**The Ministry of Education of the Azerbaijan Republic**

**The State Oil Company of the Azerbaijan Republic**

**Baku Higher Oil School**

Process Automation Engineering Department

**Analytical Geometry**

**Courses Syllabus**

Fall, 2024

Instructor : Tural Badalov

Course code: Course credit : 6

Office : 303, Campus Aypara Office hours : M-F 09.00-16.00

Prerequisites: -

Language of instruction: English

Schedule :

* CE 21.1/21.2: Lecture
* CE 21.1: Laboratory
* CE 21.2: Laboratory

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**Description about course**

In this course, the basic classical methods of mathematics, necessary for future engineers, are given. This course includes the following chapters:

Matrices and Determinants. Equation of a straight line in plane and in space. Equation of a plane. Second –order curves. Ellipse, hyperbola, parabola. Complex Numbers.

Scalar and vector quantities. Scalar product, vector product and its properties. Mixed product of three vectors and its properties.

**Course objective section**

It aims to introduce the basic techniques of Mathematics in order to develop creative thinking, problem solving and effective communication skills based on the mathematical way of thinking and also to understand cases drawn from other areas of research (economics, computer science, social sciences, etc.) and apply the appropriate methods effectively to these areas.

**Learning outcomes section**

* Basic properties of determinant,rules for calculation of two- and three-order determinants:
* Geometric interpretation of Complex numbers;
* Equations of a straight line in plane .Conditions of parallelism and perpendicularity. Canonical and parametric equations of a straight line in space;
* The normal equation of a plane. Distance from point to plane. The mutual state of the two planes;
* Expression of scalar product, vector product and mixed product of vectors in terms of their coordinates. Area and volume calculation by means of vectors.

**Assessment methods**

The exams are done using computers. Some part of exams is written examination. All questions must be answered.

**Grading**

**Exam Weight Date Exam minutes**

Final 60% TBA (to be announced) 120

Midterm 30% 6th week of the semester 60

Participation 10% deadline

**Area grading scale**

A 91-100

B 81-90

C 71-80

D 61-70

F ≤ 60

**Rules**

**Exams**

In order to be excused from the exam, the student must contact the dean and the instructor before the exam. Excuse will not be granted for social activities such as trips, cruises and sporting events (unless you are participating). The exams will all be cumulative. Most of the questions on each exam will be taken from the chapters covered since the last exam.

But some will come from the earlier chapters. In general, the coverage will reflect the amount of the time spend in class on the different chapters.

**Withdrawal (pass / fail)**

This course strictly follows grading policy of the Process Automation Engineering Department. Thus, a student is normally expected to achieve a total mark (preexam score + exam score) of at least 61 to pass. In this case of failure, he/she will be referred or required to repeat the course the following term or year.

**Late policy**

Late assignment submissions won’t be accepted for grading. The grade for this assignment will be **zero**.

**Teaching resources**

Presentation : Analytical geometry (in site: [www.lms.bhos.edu.az](http://www.lms.bhos.edu.az))

**Textbook**

:

1. Robert. A. Adams Calculus. A Complete Course. Pearson Canada, Toronto.2014.

2.Ron Larson. Elementary Linear Algebra. The Pennsylvania State University 2014

3.A.D.Myshkis. Introductory Mathematics for Engineers. Moscow .2001

For class presentations and discussions, the student should utilize journal and internet materials. Moreover, the course does not limit the use of learning materials available at BHOS library.

**Attendance**

The students are required to attend all classes as a part of their studies and those having legitimate reasons for absence (illness, family bereavement, etc.) are required to inform the instructor.

**Professionalism and Participation**

1. Attend class regularly, arrive on time, leave only when dismissed

2. Attend class with all materials required, be prepared to listen and work

3. Be well prepared for class, read all required materials, and complete all necessary preparation

4. Be attentive in class, take notes, contribute to discussion and ask intelligent questions

5. Demonstrate professional and respectful interpersonal relationships with peers and instructor: ATTITUDE COUNTS, AND whining is unacceptable

6. Take responsibility for your actions, and your results

**Plagiarism**

Honesty requires that any ideas or material taken from another source for written, visual, or oral use must be fully acknowledged. Offering the work of someone else as one’s own is plagiarism. The language or ideas thus taken from another may range from isolated formulas, images, sentences or paragraphs to entire articles copied from books, periodicals, speeches, or the writings and creations of other students. The offering of materials assembled or collected by others in the form of projects or collections without acknowledgment also is considered plagiarism. Any student who fails to give credit for ideas or materials taken from another course is guilty of plagiarism.

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| **Week** | **Topics** | **Textbook/Assignments** |
| 1-2 | **Equation of straight line on the plane**   * The line on the plane and its equations. Straight line and its general equation. A straight line equation passing through two points. Parametric equations of a straight line. Normal equation of a straight line * Equation with the angle coefficient of a straight line. The angle between two straight lines. Conditions of parallelism and perpendicularity of two straight lines. * Some simple problems of analytical geometry. Projection of the directed piece on the axis and its properties, division of the piece in a given ratio. | Textbook 1,  Chapter 10,  Pp 585-590 |
| 3 | **Matrices and determinant**   * Matrices and operations on them. Two- and three-order determinants. Basic properties of the determinant. | Textbook 2  Chapter2,  Pp40-62 |
| 4-5 | **Vectors. Scalar and Vector products**   * Scalar product of two vectors and its properties. Expression of scalar product in coordinates. * Vector product of two vectors and its properties. Expression of vector product in coordinates. * Area and volume calculation | Textbook1,  Chapter 10,  Pp568-583 |
| 6 | **Mixed product of Vectors**   * Mixed product of vectors and its properties. Expression of mixed product with coordinates. The coplanarity condition of three vectors. | Textbook1,  Chapter 10,  Pp568-583 |
| 7 | **Plane equations**   * The general, normal and intercept forms of the equation of plane. Plane equation passing through three points. The angle between two planes. Distance from a point to plane. Mutual position of two planes | Textbook1,  Chapter 10,  Pp585-590 |
| 8 | **Straight line equations in space**   * The canonical and parametric equations of a straight line in space. A straight line equation passing through two points. The angle between two straight lines. Mutual position of plane and straight line. The angle between a straight line and a plane . | Textbook1,  Chapter 10 |
| 9 | **Circles, ellipses**   * Circle and its equation. Definition of an ellipse, derivation of canonical equation, eccentricity. | Textbook3  Chapter 2,  Pp96-105 |
| 10 | **Hyperbola, parabola**   * Definition of hyperbola, derivation of the canonical equation, eccentricity, directrix and asymptotes. Definition of parabola, canonical equation | Textbook3  Chapter 2,  Pp96-105 |
| 11 | **General equation of second-order curves**   * General equation of second-order curves and determination of their type. Invariants of a second-order curves. Canonical representation of the general equation of second-order curves. | Textbook3,  Chapter 10,  Pp314-326 |
| 12 | **Complex numbers**   * Concept of complex numbers. Operations on complex numbers. Argument and absolute value of complex numbers. Trigonometric form of complex numbers. Euler formula. The power of a complex number and root from a complex number. Geometric interpretation. | Textbook 3,  Chapter 8,  pp 259-267 |
|  | **Final Exam** |  |

**Instructor of the course \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Head of the department \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**