



Sungkyunkwan University (SKKU) International Summer Semester (ISS) 2022

Engineering Mathematics 2

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SHORT COURSE DESCRIPTION

This course deals with Linear Algebra, Vector Calculus, and Complex Functions. There are two essential objects in linear algebra: matrices and vector spaces. Students will learn how to reformulate some mathematical problems into a form that involve these objects, to operate on them, to interpret them and to characterize them. Since vector calculus has important applications in engineering, we will investigate vector fields, vector-valued functions, and well-known vector integral theorems, e.g., Green's Theorem, Stokes' Theorem, and Gauss Divergence Theorem. Finally, we also plan to cover the following topics on calculus of complex functions, analytic functions, Cauchy-Riemann equations, logarithm, and principal values.

READING MATERIALS

Advanced Engineering Mathematics, 10th edition, book by Erwin Kreyszig.

COURSE REQUIREMENTS AND GRADING

Passing criterion

All ISS classes are pass/fail based on the student academic achievement evaluated by grades on a scale of 100 points (grade of 60 or above is Pass).

Attendance

Although SKKU requires students to attend at least 80% of all class meetings and we have 15 class meetings in total, the students are required to have 100% of class attendance.

Grading percentages

Attendance (20%), Quizzes (40%), Final Exam (40%).

Academic honesty

Academic dishonesty is unacceptable and will not be tolerated. Cheating, forgery, plagiarism and collusion in dishonest acts undermine the university's educational mission and the students' personal and intellectual growth. All students are expected to bear individual responsibility for their work, to learn the rules and definitions that underlie the practice of academic integrity, and to uphold its ideals. Ignorance of the rules is not an acceptable excuse for disobeying them. Any student who attempts to compromise or devalue the academic process will be sanctioned.

Electronic devices

All cellular phones or other related electronic personal communication devices must be switched off during every class session.

Electronic resources

The students are expected to check regularly the learning management system iCampus for updates and announcements about the course.

COURSE SCHEDULE

- WEEK I -

Monday (27 June) System of linear equations, Row reduction, Echelon forms; Vector equations, Matrix equation; Solution sets, Gaussian elimination, Gauss-Jordan elimination.

Tuesday (28 June) Linear independence, Matrix operations, Matrix inverse, Characterizations of invertible matrices, Properties of Determinants, Cramer's rule

Wednesday (29 June) Vector spaces, subspaces, Null spaces, Column spaces, Row spaces, Dimension, Rank

Thursday (30 June) Eigenvalues and eigenvectors; Characteristic equation, Complex eigenvalues, Gram-Schmidt process, Diagonalization; Quadratic forms

- WEEK II -

Monday (4 July) 3D Coordinate System; Vectors; Dot product, Cross product, Vector-valued functions

Tuesday (5 July) Line and plane equations, Cylinders and quadric surfaces, Arc length, curvature, Motion in space

Wednesday (6 July) Multivariable functions; Limits and continuity, Partial derivatives; Tangent planes, Linear approximations; Chain rule, Directional derivatives and Gradient vector, Maxima and minima, Lagrange multipliers

Thursday (7 July) Vector fields; Line integrals, Fundamental theorem for line integrals

- WEEK III -

Monday (11 July) Green's theorem; Curl and divergence

Tuesday (12 July) Parametric surfaces and their areas; Surface integrals

Wednesday (13 July) Stokes' theorem, Gauss Divergence theorem

Thursday (14 July) Complex Number, Complex Plane, Polar Form, Powers and Roots

Friday (15 July) Derivative: Analytic Functions, Cauchy-Riemann Equations, Laplace's Equations

- WEEK IV -

Monday (18 July) Exponential Function, Trigonometric and Hyperbolic Functions, Logarithm, General Power, Principle Value

Tuesday (19 July) Final Exam