IME 3070: Computer Controlled Manufacturing

2003-2006 Catalog Data:

Analysis and design of computer controlled manufacturing systems. Students must enroll in IME 3080 during the semester following IME 3070. **Lecture/Lab:** (3-3), **Credits:** 4 hrs.
Prerequisites: IME 2060, ECE 2100.

Textbook: (Optional)

- Automation, Production Systems and Computer-Integrated Manufacturing, by Groover, M.

References:

1. Robots and Manufacturing Automation by C.Ray Asfahl.
2. Modern Manufacturing Process Engineering by Neibel, B., Draper, B. Alan and Wysk, A. Richard., McGraw Hill.
3. Labnotes for IME 3070 (Computer Controlled Manufcturing).

Prerequisite by Topic:

1. Understand and use Kirchhoff's current and voltage laws (ECE 2100).
2. Understand basic role and basic functions of active & passive devices (ECE 2100).
3. Understand basic principles of electrical machines (DC/AC machines, transformer, motor) (ECE 2100).
4. Basic understanding of semiconductor devices such as diodes, transistors, Operational Amplifiers (ECE 2100).
5. Proficient in writing algorithms & codes for application programs (IME 2060, CS 1060)

IME 3070 Course Coordinator:

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Objectives:

At the end of the semester, students will

1. be able to select & use basic electromechanical devices typically required in automated manufacturing systems (a-d,f).
2. be able to design simple electrical & electronic circuits for manufacturing automation applications (a-e,f,h).
3. be able to understand D/A, A/D applications for process monitoring and control (c-e,g,h,k).
4. have an appreciation for the roles of electrical, mechanical, electronic and programmable devices in the design of advanced manufacturing systems (c-e,I-k).
5. be able to effectively program a NC/CNC equipment and robots (a-f,k)
6. be able to write ladder logic program logic for an operation cycle that may involve bit addresses, I/Os, timers, counters, relays and logical operators (a-f,k).

Evaluation:

This course consists of 3 hours lecture and 3 hours of laboratory each week. The lecture and laboratory portions will be evaluated separately. Both portions must be passed to pass the course. The distribution between lecture and laboratory portions will be 60-40 for the final grade. Two midterm and a comprehensive final. Closed book and notes

1. Mid Term I (Oct.'00) .....25 %
2. Mid Term II(Nov.'00) 25%
3. HomeWork ..... 10 %
4. Final Exam.....30%
5. Class Participation & Attendance ..... 5 %
6. Field Trip.....5%

Grading Scale :

If combined total score is >=90 is equivalent to a letter grade A

>=85..... BA
>=80..... B
>=75..... CB
>=70..... C
>=60 .....D
<60..... F

Lecture Schedule:

Date	**Readings**	Topics
9/1		**Introduction – Course Outline, Policies & Procedures**
9/3	Notes & Ch.14 (Rec.Text a)	Microprocessor & Applications
9/7		**Manufacturing Processes (Demo in M/T lab. Glenn Hall Rm. ##??)**

9/8	**Notes & Ch.14 (Rec.Text a)**	**Microprocessor & Applications (contd.)**
9/10		Trip to IMTS Chicago (All are expected to attend.)
9/13		**Lab #0:Basic Troubleshooting Skills** **CCM Laboratory Procedures**
9/15	Notes	NPN Transistor & its operational characteristics Transistor Circuit - A Control Application
9/17	Notes	NPN Transistor & its operational characteristics Transistor Circuit - A Control Application
9/20	Ch 4	Analog/Digital Conversion **Lab #1: Instructions (Automatic switching & amplification)**
9/22	Ch. 2 (Rec.Text a)& Notes	Building blocks of Automation
9/24	Ch 5	Sensors, Actuators (+pneumatic), Drives & Analyzers
9/27		Operational Amplifiers (Op-Amp) & it's applications
9/29		Operational Amplifiers (Op-Amp) & it's applications (contd.)
10/1	Ch. 1, Ch.13	Introduction to CAM & CIM
10/4	Ch. 2	Production Concepts and Mathematical Model
	Ch. 3	Cost of Manufacturing Lead Time and WIP
10/6	Ch. 2	Production Concepts and Mathematical Model
	Ch. 3	Cost of Manufacturing Lead Time and WIP
10/8		**Op-Amps, Lab #2: Instructions (Feedback control circuit)**
10/11		Cost of Manufacturing Lead Time and WIP (contd.) Western Spirit Day Recess ???
10/13	Ch. 17	Assembly Systems and Line Balancing
10/15	Ch. 18.3	Analysis of Automated Flow Lines
10/18(MON)		**Mid Term I**
10/20	Ch. 6	Numerical Control and CAD/CAM
10/22	Ch. 6.5	NC Part Programming
10/25		**Lab #3: Instructions (Graphical Emulation)**
10/27	Ch. 11	Introduction to Robotics, Industrial Robot design & Classification
10/29	Ch. 13	Robot Applications & Robotic cell design Safety in Robotics
11/1		**Lab #4: Instructions (Robotic Material Handling)**
11/3	Ch. 15	Group Technology
11/5	Ch. 15	Group Technology
11/8	Ch. 8	Introduction to Programmable Logic Controllers (PLC)
11/10	Ch. 8	Sequence/Logic control /w PLCs Ladder Logic Programming (NO, NC & Relays)
11/12	Ch. 8	Ladder Logic Programming (Timers & Counters)
11/15(MON)		**Mid Term II**
11/17		Programmable Controllers **Lab #5: Instructions (Sequence**

		Control /w PLC)
11/19	Ch. 25	Computer-Aided Process Planning Using PART from Tecnomatix for generating process plans
11/22		Computer-Aided Process Planning (contd.)
11/24		Thanksgiving Recess
11/29		Introduction to Flexible Manufacturing System
12/1		
12/3	Notes	Introduction to System Reconfigurability
12/5		Review for Final Exam
12/9(R)		**Final Exam (Comprehensive)(12:30 – 2:30 p.m.)**

Late Homework:

Late assignments result in **automatic** 10% off per day late. No homework will be accepted if submitted a week or more late.

Revision Date: Fall 2004