

# **32Course Specification of Surveying 3**

	I. Course Identification and General Information:					
1	Course Title:	Surveying 3				
2	Course Code & Number:	CE20	4			
		C.H Cred			Credit	
3	Credit hours:	Th.	Tu.	Pr.	Tr.	Hours
			1		1	3
4	Study level/ semester at which this	3 <sup>rd</sup> Level/ 1 <sup>st</sup> semester				
•	course is offered:					
5	Pre –requisite (if any):	Surve	ying 1 - Su	rveying 2	2	
6	Co –requisite (if any):	Statist	tics			
8	Program (s) in which the course is	Civil	Engineerin	g		
0	offered:					
9	Language of teaching the course:	English + Arabic				
10	Location of teaching the course:	Class room+ Field				
11	Prepared By:	Bashir Saleh Al-Maswari				
12	Date of Approval					

Prepared by

Head of Department Dr. Abdulkareem Yahya Al khattabi Quality Assurance Unit Ass. Prof. Dr. Mohammad Algorafi

Dean of the Faculty Prof. Dr. Mohammed AL-Bukhaiti



## **II.** Course Description:

This course deals with the real figure of earth and its relationship with survey measurements and geodesy. The main topics will include the following: Coordinate Systems, Geodetic Calculations, Map Projection, Electromagnetic Distance Measurement Theory (EDM), Geodetic National Satellite Systems (GNSS), Triangular Irregular Networks (TIN), principles of errors Theory (Least Squares Theory).

III.	Course Intended learning outcomes (CILOs) of the course	Referenced PILOs
a.1	Define the figure of earth and types of geodetic reference systems and applying mathematics for geodesy and survey measurement calculations.	A1
a.2	Describe the relationship between different coordinate systems and map projection science.	A3
a.3	Show the impact of modern survey techniques, (EDM) and (GNSS) to the society.	A4
b.1	Demonstrate proficiency in the integration of information and processes in survey and geodesy works.	В3
<b>b.2</b>	Consider the economic, social, and environmental issues in survey and geodesy works.	B4
c.1	Use the Total Station (EDM) and (GNSS) equipment precisely and accurately considering the survey and measuring requirements.	C1
c.2	Use the modern tools and software packages related to total station (EDM) and GNSS field Data.	С3
c.3	Perform budgets and project briefs for deciding the sufficient technique of survey field works.	C4
c.4	Determine the method and the procedures of solving the geodetic, map projection and geodetic network problems.	C2
d.1	Write the field work report accurately including work description, measurements, calculations, results and necessary drawings.	D1
d.2	Work independently and within a team during field work with realization of the importance of leadership.	D3

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Dean of the Faculty Prof. Dr. Mohammed AL-Bukhaiti



**Reports** 

Written assignment





#### (A) Alignment Course Intended Learning Outcomes of Knowledge and Understanding to Teaching Strategies and Assessment Strategies: Course Intended Learning Outcomes Teaching strategies Assessment Strategies Lecture **a1.** Define the figure of earth and types Multimedia of geodetic reference systems and Problem set-Written Presentations applying mathematics for geodesy and exam Written Reading survey measurements. assignment. **Problem Solving** Lecture **a2.** Describe the relationship between Multimedia Participation- Report-Presentations different coordinate systems and map Written assignment projection science. Reading Presentation Lecture **a3.** Show the impact of modern survey Survey Field work

Multimedia

Presentations

Group projects

(B) Alignment Course Intended Learning Outcomes of Intellectual Skills to Teaching Strategies and Assessment Strategies:				
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies		
<b>b1.</b> Demonstrate proficiency in the integration of information and processes in survey and geodesy works	Group work Case study	Small projects		
<b>b2</b> . Consider the economic, social, and environmental issues in survey and geodesy works.	Lecture Multimedia Presentations Reading Group work	Written exam Small projects		

Prepared by Head of Department

Dr. Abdulkareem Yahya Al khattabi

techniques, (EDM) and (GNSS) to the

society.

