronic assembly and microelectronic packaging, use of software for designing PCB layout and bills of materials, instruction in manufacturing, quality control principles and lean lite, instruction in programming of programmable logic controllers (PLC), and engineering analysis of the physical design and electronic function of PCB.

First Year

Fall Semester

		Hours
ELCT 111	ELECTRICAL CIRCUITS I	3
ELCT 115	FABRICATION PROCESS FOR ELECTRONICS	2
MTHM 155	TECHNICAL MATHEMATICS I	4
MEMS 122	INTRODUCTION TO MICRO-ELECTROMECHANICAL SYSTEMS (MEMS)	4
SDEV 101	INTRODUCTION TO THE LCCC COMMUNITY [2]	1
TECN 111	TECHNICAL PROBLEM SOLVING	3
	Hours	**17**

Spring Semester

CADD 111	INTRODUCTION TO COMPUTER AIDED DRAFTING [3]	2
CADD 216	INTRODUCTION TO 3D MODELING AND PRINTING	1
DFAB 111	INTRODUCTION TO PERSONAL FABRICATION	1
ELCT 121	DIGITAL ELECTRONICS [1]	4
MEMS 132	MEMS PACKAGING [1]	3
MTHM 168	STATISTICS [1]	3
	Hours	**14**

Second Year

Fall Semester

CHMY 171	GENERAL CHEMISTRY I	5
ELCT 233	[3]	4
ENGL 161	COLLEGE COMPOSITION I	3
MEMS 211	MICRO-FABRICATION PROCESSING [1]	3
MEMS 287	WORK-BASED LEARNING I - MEMS [1,4]	1
	Hours	**16**

Spring Semester

ENGL 164	COLLEGE COMPOSITION II WITH TECHNICAL TOPICS [1]	3
MEMS 221	MICRO-SYSTEM CAPSTONE PROJECT [1]	3
MEMS 288	WORK-BASED LEARNING II - MEMS [1]	1
Arts and Humanities Elective		3
Social Sciences Elective		3
	Hours	**13**

Third Year

Fall Semester

AETC 111	ROBOTICS/AUTOMATED MANUFACTURING	3
ELCT 112	ELECTRICAL CIRCUITS II [3, 5]	4
MEMS 311	PCB AND FLEX DESIGN [1]	3
PHYC 150	GENERAL PHYSICS I [1]	4
TECN 115	INDUSTRIAL BLUEPRINT READING	2
	Hours	**16**

Spring Semester

AETC 121	PROGRAMMABLE LOGIC CONTROLLERS [5]	3
ELCT 221	MICROCONTROLLERS [1, 5]	4
MEMS 321	PCB ASSEMBLY [1]	3
MEMS 387	WORK-BASED LEARNING - MEMS	1
QLTY 122	BASIC QUALITY TOOLS AND APPLICATIONS [1]	3
TECN 245	GEOMETRIC DIMENSIONING AND TOLERANCING [1]	2
	Hours	**16**

Fourth Year

Fall Semester

CADD 213	INTRODUCTION TO SOLIDWORKS [1, 5]	3
ELCT 234	ELECTRONIC DEVICES II [1, 5]	4
MEMS 411	PCB INSPECTION & REWORK [1]	3
PSYH 151 or SOCY 151G	INTRODUCTION TO PSYCHOLOGY or INTRODUCTION TO SOCIOLOGY	3
QLTY 234	LEAN SIX SIGMA FOR PROCESS IMPROVEMENT	4
	Hours	**17**

Spring Semester

MEMS 421	ELECTRONIC ASSEMBLY - SENIOR DESIGN [1]	3
MEMS 487	WORK BASED LEARNING MEMS [1]	1
QLTY 241	ISO 9001 [1]	2
Arts and Humanities Electives		6
Social Science Elective		3
	Hours	**15**
	Total Hours	**124**

[1] Indicates that this course requires a prerequisite.

[2] A student must register for the orientation course when enrolling for more than six credit hours per semester or any course that would result in an accumulation of 13 or more credit hours.

[3] Indicates that this course has a prerequisite or may be taken concurrently.

[4] This course offers an opportunity for experiential learning.

5 Indicates that this course is at a 300 level at other universities.

Arts and Humanities Electives

Arts and Humanities electives must be from two different disciplines.

