Course Specification
(Bachelor)

Course Title:	Construction Engineering
Course Code:	CE 4402
Program:	Bachelor of Science in Civil Engineering
Department:	Civil Engineering Department
College:	College of Engineering and Architecture
Institution:	Umm Al-Qura University
Version:	1
Last Revision Date:	31 January 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: (10)					
4. Course General Description:					
This course covers the selection, operation, and management of construction equipment used in earthmoving, excavation, lifting, hauling, compaction, grading, and paving. It also explores concrete construction techniques, formwork design, safety practices, and productivity improvement strategies. Emphasis is placed on automation and smart technologies, including robotics, and AI, to enhance efficiency and sustainability in construction projects.					
5. Pre-requirements for this course (if any)**:**					
Reinforced Concrete Design (1)					
6. Co-requisites for this course (if any)**:**					
7. Course Main Objective(s):					
1. Understand Construction Equipment and Industry Applications. 2. Analyze Earthmoving, Excavation, and Lifting Operations. 3. Evaluate Compaction, Grading, and Paving Equipment. 4. Understand Concrete Construction and Formwork Design. 5. Apply Construction Safety Practices. 6. Improve Productivity and Performance in Construction Operations. 7. Integrate Automation and Smart Construction Technologies.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	45	100%
2	E-learning		
3	Hybrid		

No	Mode of Instruction	Contact Hours	Percentage
	• Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)

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

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 role of construction equipment and key industry trends.	**K1**	Lectures, and case studies.	Quizzes, and assignments,
1.2	Classify materials and evaluate excavation, lifting, and hauling equipment.	**K2**	problem-solving exercises.	Assignments, Reports
2.0	**Skills**			
2.1	Understand compaction, grading, and paving techniques.	**S1**	Hands-on demonstrations, and field visits.	Practical assessments, and quizzes
2.2	Explain concrete mixing, placement, curing, and temporary structures.	**S2**	Case studies, design exercises, and guest lectures.	Design projects, assignments, and exams
2.3	Identify hazards and implement safety measures in equipment operation.	**S3**	Safety demonstrations, workshops, and interactive discussions.	Safety evaluations, group projects, and exams.

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
3.0	**Values, autonomy, and responsibility**			
3.1	Enhance equipment efficiency and project resource management.	**V1**	Problem-solving sessions, and real-world case analysis.	Project presentations, reports, and class participation.
3.2	Explore robotics, GPS control, and AI applications in construction.	**V2**	Multimedia demonstrations,and research projects.	Research paper, presentations, and final exams.

C. Course Content

No	List of Topics	Contact Hours
1.	**Overview of the Construction Industry**: Sectors, Equipment Roles, and Emerging Technologies	3
2.	**Earthmoving Materials and Operations**: Earthmoving Techniques, and Equipment Selection	3
3	**Excavation and Lifting Equipment**: Excavators, Draglines, Cranes, and Hoisting Mechanisms	3
4	**Loading & Hauling Equipment**: Dump Trucks, Scrapers, Loaders, and Conveyor Systems	3
5	**Compacting & Finishing Equipment**: Rollers, Vibratory Plates, and Surface Smoothing Techniques	3
6	**Rock Excavation and Blasting**: Drilling Equipment, Blasting Techniques, and Safety Considerations	3
7	**Midterm Exam and Review**	3
8	**Paving and Surface Treatments**: Asphalt Pavers, Concrete Paving Machines, and Road Maintenance Equipment	3
9	**Concrete Construction Methods and Equipment**: Mixing, Placing, and Curing Techniques	3
10	**Concrete Formwork Design**: Scaffolding, Shoring, Falsework, and Structural Considerations	3
11	**Construction Safety**: OSHA Regulations, Hazard Identification, and Equipment Safety	3
12	**Improving Productivity and Performance**: Equipment Utilization, Maintenance Strategies, and Cost Optimization	3
13	**Automation and Smart Construction Equipment**: Robotics, GPS-Controlled Machinery, Drones, and AI Applications	3
14	Machinery, Drones, and AI Applications	3
15	**Course Summary, Case Studies, and Final Review**	3
Total		**45**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Written Exam	5	20
2.	Group Project	11	10
3.	Assignments	6	10
4.	Case Study Report	13	10
5.	Final Exam	16	50

*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	Nunnally, S. W. (2019). *Construction Methods and Management.* Pearson.
Supportive References	Peurifoy, R. L., Schexnayder, C., & Shapira, A. (2023). *Construction Planning, Equipment, and Methods.* McGraw-Hill.
Electronic Materials	Online resources, project management software
Other Learning Materials	Instructor-prepared notes, research papers

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	The university provide Adequate accommodation
Technology equipment (projector, smart board, software)	Projectors are available in the classroom
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	Indirect
Effectiveness of Students assessment	Civil engineering Course coordinator	.Direct
Quality of learning resources	Assessment Committee	Direct
The extent to which CLOs have been achieved	Civil engineering Course coordinator	Direct
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify)
Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**CIVIL ENGINEERING COUNCIL**
REFERENCE NO.	**THE FIFTEENTH SESSION OF THE ACADEMIC YEAR 1446**
DATE	**30 APRIL 2025**