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C Alignment Course Intended Learning Outcomes of Professional and Practical Skills to Teaching Strategies and Assessment Strategies:					
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies			
c1. Use the Total Station (EDM) and (GNSS) equipment precisely and accurately considering the survey and measuring requirements.	Lecture Multimedia Presentations Survey Field work Group projects Problem Solving	Survey Field practice Reports Written assignment			
c2. Use the modern tools and software packages related to total station (EDM) and GNSS field Data	Lecture Multimedia Presentations Reading Computer lab	Small projects project Written exam			
<b>c3.</b> Perform budgets and project briefs for deciding the sufficient technique of survey field works.	Multimedia Presentations Brainstorming Case study	Written assignment- Group work-project			
<b>c.4</b> . Determine the method and the procedures of solving the geodetic, map projection and geodetic network problems.	Lecture Multimedia Presentations Reading Problem Solving	Problem set-Written exam Written assignment			

(D) Alignment Course Intended Learning Outcomes of Transferable Skills to						
Teaching Strategies and Assessment Strategies:						
Course Intended Learning Outcomes Teaching strategies Assessment Strategies						
<b>d1</b> . Write the field work report accurately	lecture	Write the field work				
including work description, measurements,	Case study (field	report correctly and				
calculations, results and necessary drawings.	work)	accurately				
<b>d2.</b> Work independently and within a team	Lecture	Field work				
during field work with realization of the	field work	Participation				
importance of leadership.		Work in				

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# **IV.** Course Content:

# **A – Theoretical Aspect:**

	A – Theoretical Aspect.					
Orde r	Units/Topics List	Learning Outcomes	Sub Topics List	Number of Weeks	Contact Hours	
1	Introduction	a1	Brief history of geodesy Definitions	1	2	
2	Figure of Earth	a1-c4	Spheroid triangle Geoid Ellipsoid Geodetic reference systems (WGS84)	2	4	
3	Coordinate systems and geodetic calculations	a1- a2- c4- b1-b2	Geodetic, Cartesian and Astronomical coordinate systems Forward problem Reverse problem	2	4	
4	Map Projection	a2-c4-b1- b2	Map projection concept Map projection systems (UTM)	1	2	
5	EDM Theory	a3-b1-b2- c1-c2-d1	Total Station (TS) Instrument (Surveying Applications)	1	2	
6	EDM Theory	a3-b1-b2- c1-c2-d1	Total Station (TS) Instrument (Surveying Applications)	1	2	
7	GNSS	a3-b1-b2- c1-c2-d1- d2	GPS-GLONASS-GALILEO- COMPASS	2	4	
8	Error Theory and Geodetic Networks	a1-a3-c4- b2-d1-d2	Error concept in surveying Source and type of errors Accuracy and precision concept Geodetic networks establishment (TINs) Types of TINSetc	2	4	

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9	Analysis and Adjustment of Surveying and Geodetic Measurements	a1-a3-c4- b1-d1	Conditional equations Measured equations Equal Shift Method Precise adjustment method (Least Square Theory)	2	4
Number of Weeks /and Units Per Semester		14	28		

B - Tu	B - Tutorial Aspect:					
Orde r	Tasks/ Experiments	Number of Weeks	contact hours	<b>Learning Outcomes</b>		
1	Introduction	1	1	a1		
2	Figure of Earth	1	1	a1-c4		
3	Coordinate systems and geodetic calculations	2	2	a1- a2- c4-b1-b2		
4	Map Projection	2	2	a2-c4-b1-b2		
5	EDM Theory	3	3	a3-b1-b2-c1-c2-d1		
6	GNSS	2	2	a3-b1-b2-c1-c2-d1- d2		
7	Error Theory and Geodetic Networks	2	2	a1-a3-c4-b2-d1-d2		
8	Analysis and Adjustment of Surveying and Geodetic Measurements	1	1	a1-a3-c4-b1-d1		
Numb	er of Weeks /and Units Per Semester	14	14			