Code	Title	Hours
ARTS 243G	ART HISTORY I	3
ARTS 244G	ART HISTORY II	3
ARTS 245G	WORLD ART	3
ARTS 246	HISTORY OF PHOTOGRAPHY	3
ARTS 254	HISTORY OF AMERICAN ARCHITECTURE	3
ENGL 251	AMERICAN LITERATURE I	3
ENGL 252	AMERICAN LITERATURE II	3
ENGL 253G	INTRODUCTION TO WORLD LITERATURE	3
ENGL 254G	INTRODUCTION TO HISPANIC LITERATURE	3
ENGL 255G	INTRODUCTION TO FICTION	3
ENGL 257G	INTRODUCTION TO POETRY	3
ENGL 259G	INTRODUCTION TO DRAMA	3
ENGL 261G	MASTERPIECES OF BRITISH LITERATURE I	3
ENGL 262G	MASTERPIECES OF BRITISH LITERATURE II	3
ENGL 266G	AFRICAN AMERICAN LITERATURE	3
ENGL 269G	INTRODUCTION TO SHAKESPEARE	3
HUMS 151G	INTRODUCTION TO HUMANITIES	3
HUMS 261G	INTRODUCTION TO GREAT BOOKS: ANCIENT WORLD TO THE RENAISSANCE	3
HUMS 262G	INTRODUCTION TO GREAT BOOKS: EARLY MODERN TO THE 20TH CENTURY	3
HUMS 271G	INTRODUCTION TO MYTHOLOGY	3
HUMS 274	FILM APPRECIATION	3
MUSC 262G	MUSIC AS A WORLD PHENOMENON	3
PHLY 165	BIOETHICS	3
PHLY 262G	INTRODUCTION TO EASTERN PHILOSOPHY	3
RELG 181G	INTRODUCTION TO WORLD RELIGIONS	3
RELG 261	RELIGION IN AMERICA	3
RELG 262G	INTRODUCTION TO EASTERN PHILOSOPHY	3
THTR 151G	INTRODUCTION TO THEATER	3

Social Science Electives

Social Science electives must be from two different disciplines.

Code	Title	Hours
ECNM 151	PRINCIPLES OF MACROECONOMICS	3
ECNM 152	PRINCIPLES OF MICROECONOMICS	3
HSTR 151G	CIVILIZATION I	3
HSTR 152G	CIVILIZATION II	3
HSTR 161	UNITED STATES I	3
HSTR 162	UNITED STATES II	3
HSTR 171G	THE WORLD SINCE 1900	3
HSTR 252G	WOMEN IN WORLD HISTORY	3
HSTR 260G	HISTORY OF AMERICAN TECHNOLOGY	3
HSTR 267G	AFRICAN AMERICAN HERITAGE	3
PLSC 156	AMERICAN NATIONAL GOVERNMENT	3
PSYH 151	INTRODUCTION TO PSYCHOLOGY	3
SOCY 151G	INTRODUCTION TO SOCIOLOGY	3

Program Contact(s):

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For information about admissions, enrollment, transfer, graduation and other general questions, please contact your advising team (https://www.lorainccc.edu/admissions-and-enrollment/advising-and-counseling/).

Program Requirements

This program requires a complete application form on file by May 20 (fall cohort)

1. Eligible to apply/earn AAS MEMS

2. Cumulative GPA of 2.0 (for transfer students, it has to be combined cumulative GPA of 2.0)

More program information can be found on our website. (https://www.lorainccc.edu/engineering/mechatronics/associate-of-applied-science-in-mechatronics-technology-micro-electromechanical-systems-mems/)

Program Learning Outcomes

1. An ability to apply knowledge, techniques, skills and modern tools of mathematics, science, engineering, and technology to solve broadly-defined engineering problems appropriate to the discipline of Printed Circuit Board (PCB) manufacturing, microelectronic manufacturing, and MicroElectroMechanical Systems (MEMS)

2. An ability to design systems, components, or processes meeting specified needs for broadly-defined engineering problems appropriate to the
discipline of PCB manufacturing, microelectronic manufacturing, and MEMS.

3. An ability to apply written, oral, and graphical communication in broadly-defined technical and non-technical environments; and an ability to identify and use appropriate technical literature.

4. An ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes.

5. An ability to function effectively as a member as well as a leader on technical teams.

6. The curriculum must provide baccalaureate degree graduates with instruction in the knowledge, techniques, skills, and use of modern equipment in manufacturing engineering technology. Baccalaureate degree graduates build on the strengths of associate degree programs by gaining the knowledge, skills, and abilities for entry into manufacturing careers practicing various tools, techniques and processes. The depth and breadth of expertise demonstrated by baccalaureate graduates must support the program educational objectives. The curriculum must include instruction in the following topics
   a. materials and manufacturing processes.
   b. product design process, tooling, and assembly.

    c. manufacturing systems, automation, and operations.

    d. statistics, quality and continuous improvement, and industrial organization and management.

    e. capstone or integrating experience that develops and illustrates student competencies in applying both technical and non-technical skills in successfully solving manufacturing problems.

Objectives

An accreditable program will prepare graduates with technical and managerial skills necessary for entry into industry of the design, manufacturing, process optimization, inspecting, testing, and troubleshooting of PCB and related microelectronic products. Graduates of the associate degree programs are expected to have strengths in the knowledge of equipment operations, assembly, testing, and troubleshooting of prototyping a PCB and associated microelectronic components, while baccalaureate degree graduates are expected to be prepared for careers in design, engineering process optimization, and management within the field of microelectronic manufacturing including the operation, programming, and troubleshooting of high-volume PCB manufacturing equipment, inspection, troubleshooting, repair, and technical reporting on manufactured PCB as well as quality, drafting, continuous improvement, lean manufacturing, and six sigma.

Program Educational Objectives

1. Manufacture, assemble, and test Printed Circuit Boards (PCB) by programming and operating equipment used in the field of high volume PCB manufacturing.
2. Recognize manufacturing optimization methods using industry certified processes and systematic quality tools.
3. Perform on technical team using developed skills in team leadership and engineering management.
4. Successfully complete a paid internship demonstrating professional and technical responsibilities to working as a part of an engineering team in a quality manufacturing environment.