HANDONG
UNITWIN
FELLOWSHIP

## SYLLABUS

## Lecturer's Information

| Name | Orlovskyi Igor |
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| University | National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" |


| Course Information |  |  |  |  |
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| Course Name | Linear algebra and | ical geometry for engineers | Prerequisite Course | secondary school |
| Course Date | 2023-09-05 | ~ 2023-12-21 | Course Language | Ukrainian |
| Keyword | Matrix, Linear Equations,Vector, Line, Plane, Ellipse, Hyperbola, and Parabola |  |  |  |


| Course Description (100 ~200 words) | The discipline "Linear algebra and analytical geometry for engineers " plays a significant role in the preparation of bachelors in the most engineers specialty Study subjects promote analytic thinking and allow the use of approaches, methods, and knowledge of mathematics at mastering other disciplines of special profile, lays the foundation for professional competence. <br> The discipline studies the basic concepts and theorems of linear algebra and analytic geometry and their consequences; to solve geometric, physical, mechanical and other problems; use methods of application of the theoretical apparatus of mathematic in solving practical problems of engineering. <br> The course "Linear algebra and analytical geometry for engineers " is oriented on the freshmen students of different engineers faculties of National Technical University of Ukraine "Igor Sikorsky Kiev Polytechnic Institute". <br> The course contains: <br> - Lecture material <br> - A set of solved tasks |
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| Course Goals and Objectives (Approximately 100 words) | The study of modern engineering science is impossible without knowledge of fundamental mathematics and the application of mathematical models and methods. Teaching the course "Linear algebra and analytical geometry for engineers" is a basic at: - students' mastering the fundamentals of mathematical apparatus; <br> - development of logical thinking; <br> - engineering problem statement and application of this problems; <br> - application of methods and algorithms for engineering problems solution. <br> For the study of the course "Linear algebra and analytical geometry for engineers" the knowledge of mathematics at the level of secondary school is necessary. <br> The main tasks of the cycle of lectures and practical classes: to learn to apply theoretical knowledge to solving practical problems, to develop the skills of working with information resources and to master the methods of linear algebra and analytical geometry for solving problems arising as a result of modeling of technical processes. |
| Textbook | (The format : Title, Author/Editor, Publisher, Year of Publication) <br> 1.Calculus with analytic geometry second edition George F. Simmons Colorado College, Colorado Springs ISBN 0-07-057642-4 <br> \1996 http://www.ru.ac.bd/wp-content/uploads/sites/25/2019/03/205_03_Simmons_Calculus-with-analytic-geometry.pdf <br> 2. Конспект лекцій з вищої математики. Повний курс / Д. Письменний. - М.: Айрис-Пресс, 2008. - 608 с. ISBN <br> 978-5-8112-3118-8, 978-5-8112-3480-6. <br> 3. Вища математика / Дубовик В.П., Юрик І.І. - К.: Вища школа, 1998. <br> 4. Конспект лекцій з аналітичної геометрії та лінійної алгебри для студентів технічних факультетів // Уклад.: 3.П. <br> Ординська, І.В. Орловський, М.К. Руновська. - К.: НТУУ «КПا», Електронне навчальне видання, свідоцтво 030513. - 2013. - 131 c. |
| References | 1. Лінійна алгебра та аналітична геометрія. Навчальний посібник.Булдигін В.В., Алєксєєва І.В., Гайдей В.О., Диховичний О.О., Федорова л.Б. - к: ТВіМС, 2011. <br> 2. Analytic Geometry in Two and Three Dimensions. https://vonsteuben.enschool.org/ourpages/auto/2013/8/26/58023530/Chapter\%208\%20_pg_\% 20631-698_pdf <br> 3.7. Applied Engineering Analysis - slides for class teaching * Chapter 4 Linear Algebra and Matrices Based on the book of "Applied Engineering Analysis", by Tai-Ran Hsu, published by John Wiley \& Sons, 2018. (ISBN 9781119071204) https://www.sjsu.edu/me/docs/hsu-Chapter\%204\% 20Linear\%20AIgebra\%20and\%20Matrices.pdf |
| Course <br> Requirements and Grades | Course "Linear algebra and analytical geometry for engineers" The most important requirement is a bit of mathematical maturity: a combination of patience, logical and analytical thinking, motivation, systematics, decision-making, and the willingness to persevere through failure until success is achieved. |


| Weekly Schedule |  |  |
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| Week | Main Topics | Keywords |
| 1 | Matrices and operations on them | matrix, equality of matrices, matrix addition, scalar multiplication, matrix multiplication,transpose of a matrix, elementary operations |
| 2 | Determinants and their properties | determinant, minor, cofactor, rule of Sarrus |
| 3 | The inverse of a square matrix and its properties. Matrix equations | inverse matrix, adjugate matrix |
| 4 | The rank of a matrix, its properties, ways of finding the rank. | rank of a matrix, minor |
| 5 | Systems of linear equations | system of linear equations, Rouché -Capelli theorem, matrix method, Cramer's rule, Gaussian elimination |
| 6 | Vectors and linear operations with them. Components of a vector | addition, subtraction, scalar multiplication, direction cosines, scalar projection of a vector onto an axis (other vector) and its properties |
| 7 | Linear dependence and independence of a system of vectors. The basis of the system of vectors | linear dependence, linear independence, basis |
| 8 | Scalar product. Vector product. Mixed product. | scalar product, vector product, mixed product. |
| 9 | Cartesian coordinate system on a plane and in a threedimensional space | distance between two points, partitioning a segment in a given ratio, polar coordinate system. |
| 10 | Lines on a plane. Different forms of the equation of the line | slope-intercept form, normal vector form, Cartesian equation, parametric equation, vector equation |
| 11 | Planes in a three-dimensional space. Different forms of the equation of the plane | vector equation, Cartesian equation equation of a plane containing three points, equation of a plane in a "segment form" |
| 12 | Lines in a three-dimensional space. Different forms of the equation of the line |  line passing through two points, equation of a line as an intersection of two planes |
| 13 | Second order curves and their classification. Ellipse | ellipse, focus, directrix, eccentricity |
| 14 | Second order curves: hyperbola and parabola | hyperbola, parabola, focus, directrix, eccentricity |
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| 16 |  |  |