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C - Training Aspect:						
Orde r	Tasks/ Experiments	Number of Weeks	contact hours	Learning Outcomes		
1	Total station (TS) components and its applications.	1	1	a1-a3-c1		
2	Use TS applications: Areas, Tie Distances, Remote Height and Construction Lines.	1	1	a1-a3-c1- d1-d2		
3	Use TS applications: Surveying and stakeout.	2	2	a1-a3-c1- d1-d2		
4	Use TS in Highway projects.	2	2	a1-a3-c1- d1-d2		
5	Use the modern tools and software packages related to Total Station measurements.	3	3	a3-c2		
6	Use GNSS in surveying and geodesy.	2	2	a1-a3-c1- d1-d2		
7	Use the Internet, modern tools and software packages related to GNSS Data.	2	2	a3-c2		
8	Practical Exam	1	1	a3-b2-c1		
Nı	Number of Weeks /and Units Per Semester 14 14					

# V. Teaching strategies of the course:

Lecture

**Multimedia Presentations** 

Reading

Presentations

**Problem Solving** 

**Brainstorming** 

Group projects

Field work

Computer lab

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VI	. Assignments:			
No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1	Spheroid triangle and Geodetic reference systems.	a1-c1-b1	3	0.75
2	Transformation and rotation between different Coordinate systems.	a1-a2-c1-b1-b2	4	0.75
3	Geodetic Calculations (Forward and Reverse problems)	a1-c1-b1-b2	5	0.75
4	Map projection using UTM system.	a1-a2-c4-b1-b2	6	0.75
5	EDM Theory and Total Station Instrument (TS).	a1-a3-c4-b1-b2- c1-c2	8	1
6	GNSS.	a1-a3-c4-b1-b2- c1-c2	11	1
7	Error Theory and Geodetic Networks (TINs).	a1-c4-b1-b2	13	1
8	Analysis and Adjustment of Surveying and Geodetic Measurements using Least Squares Method.	a1-c4-b1-b2	15	1.5

VII	VII. Reports:							
No	Assignments	Aligned CILOs(symbols)	Week Due	Mar k				
1	Use TS applications: Areas, Tie Distances, Remote Height and Construction Lines.	a1-a3-c1-d1-d2	3	3				
2	Use TS applications: Surveying and stakeout.	a1-a3-c1-d1-d2	4	3				
3	Use TS in Highway projects.	a1-a3-c1-d1-d2	5	2.5				
4	Use the modern tools and software packages related to Total Station measurements.	a3-c2	6	2				
5	Use GNSS in surveying and geodesy.	a1-a3-c1-d1-d2	8	2.5				
6	Use the Internet, modern tools and software packages related to GNSS Data.	a3-c2	11	2				

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III.	III. Schedule of Assessment Tasks for Students During the Semester:					
No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes	
1	Written assignments	2,3,4,5, 6,14	7.5	5	a1-a2-c4-b1-b2	
2	Quizzes.	Two times randomly	7.5	5	a1-a2-c4-b1-b2	
3	Mid-term exam.	9 <sup>th</sup>	30	20	a1-a2-a3-c4-b1- c1	
4	Final-exam.	16th	90	60	a1-a2-a3-c4-b1- b2-c1-c3	
5	Reports	3rd, 5th, 8th, 11th, 14th, and 16th	15	10	a3-c1-c2-c3-d1- d2	
	Sum		150%	100%		

## **IX.** Learning Resources:

• Written in the following order: (Author - Year of publication – Title – Edition – Place of publication – Publisher).

### 1- Required Textbook(s) (maximum two ).

1- CONTROL SURVEYS IN CIVIL ENGINEERING: M. A. R. Cooper, 1987 Collins Professional and Technical Books.

#### 2- Essential References.

1- CONTROL SURVEYS IN CIVIL ENGINEERING: M. A. R. Cooper, 1987 Collins Professional and Technical Books.

