Module (Course Syllabus) Catalogue

2022-2023

College/ Institute	Erbil Technology College	
Department	Surveying and Road Construction	
Module Name	Geodesy surveying	
Module Code	GES401	
Degree	Technical Diploma ■ Bachler ☐ High Diploma ☐ Master ☐ PhD ☐	
Semester	Four	
Credits	5	
Module type	Prerequisite ☐ Core ■ Assist. ☐	
Weekly hours	3	
Weekly hours (Theory)	(1)hr Class	( )hr Workload
Weekly hours (Practical)	(2)hr Class	( )hr Workload
Lecturer (Theory)	Sadiq Ramazan Younes	
E-Mail & Mobile NO.	sadiq.younes@epu.edu.iq (07504626931)	
Lecturer (Practical)	Dlawar Mohammad Karim	
E-Mail & Mobile NO.	dlawar@epu.edu.iq (07504947119)	

Course Book

Course Description	The lectures are divided into 3 weekly hours. The subject is taught based on 1 hour of theoretical lecture and 2 hours of laboratory basics. This course deals with concepts of astronomy and geodesy that are relevant to the practice of surveying. They include theory, field techniques, coordinate systems, gravity and levelling; control surveys and networks; GPS surveying, an introduction to the figure of the Earth and its geometric and physical characteristics; solar and Polaris observation and computations involved in the determination of true north. This course introduces Applied Geodesy and Global Navigation Satellite Systems (GNSS), with a focus on positioning - including hands-on practical experience of collecting and processing data. It also details co-ordinate reference systems and gives an overview of other satellite geodesy techniques.
Course objectives	The main objectives to be achieved after the completion of this course are summarized below: ■ To revisit geoid, ellipsoid and terrestrial reference systems ■ To introduce time systems, satellite orbital motion and radio signal propagation ■ To describe modern GPS/GNSS techniques ■ To provide opportunities to gain practical experience in GPS data processing ■ To explain baseline adjustment, datum transformations and height determination ■ To allow the students to investigate potential applications of GNSS ■ To introduce other Space Geodesy techniques, especially those that contribute to the International Terrestrial Reference Frame (ITRF) Competencies Examine history of Geodesy Explain Eratosthenes' method for determining the size of the earth Define Cassinis' ellipsoid; Huygen's theoretical ellipsoid Understand and explain how the Global Positioning System (GPS) work Examine the figure of the earth and its geometric and physical characteristics Examine satellite systems Discuss the concepts of astronomy and how astronomy is applied to surveying Obtain a position by astronomic positioning

	Examine astronomic coordinates Define and explain the current technical terminology associated with GPS Understand and use spatial location standards, methods, and United States national map accuracy standards Examine National Geodetic Survey, United States Geological Survey, and World Geodetic Survey maps Examine National Imagery and Mapping Agency (NIMA) datasets Identify fundamental geodetic networks Evaluate methods of elevation determination Use GPS hardware and software to plan a GPS field survey Assess the needs in planning a GPS field survey. Utilize gathered data and GPS software to prepare for fieldwork Demonstrate the effective use of GPS hardware and software to collect geographic data in the field Utilize GPS methods and equipment to perform a control and topographic survey Utilize GPS methods and equipment to collect data to utilize in survey layout Operate GPS hardware and software to conduct real-time and post-processing differential GPS (DGPS Integrate DGPS data in a GPS database framework
Student's obligation	Attendance of students to the lectures Conducting assignments Conducting exams
Required Learning Materials	- Tutorials are prepared in the form of PowerPoint presentation by using data show. - Using white board to explain examples and offer more details.
Assessment scheme	10% Mid Term (Theory) 15% Mid Term (Practical)

	8% Quiz 10% Lab Activity (report, paper, homework, seminar..) 12% Class Activity (report, paper, homework, seminar..) 5% Homework 20% final practical 20% final theory
Specific learning outcome:	On completing this unit students will be able to: ■ Describe how GNSS works (including time, orbits, signals, etc) ■ Give an overview of space geodesy capabilities and how they contribute to the ITRF Describe the mathematical models for pseudo-range and carrier phase-based modes of positioning ■ Explain the mathematical models for both single receiver (absolute) positioning and relative positioning ■ Describe and assess GNSS error sources and biases, e.g. atmospheric delays and multipath ■ Select an appropriate working mode for a particular application ■ Discuss current status and future trends of GNSS ■ Process GNSS data using appropriate software and critically analyse the results -
Course References:	VI. Text Book: Fundamentals of Surveying by Milton O. Schmidt and Kam W. Wong Global Positioning System: Theory and Practice GNSS – Global Navigation Satellite Systems "Geodesy" by W Torge VII. References: 1. Surveying by Bannister and Raymond 2. Surveying by Bannister and Baker 3. Surveying Practice by Kissam 4. Elementary Surveying by Brinker and Wolf 5. Site Surveying and Leveling by Clancy 6. Surveying for Civil Engineers by Kissam 7. Surveying Theory and Practice by Davis et al. 8. Surveying by Evett

Course topics (Theory & Practical)	**Week**	**Learning Outcome**
Introduction and Principles of Operation Introduction and Overview of GPS The GPS Signal Reference Coordinate Systems Fundamentals of Satellite Positioning	1-4	

Errors in Observations Differential Positioning Kinematic Methods Relative Positioning		
GNSS Static Surveys Field Procedures in Satellite Surveys Planning Satellite Surveys Performing Static Surveys Data Processing and Analysis Sources of Errors and Mistakes in Satellite Surveys	5-8	
GNSS Kinematic Surveys Planning of Kinematic Surveys Initialization Equipment Used in Kinematic Surveys Methods Used in Kinematic Surveys Performing Post-Processed Kinematic Surveys Communication in Real-Time Kinematic Surveys Real-Time Networks Performing Real-Time Kinematic Surveys Machine Control Errors and Mistakes in Kinematic Surveys	9-12	
GPS Applications Topographic Surveys Layout Surveys Additional Applications	13-14	

Questions Example Design

Historically navigation relied on position of the ………….. and ………………..

Define latitude?

Define longitude?

What is the range of latitude angles?

What is the range of longitude angles?

What instrument were used by ship navigators to determine the ship's longitude?

Using A marine chronometer, one-hour difference is ……………………. Of longitude.

What does term GPS stand for?

Define GPS?

When was the launch date of the first GPS satellite?

1966☐ 1973☐ 1976☐ 1978☐

When was the date that initial full capacity of GPS satellites completed?

1981☐ 1993☐ 1992☐ 1995☐

How long a GPS satellite take to complete an orbit around the earth?

10 hours☐ 24 hours☐ 20 hours☐ 12 hours☐

How many orbits a GPS satellite complete in 24 hours?

How many orbits do a GPS satellite complete in 24 hours?

2☐ 1☐ 3☐ 4☐

How high do the GPS satellites fly in their orbit (in km)?
Define Geodesy?
What are types of Geodesy; just name them?
Define Geoid?
Define Ellipsoid?
Ellipsoid is the solid geometric shape obtained by …………….. an ellipse about its ……………………..
Define datum?
What are two types of horizontal datum; just name them?
Define a local datum?
Define a global datum?

Extra notes:

External Evaluator

This course book is reviewed by (Ahmad Redha Abdulrahman) as he is lecturer in Surveying department in Hawler Institute. He assessed and approved all content of the Computer Essentials subject as he admitted the course book is almost covered the several terms of Computer principils in both theoretical and practical aspects. The course can be presented in the classes for entire curriculum year.

Ahmad Redha Abdulrahman
signature