# ADSE2016: MANUFACTURING ENGINEERING WORKSHOP

**Effective Term**
Summer Term 2023

## Part I Course Overview

**Course Title**
Manufacturing Engineering Workshop

**Subject Code**
ADSE - Advanced Design and System Engineering
**Course Number**
2016

**Academic Unit**
Systems Engineering (SYE)

**College/School**
College of Engineering (EG)

**Course Duration**
One Semester

**Credit Units**
0

**Level**
B1, B2, B3, B4 - Bachelor's Degree

**Medium of Instruction**
English

**Medium of Assessment**
English

**Prerequisites**
Nil

**Precursors**
Nil

**Equivalent Courses**
Nil

**Exclusive Courses**
Nil

**Additional Information**
Course duration 4 full days (Conducted during the summer term of the second year)

# Part II Course Details

**Abstract**

The aim of the course is to equip the students with the basic knowledge and skill of the processes and operation technologies required to develop intelligent manufacturing including material handling and conveyor system in the production discipline.

**Course Intended Learning Outcomes (CILOs)**

| | CILOs | Weighting (if app.) | DEC-A1 | DEC-A2 | DEC-A3 |
|---|---|---|---|---|---|
| 1 | Use the basic components of the process and operations of intelligent manufacturing, material handling and conveyor system. | 10 | | x | |
| 2 | Apply some commonly used actuators, sensors, and their interfacing technologies for applications in process and operation in manufacturing systems. | 20 | | x | |
| 3 | Utilize sensor information and controlling manufacturing and industrial process. | 30 | | x | |
| 4 | Apply the knowledge of actuators, sensors and software programming to develop processing and operations of manufacturing system. | 30 | | x | |
| 5 | Report and present the results in a professional manner. | 10 | | x | |

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

**Teaching and Learning Activities (TLAs)**

| | TLAs | Brief Description | CILO No. | Hours/week (if applicable) |
|---|---|---|---|---|
| 1 | Orientation | Brief explanation about the overall manufacturing engineering workshop, including the components and their interfacing and safety. | 1, 2, 3, 4 | 3 hrs/ semester |
| 2 | Practices on using different components | Introducing different components of manufacturing system. | 1, 2, 3, 4 | 6 hrs/ semester |

| | | | | |
|---|---|---|---|---|
| 3 | Laboratory / Project activities / Reflective writing (Logbook) and Project report | Laboratory / Project activities – The activities will enable the students to learn the practical skills of hardware interfacing and programing for achieving the defined goals.<br><br>Reflective writing – A logbook recording the work conducted by the students is to be kept and submitted at the end of the course. Teacher would provide feedback as appropriate.<br><br>Finally, students are required to submit their project reports. | 2, 3, 4, 5 | 15 hrs/ semester |

**Assessment Tasks / Activities (ATs)**

| | ATs | CILO No. | Weighting (%) | Remarks (e.g. Parameter for GenAI use) |
|---|---|---|---|---|
| 1 | Quiz | 1, 2, 3, 4 | 50 | Refer to Note 1 |
| 2 | Reflective Journals (Logbook) | 5 | 20 | Refer to Note 2 |
| 3 | Project Report | 5 | 20 | Refer to Note 3 |
| 4 | Actual Attendance | 2, 3, 4, 5 | 10 | |

**Continuous Assessment (%)**

100

**Examination (%)**

0

**Additional Information for ATs**

Note 1
Quiz will cover all the training material. Student must pass the quiz in order to pass the course.

Note 2
Logbook - Each student is required to keep a logbook to record what he/she has learnt in the workshop. Students are expected to submit their logbooks at the end of the course. In the logbook, each student should:
- Record what he/she has learnt in the training;
- Observe his/her accomplishments;
- Share insights and new understandings;
- Analyze the strengths and areas that could be improved in his/her work;
- Determine what, if any, modifications need to be made;
- Draw conclusions beyond the textbook or classroom experience;
- Make connections of what he/she has learnt to other industrial applications.

