MICROELECTRONIC MANUFACTURING, BACHELOR OF APPLIED SCIENCE

Curriculum Code #9601

Effective May 2023

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 engineering principles and technical skills to design, assembly, prototyping, and manufacturing of printed circuit boards (PCB) used in electronic hardware production. Includes hands-on machine operation of equipment used in high volume electronic assembly, use of software for designing PCB layout and bills of materials, programming and operation of automated PCB manufacturing equipment with surface mount technology, quality control principles including lean and six sigma, in-circuit test fixture design, test engineering, and engineering analysis of the physical design and electronic function of electronic hardware containing digital microcontrollers, analog circuitry, and MEMS sensors.

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
MEMS 124	PRINTED CIRCUIT BOARD TEST & TROUBLESHOOTING [3]	3
SDEV 101	INTRODUCTION TO THE LCCC COMMUNITY [2]	1
	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 [1,3]	4
MEMS 132	MEMS PACKAGING [1]	3
MEMS 134	THRU-HOLE MANUFACTURING [3]	2
MTHM 168	STATISTICS [1]	3
	Hours	**16**
Second Year		
Fall Semester		
CHMY 171	GENERAL CHEMISTRY I	5
ELCT 233	ELECTRONIC DEVICES I [1, 3]	4
ENGL 161	COLLEGE COMPOSITION I	3
MEMS 211	SEMICONDUCTOR PROCESSING [1, 3]	3
MEMS 287	WORK-BASED LEARNING I - MEMS [4]	1
	Hours	**16**
Spring Semester		
ENGL 164	COLLEGE COMPOSITION II WITH TECHNICAL TOPICS [1]	3
MEMS 221	MICRO-SYSTEM CAPSTONE PROJECT [1, 3]	3
MEMS 288	WORK-BASED LEARNING II - MEMS [1, 4]	1
Arts and Humanities Elective [6]		3
Social Sciences Elective [7]		3
	Hours	**13**
Third Year		
Fall Semester		
CADD 313	INTRODUCTION TO SOLIDWORKS WITH ADVANCED PROJECTS [1]	3
ELCT 221	MICROCONTROLLERS [1]	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		
ELCT 234	ELECTRONIC DEVICES II [1]	4
MEMS 322	SMT MANUFACTURING [1]	3
MEMS 323	SMT PROGRAMMING [1, 3]	3
MEMS 387	WORK-BASED LEARNING - MEMS [1, 4]	1
QLTY 122	BASIC QUALITY TOOLS AND APPLICATIONS [1]	3
TECN 345	GEOMETRIC DIMENSIONING AND TOLERANCING WITH ADVANCED PROJECTS [1]	2
	Hours	**16**
Fourth Year		
Fall Semester		
ELCT 112	ELECTRICAL CIRCUITS II [1, 3]	4
MEMS 412	AOI PROGRAMMING [1]	3
MEMS 413	BGA REWORK & X-RAY INSPECTION [1]	2
PSYH 151 or SOCY 151G	INTRODUCTION TO PSYCHOLOGY or INTRODUCTION TO SOCIOLOGY	3
Social Science Elective [7]		3
	Hours	**15**
Spring Semester		
MEMS 421	SENIOR PROJECT - NEW PRODUCT INTRODUCTION [1]	3
MEMS 487	WORK BASED LEARNING MEMS [1,4]	1
QLTY 241	ISO 9001 [1]	2
QLTY 334	LEAN SIX SIGMA FOR PROCESS IMPROVEMENT WITH ADVANCED PROJECTS [1]	4
TAMS 351 or TAMS 415	MICROCONTROLLER HARDWARE DESIGN & PROGRAMMING [1] or PRINCIPLES OF LABVIEW	4
Arts and Humanities Electives [6]		3
	Hours	**17**
	Total Hours	**126**

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 - student must be first employed within their field of study before taking this class.

5

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

6

This program requires two Arts and Humanities OT 36 electives (http://catalog.lorainccc.edu/academic-information/transfer-module-requirements/). These courses must be chosen from two different disciplines.

7

This program requires two Social Science OT 36 electives (http://catalog.lorainccc.edu/academic-information/transfer-module-requirements/). These courses must be chosen from two different disciplines.

Program Contact(s):

Johnny Vanderford
440-366-4206
jvanderford@lorainccc.edu

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.