**University**: Benha University

**Faculty**: Faculty of Engineering at Shoubra

**Department offering the program**: Geomatics Engineering Department

**Program offering the course**: Geomatics Engineering Program

**1- Course Data (Basic Information)**

**Course Code:** GED209 **Course Title:**  Geodesy 2

**Semester/Year:** Second / 2022-2023 **Specialization:** Geomatics Engineering

**Prerequisite courses** : GED103

**Contact Hours:** 6 **Lecture:** 2 **Tutorial:** 2 **Lab:** 2

**2- Course Aims**

The aim of the course is to know the basic principles of classical geodesy, know the different coordinate systems used in geodesy, identify the actual and mathematical figure of the earth, identify the applications of geodesy in surveying fields, and solve the main geodetic problems by relating them to mathematical theorems, have a great knowledge of the theory of some geodetic instruments and complete surveying missions using the methodology of traditional geodesy.

**3- Course Contents**

Introduction – Celestial sphere – astronomic and geodetic coordinate systems - latitude, longitude, and azimuth determination – zenith determination ‐ Spherical triangles -Napier’s rule ‐ Time Methods to change time and its determination. History of the Egyptian Geodetic network ‐coordinate systems used in Geodesy – Establishing of local and world best fitting ellipsoid - Gravimetric effect on observations ‐ coordinate transformations – datum shift – Two and three-dimensional Geodesy – adjustment of three‐dimensional geodetic networks.

**4- Program Competences Served by the Course (A1, A5,A9, A10, B2 and B5)**

**Level (A) General Engineering Competences**

*On completing this course, students will be able to:*

**A.1** Identify, formulate, and engineering problems by applying engineering fundamentals, basic science and mathematics.

**A.5** Practice research techniques and methods of investigation as an inherent part of learning.

**A.9** Use creative, innovative, and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.

**A.10** Acquire and apply new knowledge, and practice self, lifelong and other learning strategies.

**Level (B) Surveying Engineering Competences**

 *At the end of this course, the students will be able to:*

**B.2** Select the suitable tools and different technologies of data gathering for surveying works according to the required accuracy.

 **B.5** Be aware of basic law and regulation rules needed for different survey works.

**5- Learning Outcomes (LO’s)**

*At the end of the course, the student will be able to:*

|  |
| --- |
| Cognitive Domain |
| LO1 |

|  |
| --- |
|  |
|  |
| Recognize the concept of classical and 3D geodesy.  |
|  |

 |
| LO2 | Solve geodetic problems. |
| LO3 | Explain the geometry of the figure of the earth. |
| LO4 | Apply the geodetic mathematical models. |
| LO5 | Evaluate measurement of geodetic networks. |
| LO6 | Use the knowledge of mathematics, engineering sciences, information technology and planning projects in geodesy |
| Psychomotor Domain |
| LO7 | Construct different geodetic networks |
| Affective Domain |
| LO8 | Select rules needed for different geodetic networks. |

**6- Mapping Learning Outcomes (LO’s) with competences**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  **LO’s NARS** | **A1** | **A5** | **A9** | **A10** | **B2** | **B5** |
| LO1 | ◼ |  |  |  |  |  |
| LO2 | ◼ |  |  |  |  |  |
| LO3 | ◼ |  |  | ◼ |  |  |
| LO4 |  | ◼ |  |  |  |  |
| LO5 |  |  |  | ◼ |  |  |
| LO6 |  | ◼ |  |  |  |  |
| LO7 |  | ◼ | ◼ |  |  | ◼ |
| LO8 |  |  | ◼ |  | ◼ | ◼ |

**7- Lecture Plan**

Topics to be covered weekly & Matrix of LO’s

| Week | Topics | Planned Hours | Learning Outcomes |
| --- | --- | --- | --- |
| LO1A1 | LO2A1 | LO3A1 | LO4A5 | LO5A10 | LO6A5 | LO7A5-A9-B5 | LO8B2-A9-B5 |
| W1 | Introduction – Celestial sphere – astronomic and geodetic coordinate systems  | 6 |  |  |  | **◼** |  |  |  | ◼ |
| W2 | latitude, longitude,  and azimuth determination –  | 6 | ◼ |  |  | **◼** |  |  |  | ◼ |
| W3 | zenith determination ‐ Spherical triangles – Napier’s rule  | 6 | **◼** |  |  |  |  | **◼** |  |  |
| W4 | Methods to change time and its determination | 6 |  | ◼ |  |  | **◼** |  |  | ◼ |
| W5 |  History of the Egyptian Geodetic network ‐coordinate systems used in Geodesy | 6 |  |  | **◼** |  |  |  |  |  |
| W6 |  Establishing of local and world best fitting ellipsoid | 6 |  | ◼ |  |  |  |  |  | ◼ |
| W7 | Mid-term Exam | 6 |  |  | **◼** |  | **◼** |  |  |  |
| W8 |  Gravimetric effect on observations | 6 |  |  | ◼ |  |  | **◼** |  |  |
| W9 | ‐ coordinate transformations  datum shift  | 6 |  |  |  |  |  |  | ◼ | ◼ |
| W10 | Two and three‐ dimensional Geodesy | 6 |  |  |  | ◼ |  |  | ◼ | ◼ |
| W11 | adjustment of three dimensional geodetic networks | 6 |  |  |  | ◼ |  |  | ◼ | ◼ |
| W12 | Curvature and refraction effects. | 6 |  |  |  |  | **◼** |  | ◼ | ◼ |
| W13 | datum shift  | 6 |  |  |  | **◼** |  | **◼** |  |  |
| W14 | Oral Exam |  |  |  |  |  |  |  |  |  |