2-المساحة: أنظمة الإحداثيات وقراءة الخرائط - 2002، الدكتور / يوسف صيام، أستاذ المساحة، كلية الهندسة، الجامعة الأر دنية مكتبة العروبة -عمان - الأردن.

### 3- Electronic Materials and Web Sites etc.

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7	K. Course Policies:
1	Class Attendance: The students should have more than 75 % of attendance in lectures, practical and field works according to rules and regulations of the faculty.
2	<b>Tardy:</b> The students should respect the timing of attending the lectures. They should attend on time.
3	Exam Attendance/Punctuality: The student should attend the exam 15 minutes earlier. The punctuality should be implemented according to rules and regulations of the faculty for midterm, Practical and final exams.
4	Assignments & Reports:  The assignment is given to the students after each lecture or chapter, the student has to submit all the assignments for checking on time.  The student must submit the report for checking on time.
5	Cheating:  If any cheating occurred during the examination, the student is not allowed to continue and he/she has to face the examination committee for enquiries.
6	Plagiarism: The student will be terminated from the Faculty, if one student attends the exam on another behalf according to the policy, rules and regulations of the university.
7	Other policies: -All the teaching materials should be kept out the examination hallThe Mobile phone and all digital media are not allowedThere should be a respect between the students themselves and their teacher.

Reviewed By	Vice Dean for Academic Affairs and Post Graduate Studies
	Dr. Tarek A. Barakat
	Dr. Mohammad Algorafi
	Deputy Rector for Academic Affairs Dr. Ibrahim AlMutaa
	Dr. Ahmed mujahed
	Dr. Munaser Alsubri

Prepared by Head of I

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# Course Plan (Syllabus) of Surveying 3

I. Information about Faculty Member Responsible for the Course:							
Name of Faculty Member	Bashir Saleh Al- Maswari	Office Hours					
Location& Telephone No.		SAT	SUN	MON	TUE	WED	THU
E-mail		2	2	2			

	II. Course Identification and General Information:						
1-	Course Title:	Surveying 3					
2-	Course Number & Code:	CE20	4				
			C	.H		Credit	
3-	Credit hours:	Th.	Tu.	Pr.	Tr.	Hours	
		2	1		1	3	
4-	Study level/year at which this course is	3 <sup>rd</sup> Lev	vel/ 1st Sem	ester			
•	offered:						
5-	Pre –requisite (if any):	Survey	ing 1 - Surve	eying 2			
6-	Co –requisite (if any):	Statisti	cs				
7-	<b>Program</b> (s) in which the course is	Civil E	Engineering				
	offered						
8-	Language of teaching the course:	English + Arabic					
9-	System of Study:	Semester					
10-	Mode of delivery:	Lecture + practical + lab					
11-	Location of teaching the course:	Class 1	room +lab				

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## **III.** Course Description:

This course deals with the real figure of earth and its relationship with survey measurements and geodesy. The main topics will include the following: Coordinate Systems, Geodetic Calculations, Map Projection, Electromagnetic Distance Measurement Theory (EDM), Geodetic National Satellite Systems (GNSS), Triangular Irregular Networks (TIN), principles of errors Theory (Least Squares Theory).

## IV. Intended learning outcomes (ILOs) of the course:

- Brief summary of the knowledge or skill the course is intended to develop:
- **a.1** Define the figure of earth and types of geodetic reference systems and applying mathematics for geodesy and survey measurement calculations. A1
- **a.2** Describe the relationship between different coordinate systems and map projection science. A3
- a.3 Show the impact of modern survey techniques, (EDM) and (GNSS) to the society. A4
- **b.1** Demonstrate proficiency in the integration of information and processes in survey and geodesy works. B3
- **b.2** Consider the economic, social, and environmental issues in survey and geodesy works. B4
- **c.1** Use the Total Station (EDM) and (GNSS) equipment precisely and accurately considering the survey and measuring requirements.
- **c.2** Use the modern tools and software packages related to total station (EDM) and GNSS field Data. C3
- **c.3** Perform budgets and project briefs for deciding the sufficient technique of survey field works. C4
- **c.4** Determine the method and the procedures of solving the geodetic, map projection and geodetic network problems. C2
- d.1 Write the field work report accurately including work description, measurements, calculations, results and necessary drawings.D1
- **d.2** Work independently and within a team during field work with realization of the importance of leadership. D3

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## **V.Course Content:**

Distribution of Semester Weekly Plan Of course Topics/Items and Activities.