Note 3

Project Report - After the course, students are required to submit their reports of their projects. The students will be assessed at least on how well they would discuss and tackle the following items:
- Identifying the problem definition.
- Design a solution.
- Implementing the designed solution.
- Testing and verifying the solution.
- Discussing the pros and cons of the proposed solution.

To pass the course, a student needs to achieve at least 30% of the total maximum mark.

**Assessment Rubrics (AR)**

**Assessment Task**

1. Project

**Criterion**

1.1 Ability to Identify and Describe the basic principles and applications of some commonly used actuators, sensors, and their interfacing technologies for the application in production and operation.
1.2 Ability to Develop PLC software programs for real-time automation applications related to material handling.

**Pass (P)**

Able to develop a functional program to achieve the required task.

**Failure (F)**

The submitted program is not workable.

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**Assessment Task**

2. Reflective Journals (learning logbook)

**Criterion**

Ability to Demonstrate reflective practice in an engineering context.

**Pass (P)**

Able to submit the logbook on time with reasonably accurate descriptions of all the training exercises.

**Failure (F)**

Fail to submit the logbook with acceptable descriptions of the training exercises.

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**Assessment Task**

3. Quiz

**Criterion**

3.1 Ability to Describe the basic components for constructing a system for the application in production and operations.
3.2 Ability to Describe the basic principles and applications of some commonly used actuators, sensors, and their interfacing technology.

**Pass (P)**

Able to correctly answer at least 50% of the quiz questions.

**Failure (F)**

The quiz score is below 50%.

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**Assessment Task**

4. Actual Attendance

**Criterion**

4.1 Ability to Develop PLC software program for real time automation application for production and operation systems.
4.2 Ability to Apply the knowledge of actuators, sensors and software programming to develop a system for the application in production and operation systems.

**Pass (P)**

Able to attend over 85% of all the classes.

**Failure (F)**

Attendance is below 85%

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# Part III Other Information

**Keyword Syllabus**

- Operation and process engineering, analysis and monitoring
- Material handling system design
- Distribution control and monitoring
- Facility optimization
- Effective space utilization and optimization
- Process and operation improvement
- Route and path planning
- Warehouse operation and management
- Actuator technologies
- Sensor technologies
- RFID (Radio-Frequency Identification) and Bar-Code Systems
- PLC, embedded microcontroller and Industrial PC
- Power switching devices
- Flow and tracking devices
- Conveyor systems

**Reading List**

**Compulsory Readings**

| | Title |
|---|---|
| 1 | Nil |

**Additional Readings**

| | Title |
|---|---|
| 1 | Manager’ s Guide to Operations Management, John W. Kamauff, McGraw-Hill, New York, 2010. |
| 2 | Integral Logistics Management: Operations and Supply Chain Management within and across Companies, 4th Edition, Paul Schönsleben, CRC Press, 2016. |
| 3 | Applied Simulation: Modeling and Analysis using FlexSim, 3rd Edition, FlexSim Software Products, Inc. 2100 |
| 4 | Handbook of Industrial Automation, edited by Richard L. Shell and Ernest L. Hall, New York: Marcel Dekker, 2000. |
| 5 | Programmable Logic Controllers: Programming Methods and Applications, John R. Hackworth, Frederick D. Hackworth, Jr., Upper Saddle River, N.J.: Pearson/Prentice Hall, 2004. |
| 6 | Programmable Logic Controllers, 5ht Edition, Frank D. Petruzella, McGraw Hill, 2016. |

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|---|---|
| 7 | Introduction to Mechatronics and Measurement Systems, David G. Alciatore, Michael B. Histand, McGraw-Hill, 2007. |
| 8 | Global RFID: The Value of the EPCglobal Network for Supply Chain Management, Edmund W. Schuster, Stuart J. Allen, David L. Brock, Berlin: Springer, 2007. |
| 9 | RFID in the Supply Chain: A Guide to Selection and Implementation, Judith M. Myerson, Boca Raton, FL: Auerbach, 2007. |