



Course Specification

(Bachelor)

Course Title: **Digital and Physical Prototyping**

Course Code: **SE4712**

Program: **BSc in Software Engineering**

Department: **Software Engineering**

College: **College of Computing**

Institution: **Umm Al Qura University**

Version: **1.0**

Last Revision Date: **22/04/2025**



Table of Contents

A. General information about the course:	3
B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods	4
C. Course Content	5
D. Students Assessment Activities	5
E. Learning Resources and Facilities	6
F. Assessment of Course Quality	7
G. Specification Approval	7



A. General information about the course:

1. Course Identification

1. Credit hours: (3)

2. Course type

- A. University College Department Track Others
- B. Required Elective

3. Level/year at which this course is offered: (3rd year/ 5th or 6th level) or (4th year/8th level)

4. Course General Description:

This course introduces students to the principles, tools, and techniques of prototyping in both digital and physical domains. Students will explore rapid prototyping methodologies, including CAD (Computer-Aided Design), 3D printing, and software prototyping tools. The course emphasizes iterative design, problem-solving, and practical implementation to create functional and aesthetic prototypes.

5. Pre-requirements for this course (if any):

CS2105 - Data Structures and Algorithms with Java

6. Co-requisites for this course (if any):

N/A

7. Course Main Objective(s):

Upon successful completion of this course, you will be able to:

1. Understand the role of prototyping in the design and development process.
2. Develop skills in creating digital and physical prototypes using modern tools.
3. Apply iterative design and testing methodologies to refine prototypes.
4. Evaluate the functionality and usability of prototypes in real-world applications.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100%
2	E-learning	0	0
3	Hybrid <ul style="list-style-type: none"> • Traditional classroom • E-learning 	0	0



No	Mode of Instruction	Contact Hours	Percentage
4	Distance learning	0	0

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	30
2.	Laboratory/Studio	30
3.	Field	0
4.	Tutorial	0
5.	Others (specify)	0
Total		60

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Explain the fundamentals of digital and physical prototyping.	K1	Lecture, Exercise	Quiz, Exams, Assignments
1.2	Understand the limitations and potential of digital and physical prototyping tools.	K2	Lecture, Exercise	Quiz, Exams, Assignments
2.0	Skills			
2.1	Design and create CAD-based digital prototypes.	S1	Lecture, Exercise	Quiz, Exams, Assignments
2.2	Develop physical prototypes using modern fabrication technologies like 3D printing.	S2	Lecture, Exercise	Quiz, Exams, Assignments
2.3	Conduct usability testing to refine prototype functionality.	S3	Lecture, Exercise	Quiz, Exams, Assignments
2.4	Document and present the design and development process of prototypes effectively.	S4	Lecture, Exercise	Quiz, Exams, Assignments



Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
3.0	Values, autonomy, and responsibility			
3.1	Collaborate with team members to develop digital and physical prototypes.	V2	Lecture, Exercise	Quiz, Exams, Assignments
3.2	Evaluate ethical considerations and societal impacts in the choice of prototyping materials and methods.	V1	Lecture, Exercise	Quiz, Exams, Assignments

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to Digital and Physical Prototyping	3
2.	Basics of CAD Tools for Software Engineers	6
3.	Advanced CAD Modeling Techniques	6
4.	3D Printing for Rapid Prototyping	3
5.	Laser Cutting and Hardware Fabrication	3
6.	Introduction to Software Prototyping Tools	3
7.	Designing User Interfaces for Prototypes	3
8.	Integrating Software and Hardware Components	3
9.	Usability Testing and Feedback Mechanisms	3
10.	Iterative Design and Prototype Refinement	3
11.	Advanced Prototyping Techniques	3
12.	Team Projects: Concept to Prototype	3
13.	Presentation and Evaluation of Prototypes	3
Total		45

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Assignments and Quizzes	2-14	15
2.	Projects	2-14	15
3.	Practicals	2-14	10





No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
4.	Mid Term	7	20
5.	Final Exam	16-17	40

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	<ul style="list-style-type: none"> McElroy, K. (2016). <i>Prototyping for designers: Developing the Best Digital and Physical Products</i>. "O'Reilly Media, Inc." Chua, C. K., Leong, K. F., & Lim, C. S. (2010). <i>Rapid Prototyping: Principles and Applications (3rd Edition) (With companion CD-Rom)</i>. World Scientific Publishing Company.
Supportive References	<ul style="list-style-type: none"> Staiano, F. (2023). <i>Designing and Prototyping Interfaces with Figma - Second Edition: Elevate Your Design Craft with UX/UI Principles and Create Interactive Prototypes</i>. Awari, G. K., Thorat, C. S., Ambade, V., & Kothari, D. P. (2021). <i>Additive manufacturing and 3D printing technology: Principles and Applications</i>. CRC Press. Ghosh, A. (2023). <i>Mastering UX Design with Effective Prototyping: Turn your ideas into reality with UX prototyping (English Edition)</i>. BPB Publications.
Electronic Materials	
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Traditional Classroom
Technology equipment (projector, smart board, software)	Multimedia Projector
Other equipment (depending on the nature of the specialty)	N/A





F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Direct, Indirect
Effectiveness of Students assessment	Faculty, Peer reviewer	Direct, Indirect
Quality of learning resources	Faculty, Course coordinator	Direct, Indirect
The extent to which CLOs have been achieved	Course coordinator, Program management committee	Direct
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify))

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	SOFTWARE ENGINEERING DEPARTMENT COUNCIL
REFERENCE NO.	THE 17TH MEETING FOR THE ACADEMIC YEAR 1446H
DATE	22/04/2025