# **A – Theoretical Aspect:**

Order	Topics List	Sub Topics List	Week	Contact
Oruci	Topics List	Sub Topics List	Due	Hours
1	Introduction	Brief history of geodesy	1	2
	muoduction	Definitions	1	<u> </u>
		Spheroid triangle		
2	Figure of	Geoid	2,3	4
_	Earth	Ellipsoid	_,c	
		Geodetic reference systems (WGS84)		
	Coordinate	Geodetic, Cartesian and Astronomical		
3	systems and	coordinate systems	4,5	4
	geodetic	Forward problem	,,,,	
	calculations	Reverse problem		
		Map projection concept		
4	Map	Map projection	6	2
	Projection	systems		
		(UTM)		
5	EDM Theory	Total Station (TS) Instrument (Surveying	7	2
		Applications)		
6	Midterm Exam		8	2
7	EDM Theory	Total Station (TS) Instrument (Surveying	9	2
		Applications)		
8	GNSS	GPS-GLONASS-GALILEO-COMPASS	10,11	4
		Error concept in surveying		
	Error Theory	Source and type of errors		
9	and Geodetic	Accuracy and precision concept	12,13	4
	Networks	Geodetic networks establishment (TINs)		
		Types of TINSetc.		
10	Analysis and	Conditional equations	14,15	4
10	Adjustment of	Measured equations	17,13	7

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	Surveying and	Equal Shift Method		
	Geodetic	Precise adjustment method (Least Square		
	Measurements	Theory)		
11	Final Exam		16	2
	Number of Weeks /and Units Per Semester			32

B - Tu	B - Tutorial Aspect:						
Order	Topics List	Week Due	Contact Hours				
1	Introduction	1	2				
2	Figure of Earth	2	2				
3	Coordinate systems and geodetic calculations	3,4	4				
4	Map Projection	5,6	4				
5	EDM Theory	7,8,9	6				
6	GNSS	10,11	4				
7	Error Theory and Geodetic Networks	12,13	4				
8	Analysis and Adjustment of Surveying and Geodetic Measurements	14	2				
	Number of Weeks /and Units Per Semester	14	28				

<b>C</b> -	<b>Training</b>	<b>Aspect:</b>
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Yahya Al khattabi

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Order	Topics List	Week Due	Contact Hours
1	Total station (TS) components and its applications.	1	2
2	Use TS applications: Areas, Tie Distances, Remote Height and Construction Lines.	2	2
3	Use TS applications: Surveying and stakeout.	3,4	4
4	Use TS in Highway projects.	5,6	4
5	Use the modern tools and software packages related to Total Station measurements.	7,8,9	6
6	Use GNSS in surveying and geodesy.	10,11	4
7	Use the Internet, modern tools and software packages related to GNSS Data.	12,13	4
8	Practical Exam	14	2
	Number of Weeks /and Units Per Semester	14	28

VI. Teaching strategies of the course:				
Lecture				
Multimedia Presentations				
Reading				
Presentations				
Problem Solving				
Brainstorming				
Group projects				
Field work				
Computer lab				

