American University-Central Asia

SYLLABUS
LINEAR ALGEBRA
AND ANALYTIC GEOMETRY
(MAT 131, ID 2926)

Required and recommended for the students of "Applied Mathematics and Informatics" and "Software Engineering"
Fall 2015 (September 1 – December 11)

1. **Instructor:** Sklyar Sergey Nikolaevich - Professor, Doctor nauk in Physics and Mathematics. Office: 415, Phone: +998(312)91-50-00(Ext: 426), E-mail: sklyar_s@auca.kg
2. **Consultations:** according to the preliminary arrangement with instructor.
3. **Volume of academic load:** 3 classes per week (one lesson = 50 minutes), 15 working weeks, total **6** credits.
4. **Brief course description:** This course will introduce to the elements of linear algebra and analytic geometry with examples from real life and various sciences. In selecting such problems for our examples and exercises we highlighted this motivation by references to applications in the social, business, and life sciences. The course was prepared with three related objectives: concreteness, motivation and applicability.
5. **Prerequisites:** secondary school mathematics.
6. **Textbooks:**

Required:

1. Lial M., Miller C. Finite mathematics and calculus with applications. -Scott, Foresman and Company. 1989.
2. Сборник задач по алгебре и аналитической геометрии. Под редакцией Феденко А.С. Минск, 1999.

Additional:

3. Tomas G.B., Jr. Ross L. Finney "Calculus and analytic geometry", Addison-Wesley Publishing Comp., 1988.
4. Петрова В.Т. Лекции по алгебре и геометрии. Часть 1. Москва, 1999.
5. Гусак А.А. Справочное пособие к решению задач: аналитическая геометрия и линейная алгебра. Минск, 1998.

7. **Objectives:** The primary objectives of this course are:
- ✓ to develop abstract and logical (probative) thinking,
- ✓ understanding how to set and solve problems,
- ✓ acquiring as basic knowledge of linear algebra and analytic geometry,
- ✓ appreciating the value of continued mathematical education for the major.

8. **Expected outcomes:** After completing MAT 103, MAY 131 the student will be able to
- ✓ Understand basic matrix operations and solve systems of linear equations.
- ✓ Formulate and apply an equation, inequality or system of linear equations to a contextual (real-world) situation.
- ✓ Determine equations of lines, including point-slope, slope-intercept forms and parametric and symmetric equations; the plane and line in space.
- ✓ Understand two- and three-dimensional vectors and solve the problems.
- ✓ Determine equations of a circle, parabola, ellipse and hyperbola; cylinder, cone, ellipsoid, hyperboloids and paraboloids.
- ✓ Develop the algebraic skills necessary for problem solving.
- ✓ Develop the ability to model linear, quadratic, and other nonlinear relations, including the use of the graphing techniques and geometrical principles as tools, for the purpose of solving real-world problems.

9. **Requirements and knowledge evaluation:**

Grading

Grades will be based on a total of 100 points, coming from**:**

Quiz 1	The instructor sets day and time	10 points
Midterm Exam	The instructor sets day and time	30 points
Quiz 2	The instructor sets day and time	10 points
Final Exam	Office of the Registrar sets day and time	40 points
Homework and class activity	Every class	10 points

The final grade of the student will calculated in conformity with a following scale:

0 ≤ F ≤ 40 < D ≤ 45 < C- ≤ 50 < C ≤60 < C+ ≤65< B- ≤70 < B ≤ 80 < B+ ≤ 85< A- ≤ 90 < A≤100.

Make-up Exams and Quizzes

- ✓ If the reason for missing any exam or quiz is not valid, then the grade 0 will be given for the missing exam or quiz.
- ✓ If a student misses both exams for any reasons, he/she will not be attested for the course.
- ✓ If the reason for missing the midterm exam is valid, the student's Final Exam will be worth up to 60 points. In this case, extra tasks will be included in the Final Exam.
- ✓ If the reason for missing the Final Exam is valid, the student can apply for the grade of "I".

Attendance Requirements

It is important to attend classes to master the materials in the course. Attendance affects grades: students lose 1 point for any unexcused absence. Missing 10 or more classes for any reasons will result in a grade of "F" in the course.

Academic Honesty

The Applied Mathematics and Informatics Department has zero tolerance policy for cheating. Students who have questions or concerns about academic honesty should ask their professors or refer to the University Catalog for more information.

Cell phones

We ask students to turn off their cell phones during math classes. Use of cell phones is entirely prohibited during the exams.

Syllabus change

Instructors reserve the right to change or modify this syllabus as needed; any changes will be announced in class.

10. Course content and tentative academic calendar:

Week 1.

Matrix algebra, properties of matrix operations. [1]: p.114-131, [4]: p.154-162.

Week 2-3.

Systems of linear equations. Determinant. Kramer rule. [1]: p.90-102, [4]: p.224-258.

Weeks 3-4.

Systems of linear equations. Gauss-Jordan method [1]: p.103-114.

Weeks 5-6.

Inverse of a matrix and application to the systems of linear equations. [1]: p.132-142; [4]: p. 168-179.

Applications of the linear algebra methods (optional): Cryptography, Input-Output Models, Leontief's Model. [1]: p.143-152, 156-160.

Weeks 7.

Cartesian coordinate system on a plane and in a space. Distance between two points. Segment division. . [1]: p. 30-64.

Weeks 8-9.

Vectors. Linear space, properties of vectors operations, geometric interpretation of vector. The scalar (dot) product, angle between vectors. Linear independence and expressing a vector by the basic vectors. Vector (cross) product. [1]: p. 30-64, [3]: p. 748-785.

Weeks 10-12.

Analytical geometry on plane. Straight line on plane. Equation of line in the Cartesian system of coordinates, angle between lines, parallel lines. Different methods of the line representation. Distance from point to line. Algebraic curves of the second order: ellipsis, parabola, hyperbola [1]: p.132-139, [3]: p. 2-17, 516-548.

Weeks 13-15.

Analytical geometry in space. The plane and line in space. Equations of plane and line in Descartes coordinate system, angle correlations: between planes, between lines, between line and plane in space. Distances: from point to plane, from point to line. Surfaces of the second order: cylinder, cone, ellipsoid, hyperboloids and paraboloids. [3]: p.841-851.

Applications of the analytical geometry methods (optional): Linear Programming. A geometric approach to linear programming problems. Applications of linear programming. Optimum production output. Diet problem. Transportation problem. [1]: p. 162-188.