University of Guelph
School of Engineering
ENGG*3070, Integrated Manufacturing Systems
Fall 2012 Course Outline (First Offering)

Instructor

Name:	Fantahun M. Defersha, PhD
Email:	fdefersh@uoguelph.ca
Telephone:	(519) 824-4120 Ext. 56512
Office Hours:	Tuesday; 10:00 AM - 12:15 PM (and by appointment); THRN 2403

Schedules

Lecture: Monday, Wednesday, Friday; 11:30 AM - 12:20 PM; MINS, Room 103

Lab 1: Monday 3:30 PM - 5:20 PM; THRN, Rooms 1009

Lab 2: Tuesday; 1:30 PM - 03:20 PM; THRN, Rooms 1009

Calendar Description

Common production machines and manufacturing systems are dealt with, particularly automated systems, robotics, computer control and integration techniques, materials handling, inspection processes and process control. The course addresses societal and environmental issues related to manufacturing.

Prerequisite(s):   ENGG*2120, ENGG*2450

Co-requisite(s):   ENGG*3410

Mandatory Text Book

Author: Mikell P Groover; Title: Automation, Production Systems, and Computer-Integrated Manufacturing; Publisher: PEARSON-Prentice Hall; Year of Publication: 2008; Edition: 3rd; ISBN: 0-13-239321-2

Note: The lecture is the primary source of information for the course and certain topics will be more elaborated than presented in the text book. Discussion and Examples that may not be

available from the text book may also be presented during the lecture time to help you further understand the subject matter of the various topics. As such it is highly recommended that you attend the lectures.

Course Learning Outcomes

- Identify the basic components of integrated manufacturing systems
- Understand the fundamental of automation and control technologies in manufacturing
- Understand Ladder Logic Programming, Robot Programming, Human Machine Interface (HMI) programming, and Vision System for Quality Inspection
- Know the techniques how different components (machine tools, material handling, robots, inspection, storage) of a manufacturing system can be integrated
- Understand the concepts of material handling systems(e.g. conveyors, automated guided vehicles), material storage and retrieval systems, automatic identification and data capture
- Model and analyze single station manufacturer cells, assembly lines, cellular manufacturing, flexible manufacturing systems
- Understand the fundamental of manufacturing support systems such as process planning, production planning and control, just-in-time and lean production.

Detail Course Outline

Introduction
- Automation in Production Systems
- Manual Labor in Production Systems
- Types Manufacturing Operations and Production Facilities
- Basic Elements of Automation
- Level of Automation

Discrete Control Using Programmable Logic Controller
- Discrete Process Control
- Ladder Logic Diagrams
- Programmable Logic Controller

Manufacturing Systems
- Components of Manufacturing Systems

- Classification Scheme for Manufacturing Systems

Single Station Manufacturing Cells

- Single Station Manned Cells
- Single Station Automated Cells
- Application of Single Station Cells

Manual and Automated Production and Assembly Lines

- Fundamental of Manual Assembly Lines
- Analysis of Single Model Assembly Lines
- Line Balancing Algorithms
- Mixed Model Assembly Lines
- Fundamentals of Automated Production and Assembly Lines
- Applications of Automated Production and Assembly Lines
- Analysis of Transfer Lines and Assembly Systems

Cellular Manufacturing System

- Part families
- Part Classification and Coding
- Production Flow Analysis
- Cellular Manufacturing
- Application of Group Technology
- Quantitative Analysis in Group Technology

Flexible Manufacturing Systems

- FMS Components
- FMS Applications and Benefits
- FMS Planning and Implementation Issues
- Quantitative Analysis of Flexible Manufacturing Systems

Manufacturing Support Systems

- Process Planning
- Production Planning and Control
- Just-in-time and Lean Production
- Order Release

- Flow Shop Sequencing
- Job Shop Sequencing

Laboratory

The laboratory is intended to provide the students a demonstration how the different components of the manufacturing systems are integrated and programmed. The Laboratory Facility includes CNC Milling and Turning Machines, Robot System, Gantry System, Conveyor with variable speed drive, Material Storage, Assembly Station, Work feeding Stations, Vision System for Quality Inspection, Human Machine Interface. As time permits, the lab may be used to introduce students on the use of some computer software for manufacturing systems analysis.

Attendance

The best leaning experience will be achieved if you *attend lecture and lab regularly*. Scientific studies have proven that a student success rate is strongly related to his/her class attendance. Those who attend classes and tutorials have higher success rates than those who do not.

Class Participation

Students are encouraged and expected to actively participate in class. You can use laptop or tablets in class, but only for following along with the class notes — please, no web surfing, e-mailing, instant-messaging, etc., as such is very distracting to those around you, and obviously to you. Turn-off all cell phones, phones, blackberries, etc. during class ... putting on vibrate may not be enough. Out of respect to your classmates please keep your private discussions outside the classroom.

Grading Scheme

Assignments	15%
Lab	10%
Mid-Term	30%
Final Exam	45%

Late Assignment/Missed Test Policy

Generally, when you find yourself unable to meet a course requirement such as an assignment, LAB or a test as a result of compassionate, illness or physiological reasons, a formal explanation must be made in writing to the instructor and (where possible) proper documentation must be provided. This should be done prior to an exam or assignment or LAB period (if possible) or as soon as possible but definitely within a week after the exam or assignment due date or the Lab is conducted. If no explanations are provided, exams receive a grade of zero and assignments/lab reports are subject to the following deductions:

- 25% will be deducted if the assignment is up to 24 hours late,
- 50% will be deducted if the assignment is 24 to 48 hours late,
- No assignments will be accepted after that.

Assignments will be collected during lecture time at their due dates. Assignment marks will be posted on CourseLink. It is your responsibility to continually check your mark records on the CourseLink and you may appeal any mark for an assignment within one week after the marked assignments are returned to the class. Solutions of assignment problems will be posted on CourseLink.

Exam Dates

- Mid-term (TBA).
- Final Exam:Wednesday December 5, 2012 from 11:30AM - 1:30PM Room, TBA

University Policy on Academic Misconduct

Academic misconduct, such as plagiarism, is a serious offence at the University of Guelph. Please consult the Undergraduate Calendar 2012-2013 and School of Engineering programs guide, for offences, penalties and procedures relating to academic misconduct.

http://www.uoguelph.ca/registrar/calendars/undergraduate/current/pdffiles/calendar.pdf

Disclaimer

The instructor reserves the right to change any or all of the above in the event circumstances, subject to the University of Guelph Academic Regulations.