	VII. Assignments:						
No	Assignments	Aligned CILOs(symbols)	Week Due	Mark			

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1	Spheroid triangle and Geodetic reference systems.	a1-c1-b1	3	0.75
2	Transformation and rotation between different Coordinate systems.	a1-a2-c1-b1-b2	4	0.75
3	Geodetic Calculations (Forward and Reverse problems)	a1-c1-b1-b2	5	0.75
4	Map projection using UTM system.	a1-a2-c4-b1-b2	6	0.75
5	EDM Theory and Total Station Instrument (TS).	a1-a3-c4-b1-b2-c1-c2	8	1
6	GNSS.	a1-a3-c4-b1-b2-c1-c2	11	1
7	Error Theory and Geodetic Networks (TINs).	a1-c4-b1-b2	13	1
8	Analysis and Adjustment of Surveying and Geodetic Measurements using Least Squares Method.	a1-c4-b1-b2	15	1.5

VIII. Reports:						
No	Assignments	Aligned Week CILOs(symbols) Due		Mark		
1	Use TS applications: Areas, Tie Distances, Remote Height and Construction Lines.	a1-a3-c1-d1-d2	3	3		
2	Use TS applications: Surveying and stakeout.	a1-a3-c1-d1-d2	4	3		
3	Use TS in Highway projects.	a1-a3-c1-d1-d2	5	2.5		
4	Use the modern tools and software packages related to Total Station measurements.	a3-c2	6	2		
5	Use GNSS in surveying and geodesy.	a1-a3-c1-d1-d2	8	2.5		
6	Use the Internet, modern tools and software packages related to GNSS Data.	a3-c2	11	2		

IX. Schedule of Assessment Tasks for Students During the Semester:						
Assessment	Type of Assessment Tasks	Week Due	Mark	Proportion of Final Assessment		

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1	Written assignments	2,3,4,5, 614	7.5	5
2	Quizzes.	Two times randomly	7.5	5
3	Mid-term exam.	9 <sup>th</sup>	30	20
4	Final-exam.	16th	90	60
5	Reports	3rd, 5th, 8th, 11th, 14th, and 16th	15	10
	Sum		150	100%

## X. Learning Resources:

• Written in the following order: (Author – Year of publication – Title – Edition – Place of publication – Publisher).

### 1- Required Textbook(s) (maximum two).

1- CONTROL SURVEYS IN CIVIL ENGINEERING: M. A. R. Cooper, 1987 Collins Professional and Technical Books.

#### 2- Essential References.

1- CONTROL SURVEYS IN CIVIL ENGINEERING: M. A. R. Cooper, 1987 Collins Professional and Technical Books.

2- المساحة: أنظمة الإحداثيات وقراءة الخرائط - 2002، الدكتور / يوسف صيام، أسناذ المساحة، كلية الهندسة، الجامعة الأردنية- مكتبة العروبة -عمان - الأردن.

### 3- Electronic Materials and Web Sites etc.



	XI. Course Policies:
Unl	ess otherwise stated, the normal course administration policies and rules of the Faculty of
	apply. For the policy, see:
	Class Attendance:
1	The students should have more than 75 % of attendance according to rules and
	regulations of the faculty.
	Tardy:
2	The students should respect the timing of attending the lectures. They should attend
	within 1 minutes from starting of the lecture.
	Exam Attendance/Punctuality:
3	The student should attend the exam on time. The punctuality should be implemented
	according to rules and regulations of the faculty for midterm exam and final exam.
	Assignments & Projects:
4	The assignment is given to the students after each chapter, the student has to submit all
	the assignments for checking on time.
	Cheating:
5	If any cheating occurred during the examination, the student is not allowed to continue
	and he/she has to face the examination committee for enquiries.
	Plagiarism:
6	The student will be terminated from the Faculty, if one student attends the exam on
0	The student will be terminated from the Faculty, if one student attends the exam on another behalf according to the policy, rules and regulations of the university.
0	another behalf according to the policy, rules and regulations of the university.  Other policies:
7	another behalf according to the policy, rules and regulations of the university.  Other policies:  -All the teaching materials should be kept out the examination hall.
	another behalf according to the policy, rules and regulations of the university.  Other policies:

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