

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

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

**Baku Higher Oil School**

“Approved by”

Rector of Baku Higher Oil School

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Elmar Gasimov**

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Computer Engineering Department

Calculus

**Courses Syllabus**

Fall, 2024

Instructor : Nijat Aliyev, PhD

Course code: MATH 205 Course credit hour : 6

Office : 112, Campus Aypara Office hours : T 15.00-15.50

Prerequisites: No prerequisites Language of instruction: English

Schedule : Lecture Tue 12.00-12.50, Th 11.00-11.50

Tutorial Tue 10.00-11.50, 15:00-15:50, Th 10.00-14.50

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**Description about course**

A course of Calculus studies the various concepts in pure and applied mathematics. The course consists of five chapters which include Differentiation of functions of a single variable, Integration of functions of a single variable, Sequences and series, Differentiation of functions of many variables, Integration of functions of many variables. Lectures will introduce the mathematical theory as well as worked examples taken from the fields of science, engineering and other numerate disciplines. Tutorials will support the students learning by providing a forum for practicing their mathematical skills. Students will gain a sound mathematical knowledge as well as an appreciation of mathematics as an important tool for a scientist or engineer.

**Course objective section**

**Course objectives for the Students:**

* Develop a high level of understanding of using mathematical methods in solving different problems of engineering and science
* Work cooperatively to facilitate a collegial atmosphere conducive to learning for all students in the class.
* Prepare for and attend each class by reading the assigned sections before class, completing homework, and participating in class discussions and team activities.

**Course objectives for the Instructor:**

* To provide all students the tools necessary to succeed in their pursuit of a high level of understanding of the principles of solving optimization problems, differentiation and integration of functions of one and two variables,
* To provide all students with an atmosphere conducive to learning the principles of mathematics.
* To provide sufficient feedback to students, enabling them to gauge their progress towards achieving their goal in learning the principles of mathematics.
* To facilitate student learning through the use of appropriate activities, appropriate technology, and the illustration of mathematical applications in the real world.

**Learning outcomes section**

* Students will know and will be able to differentiate and integrate different functions , to use applications of derivatives in investigating the functions and solving engineering optimization problems. They will also use integrals in calculating the areas and volumes. They will be able to use convergence tests to determine whether the series is convergent or divergent.
* The students will be able to find partial derivatives of the functions of two or more variables, to determine their stationary points and classify them as maxima, minima and saddle points. They will demonstrate appropriate knowledge in solving optimization problems.
* They will also learn how to calculate double integrals, interchange the order of integration, rewrite the double integral from Cartesian coordinates to polar coordinates. They will understand the applications of double integrals: volume, average values, mass and center of mass.
* Students will have strong mathematical reasoning and problem solving skills and apply these skills to the solution of theoretical and applied problems in Engineering.
* Students will demonstrate a comprehension of technology by understanding how things work on a fundamental level.

**Assessment methods**

The exams are written examination. All questions must be answered.

**Grading**

**Exam Weight Date Exam minutes**

Final 70% TBA (to be announced) TBA

Midterm 30% 6th week of the semester TBA

Resit exam 70%

**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. In the case of failure the student can also be given a chance to retake the exam. Resit exam will be graded out of 60%, and 40% for midterm exam will remain unchanged.

**Late policy**

Late homeworks need not to be accepted for grading. (this is sample you can change the policy)

**Teaching resources**

Textbook :

[1] George B. Thomas Calculus: early transcendentals, 13th edition, 2006

[2] Stroud K.A. Engineering mathematics; with additions by Dexter J. Booth, 5th edition, Industrial Press, Inc. New York, 2001(available in BHOS library)

[3] Croft A., Davison R. Mathematics for Engineers , 3rd edition, 2008 (available in BHOS library)

[4] Mary P Attenborough, Mathematics for Electrical Engineering and Computing, 2003 (available in BHOS library)

[5] Anton Howard, Calculus with analytic geometry, 1992

[6] Roy Larson, Bruce H. Edwards, Calculus of a Single Variable, 9th Edition

[7] Roy Larson, Bruce H. Edwards, Multivariable Calculus, 11th Edition

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 |  | Functions. Domain and range of a function. Trigonometric functions. Rate of change. Limit of a function. Asymptotes. Continuous functions. Derivative of a function, differentiation rules. | [1], Chapter 1,2 |
| 3 |  | Implicit Differentiation. Chain Rule. Applications of derivatives. Stationary points, increasing and decreasing functions, concave up and concave down functions, maxima and minima, inflection points. Optimization problems. Implicit differentiation. | [1], Chapter 3,4 |
| 4 |  | Area and estimating with finit sums. Definite integral. Fundamental theorem of calculus. Antiderivative, the indefinite integral. Methods of Calculation. Integration by substitution. | [1], Chapter 5 |
| 5 |  | Integration techniques. Integration of rational, irrational and transcendental functions. Integration by partial fractions. Integration by parts. | [1], Chapter 8 |
| 6 |  | Applications of definite integrals: area under the curve, area between two curves. Improper integrals. | [1], Chapter 6,8 |
| 7 |  | Sequences and series. Infinite series. Convergent and divergent series. Algebraic properties of infinite series. Tests for convergence. Alternating series test. Power series. Approximating functions by polynomials. Maclaurin and Taylor series. | [1], Chapter 10 |
| 8 |  | Functions of two or more variables. Geometry of Vectors. | [1], Chapter 13 |
| 9 |  | Partial Derivatives.Using the chain rule to find partial derivatives. Stationary points of the functions of two variables. | [7], Chapter 14 |
| 10 |  | Classification of stationary points. Maxima, minima and saddle points. Solving optimization problems | [7], Chapter 14 |
| 11 |  | Integration of functions of two variables. Double integrals. Interchanging the order of integration. | [7], Chapter 15 |
| 12 |  | Applications of double integrals: volume, average value, mass and center of mass. | [7], Chapter 15 |
| 13 |  | Preparing for the final exam. |  |
|  |  | **Final Exam** |  |

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

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