

# SYE2011: FUNDAMENTAL ENGINEERING ANALYSIS AND DESIGN FOR MANUFACTURING ENGINEERS II

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**Effective Term**

Semester A 2025/26

## Part I Course Overview

**Course Title**

Fundamental Engineering Analysis and Design for Manufacturing Engineers II

**Subject Code**

SYE - Systems Engineering

**Course Number**

2011

**Academic Unit**

Systems Engineering (SYE)

**College/School**

College of Engineering (EG)

**Course Duration**

One Semester

**Credit Units**

3

**Level**

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

**Medium of Instruction**

English

**Medium of Assessment**

English

**Prerequisites**

ADSE2010 Fundamental Engineering Analysis and Design for Manufacturing Engineers I / SYE2010 Fundamental Engineering Analysis and Design for Manufacturing Engineers I

**Precursors**

Nil

**Equivalent Courses**

ADSE2011 Fundamental Engineering Analysis and Design for Manufacturing Engineers II

**Exclusive Courses**

Nil

## Part II Course Details

### Abstract

Integrated use of principles from different engineering disciplines has become pervasive in the modern manufacturing environment in the Industry 4.0 era. In this course (**Part II** of a two-course sequence), students will learn the elements of fundamental engineering techniques useful for the intelligent manufacturing engineers. Built upon the foundation of practical mechanics and electronics techniques covered in Part I, the students will learn further electronics and mechanical/robotics principles at an intermediate level in Part II. These lead up to laboratory projects, in which the students working in teams will generate and execute engineering models that apply these electronics and mechanical/robotics principles.

### Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Apply the principles of robotics, at an intermediate level, to mechanical systems (e.g., spatial transformation; forward kinematics; inverse kinematics).	35	x	x	
2	Describe and apply further electronics principles (built upon the principles learned in SYE2010 [Part I of the two-course sequence]) to circuits and devices, to explain their behavior and responses.	35	x	x	
3	Generate and execute engineering models that demonstrate the techniques learned in CILO 1.	15	x	x	
4	Generate and execute engineering models that demonstrate the techniques learned in CILO 2.	15	x	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.

### Learning and Teaching Activities (LTAs)

LTAs	Brief Description	CILO No.	Hours/week (if applicable)	
1	Lectures	Students will engage in lectures and in-class discussions to gain knowledge about the key concepts discussed in CILOs 1-2.	1, 2	3 hours/week

2	Laboratory sessions	In the laboratory sessions, students will generate and execute engineering models that apply the electronics and mechanical/robotics principles discussed in CILOs 1-2	1, 2, 3, 4	3 hours/week for 2 weeks
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**Assessment Tasks / Activities (ATs)**

	ATs	CILO No.	Weighting (%)	Remarks ("- " for nil entry)	Allow Use of GenAI?
1	Regular Assignments Students will be assessed their understanding of concepts and techniques learned in class, reading materials and their ability to apply these concepts, techniques and subject-related knowledge.	1, 2, 3	15	-	No
2	Laboratory Project Reports Executing and documenting the practical application of concepts and techniques learned.	1, 2, 3, 4	35	-	No

**Continuous Assessment (%)**

50

**Examination (%)**

50

**Examination Duration (Hours)**

2

**Minimum Continuous Assessment Passing Requirement (%)**

30

**Minimum Examination Passing Requirement (%)**

30

**Assessment Rubrics (AR)****Assessment Task**

Coursework (continuous assessment)

**Criterion**

Achieving all CILOs

**Excellent (A+, A, A-)**

High

**Good (B+, B, B-)**

Significant

**Fair (C+, C, C-)**

Moderate

**Marginal (D)**

Basic

**Failure (F)**

Not even reaching marginal levels

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**Assessment Task**

Examination

**Criterion**

Achieving CILOs 1-3.

**Excellent (A+, A, A-)**

High

**Good (B+, B, B-)**

Significant

**Fair (C+, C, C-)**

Moderate

**Marginal (D)**

Basic

**Failure (F)**

Not even reaching marginal levels

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## Part III Other Information

**Keyword Syllabus**

mechanical/robotics principles/techniques – spatial transformation, forward kinematics, inverse kinematics; further electronics principles; IoT techniques – e.g., programming of microcontrollers/single-board computers to control various external modules and sensors.

**Reading List**

**Compulsory Readings**

Title	
1	Lecture notes and slides provided by the instructor

**Additional Readings**

<b>Title</b>	
1	Practical Electronics for Inventors; 4th Edition; Scherz and Monk; McGraw-Hill, 2016.
2	Robotics and Control: Fundamental Algorithms in MATLAB; 1st Edition, P. Corke; Springer 2021.
3	Internet of Things with Raspberry Pi and Arduino; 1st Edition; Singh, Gehlot, et al.; CRC Press, 2019.
4	Practical Python Programming for IoT; 1st Edition; G. Smart; Packt Publishing, 2020.