



Course Specification

(Bachelor)

Course Title: **Engineering Design**

Course Code: **IE3302**

Program: **Industrial Engineering**

Department: **Mechanical and Industrial Engineering**

College: **Engineering and Computing at Alqunfudah**

Institution: **Umm Al-Qura University**

Version: **2**

Last Revision Date: **18-03-2025**



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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: (5 / 3)

4. Course General Description:

This course introduces engineering students to the fundamentals of engineering design. It emphasizes creative problem-solving, teamwork, and incorporating ethics, safety, sustainability, and societal impacts into the design process. Students will learn about engineering design cycles, need analysis, problem formulation, and concept generation, with attention to economic, environmental, and global constraints. It also includes topics on human factors, intellectual property, engineering ethics. The course involves hands-on team projects, report writing, presentations, and the use of design software tools.

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

None

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

7. Course Main Objective(s):

- **To Develop Problem-Solving and Design Skills.**
- **To Enhance Teamwork and Communication.**
- **To incorporate Ethics, Sustainability, and Human Factors**

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	5	100 %
2	E-learning		





No	Mode of Instruction	Contact Hours	Percentage
3	Hybrid <ul style="list-style-type: none"> Traditional classroom E-learning 		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	30
2.	Laboratory/Studio	45
3.	Field	
4.	Tutorial	
5.	Others (specify)	
Total		75

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 and apply fundamental engineering design principles, including need analysis, problem formulation, and concept generation.	K1, K2	Lectures, case studies, design exercises	Exams, quizzes, assignments
1.2	Integrate knowledge of mathematics, physics, and probability in solving engineering design problems.	K2, S1	Problem-based learning, hands-on design projects	Problem-solving tasks, project reports
...				



Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
2.0	Skills			
2.1	Identify and solve real-world engineering design problems using systematic design methodologies.	S1, S5	Project-based learning, collaborative workshops	Design projects, peer evaluations
2.2	Design, build, and test components and processes while considering functional and performance requirements.	S3, S5	Laboratory work, prototyping, simulation exercises	Lab reports, prototype demonstrations
...	Utilize modern computer-aided design (CAD) and engineering tools in the design process.	S4	Software tutorials, hands-on practice	Software-based assignments, project evaluations
3.0	Values, autonomy, and responsibility			
3.1	Apply sustainability, safety, and ethical considerations in the engineering design process.	V1	Case studies, ethical dilemma discussions	Reflective essays, case study analyses
3.2	Communicate design solutions effectively through technical reports, presentations, and teamwork.	V2	Presentation skills workshops, report writing sessions	Oral presentations, technical reports
3.3	Demonstrate leadership, project management, and teamwork skills in multidisciplinary design projects.	V3	Team-based projects, leadership role assignments	Group project assessments, peer reviews





Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
3.4	Develop a mindset of continuous learning and professional growth in engineering design.	V4	Self-reflection activities, lifelong learning strategies	Self-assessment reports, learning portfolios

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to Engineering Design	5
2.	The Engineering Design Process	5
3.	Conceptualization and Design Methodologies	5
4.	Engineering Ethics and Professional Responsibility	5
5.	Teamwork and Collaboration in Engineering	5
6.	Research & Technical Communication Skills	5
7.	Customer Needs and Market Analysis	5
8.	Functional Decomposition & Reverse Engineering	5
9.	Establishing Product Specifications	5
10.	Concept Generation and Creativity	5
11.	Concept Evaluation and Decision Making	5
12.	Prototyping and Design for Manufacturing	5
13.	Materials Selection and Cost Analysis	5
14.	Detailed Design and Structural Analysis	5
15.	Final Project & Presentation	5
Total		75

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes	Weeks 3, 6, 10	10%
2.	Assignments	Throughout	10%
3.	Group Project	Week 12	15%
4.	Midterm Exam	Week 8	25%
4.	Final Exam	Week 15	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	Canbazoğlu, T. "Introduction to engineering: Engineering fundamentals and concepts: E-Book." (2018).
Supportive References	Taura, Toshiharu. <i>Creative design engineering: Introduction to an interdisciplinary approach</i> . Academic Press, 2016.
Electronic Materials	
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms with projectors and discussion space
Technology equipment (projector, smart board, software)	Computers with project management software (e.g., MS Project, JIRA)
Other equipment (depending on the nature of the specialty)	

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Indirect: Survey
Effectiveness of Students assessment	External Assessors	Direct: Q. Committee , Deanship of Improvement and Quality
Quality of learning resources	Program Leaders, Peer Reviewers	Direct: Stakeholders, Quality requirements, Deanship of Improvement and Quality
The extent to which CLOs have been achieved	Instructor, Q. Committee	Direct: Mid exam, HW, Quizzes, Project and Final Exam
Other	Students	Indirect: Survey

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE

Department of Mechanical and Industrial Engineering





REFERENCE NO.

The fifteenth session of the academic year 1446

DATE

06/11/1446

