Course Specification
(Bachelor)

Course Title:	Global Navigation Satellite System (GNSS)
Course Code:	CE 41804
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: (9, 10)					
4. Course General Description:					
The course covers the main aspects and application fields of GNSS survey. It presents the definition of geoid and earth shape, ellipsoidal equations and coordinate systems. It includes the explanation of map projection and Transformation between coordinate systems. It presents all aspects of GNSS needed to understand and use including the basics technology, common hardware, surveying methods, survey design, planning and observations. It outlines the different civilian and military applications of GNSS. The integration of GNSS with GIS, remote sensing and echo sound are included.					
5. Pre-requirements for this course (if any)**:**					
Department Approval					
6. Co-requisites for this course (if any)**:**					
NA					
7. Course Main Objective(s):					
The main objectives of this course are: 1- The student will understand the geodetic basics of GNSS. 2- The student will be able to understand the GNSS performance, techniques different applications. 3- The student will have skills to practice GNSS techniques and applications for providing solutions for Hajj and Umrah.					

2. Teaching mode (mark all that apply)

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

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

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	45
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	To demonstrate knowledge of principles of Global Navigation Satellite System (GNSS)	**K1**	Lecture, Discussions	Written Exam
1.2	To demonstrate knowledge of contemporary issues in GNSS	**K1**	Lecture, Discussions	Written Exam
...				
2.0	**Skills**			
2.1	To increase the ability to imagine the details of GNSS and its elements	**S1**	Lecture, Discussions	Written Exam
2.2	To apply the GNSS basics, techniques, projection, geoid, equations, coordinat systems, observations	**S3**	Lecture, Discussions	Written Exam
...				

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
3.0	**Values, autonomy, and responsibility**			
3.1	To integrate professionally and ethically in a team work for GNSS applications	**V1**	Discussions	Grading Performance
3.2	To use life-long learning and continuing education for GNSS techniques and instrumentation	**V3**	Discussions	Grading Performance
...				

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction	3
2.	Geoid and Earth shape	3
3.	Ellipsoidal equations	3
4.	Coordinate systems	3
5.	Map projection	3
6.	Transformation between coordinate systems	3
7.	Basic concept of GNSS	3
8.	GPS	3
9.	GLONASS	3
10.	GALLILIO	3
11.	BIDUE, IRNASS	3
12.	Comparison study of the exist GNSS systems	3
13.	Errors in GNSS	3
14.	Observations techniques in GNSS	3
15.	Applications of GNSS	3
Total		**45**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Assignments	2, 4, 6, 10, 12	10%
2.	Mid Term Exam	8	30%
3.	Report & Presentation	15	10%
4.	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	J. Sanz Subirana, J.M. Juan Zornoza and M. Hernández- Pajares "GNSS data processing; Vol. I: Fundamentals and Algorithms". European Space Agency, 2013.
Supportive References	Shusen Tan "GNSS systems and engineering", John Wiely & Sons, Singapore, 2018
Electronic Materials	http://esa.int/ http:// https://www.gpsworld.com/
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	NA
Technology equipment (projector, smart board, software)	• Printers • Engineering Software
Other equipment (depending on the nature of the specialty)	International journal membership

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Faculty members who teach this course	• Students questioners running at the semester end. • Analysis of students` marks

Assessment Areas/Issues	Assessor	Assessment Methods
		Regular feedback of the students about the course and the teaching methods
Effectiveness of Students assessment	Faculty members who teach this course.	Regular revising and improving of the course contents.
Quality of learning resources	Program Leaders	Frequent improvement for teaching and learning techniques.
The extent to which CLOs have been achieved	Independent member(s) teaching staff	A sample of students' answer sheets is revised by a specified committee of the department
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 SESSION OF THE ACADEMIC YEAR 1446**
DATE	**30 APRIL 2025**