**8) Teaching and Learning Methods**

| **Learning Outcomes** | **Teaching and Learning Methods** |
| --- | --- |
| Face-to-face Lecture | Online Lectures | Tutorial / Exercise | Group Discussions | Laboratory | Self-Reading | Presentation | Collaborate Learning (Team Project) | Research and Reporting | Brain Storming  |
| **Cognitive Domain** | LO1 | ⚫ |  | ⚫ | ⚫ |  |  |  |  | ⚫ | ⚫ |
| LO2 | ⚫ |  | ⚫ | ⚫ |  | ⚫ |  |  | ⚫ |  |
| LO3 | ⚫ |  | ⚫ | ⚫ |  |  |  |  | ⚫ | ⚫ |
| LO4 | ⚫ |  | ⚫ | ⚫ |  |  |  |  | ⚫ |  |
| LO5 | ⚫ |  | ⚫ | ⚫ |  | ⚫ |  |  | ⚫ |  |
| LO6 | ⚫ |  | ⚫ | ⚫ |  |  |  |  | ⚫ |  |
| **Psychomotor Domain** | LO7 | ⚫ |  | ⚫ | ⚫ |  | ⚫ |  |  | ⚫ | ⚫ |
| **Affective Domain** | LO8 | ⚫ |  | ⚫ | ⚫ |  |  |  |  | ⚫ | ⚫ |

**Student Academic Counseling and Support**

* Students are directed to contact teaching staff for academic support during specific office hours.
* There are no disabled students in the program, thus no special support is needed.

**9- Student Assessment**

**a) Student Assessment Methods**

| **Learning Outcomes** | **Assessment Methods** |
| --- | --- |
| Written Exams | Online Exams | Oral Exam | Pop Quizzes |  In-class Problem Solving | Take-Home Exam | Research Assignments | Reporting Assignments | Project Assignments | In-class Questions |
| **Cognitive Domain** | LO1 | ⚫ |  | ⚫ |  | ⚫ |  |  | ⚫ |  | ⚫ |
| LO2 | ⚫ |  | ⚫ |  | ⚫ |  |  | ⚫ |  |  |
| LO3 | ⚫ |  | ⚫ | ⚫ | ⚫ |  |  | ⚫ |  | ⚫ |
| LO4 | ⚫ |  | ⚫ |  | ⚫ |  |  | ⚫ |  |   |
| LO5 | ⚫ |  | ⚫ | ⚫ | ⚫ |  |  | ⚫ |  |  |
| LO6 | ⚫ |  | ⚫ |  | ⚫ |  |  | ⚫ |  |  |
| **Psychomotor Domain** | LO7 | ⚫ |  | ⚫ | ⚫ | ⚫ |  |  | ⚫ |  | ⚫ |
| **Affective Domain** | LO8 | ⚫ |  | ⚫ | ⚫ | ⚫ |  |  | ⚫ |  | ⚫ |

**b- Assessment Schedule and Weight**

|  |  |  |
| --- | --- | --- |
| **Assessment Tool** | **Week** | **Weight** |
| Midterm Examination | 7 | 20 % |
| Final Examination | (As Scheduled) | 50 % |
| Quizzes  | 3,5,9 | 10 % |
| Home assignments, and Reports | 2,4,6,8,10,12 | 10% |
| Oral Exam | 14 | 10% |
| **Total** |  | **100** % |

**10- Facilities**

The following facilities are needed for this course:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ■ | Classroom | □ | Smart Board | □ | Computer with software |
| ■ | Lecture Hall | ■ | White Board | □ | MIS system |
| ■ | Sound and Microphone | ■ | Data Show | □ | Internet Access |
| □ | Other: …  |  |  |  |  |

**11- List of References**

a‐ Course Notes

 1‐ PPT prepared by instructor

 b‐ Books 1‐ Hooijberg, M., 2007. Geometrical Geodesy: Using Information and Computer Technology. Spr verlag, Berlin, Germany.

2‐ Hooijberg, M., 2011. Practical Geodesy: Using Computers. Springer Ltd, London, UK

3‐Hirt, C. and Buerki, B. 2006: Status of geodetic Astronomy at the beginning of 21st Century

4‐Surveying and Geodetic Applications: Applications based on extensive field experience LAMBERT Academic Publishing (August 20, 2018)

5.Hand book of Geodetic astronomyPublished by LAP LAMBERT Academic   Publishing (July 28, 2011)

**- Course Coordinator: Prof. Dr. Ali Ahmed El-Sagheer Signature:**

 **Dr. Omayma Obada Signature:**

**- Program Coordinator: Prof. Dr/ Mahmoud salah Signature:**