Applied Mathematics III Course Syllabus for Engineering Students

Wolkite University
College of Natural and Computational Sciences
Mathematics Department

Course information	**Program:** B.Sc **Enrollment:** Regular **Course Title** : Applied Mathematics III **Course Category:** supportive **Course Code**: Math2042 **Course Credit point** : 7 ECTS **Credit Hours:** 4hrs **Academic Year**: 2024/25 **Tutorial Hours:** 3hrs **Year : II Semester: II** **Prerequisites:** Applied mathematics II **First class Date:** February **last class Date:** May
Instructor's Contact Information	**Instructor's Name:** Solomon Amsalu (Asst..Prof.) **Email :** solomon.amsalu@wku.edu.et **Office Building: NCS-New Building Room № : First Floor**

On completion of the course successful students will be able to:

- Define the concept of ordinary differential equations.
- Distinguish separable, homogeneous and exact differential equations.
- Distinguish linear and nonlinear differential equations.
- Compute general and particular solution of homogeneous differential equations.
- Appreciate the application of differential equations.
- Use the concept of vector and scalar fields to define arc length, curvature gradient divergence and curl.
- Compute line and surface integrals.
- Appreciate the application of vector differential and integral calculus.
- Use the concept of complex numbers and variables in higher topics.
- Compute limits, derivatives and integrals of complex variables.

Topics and Subtopics	Text books
UNIT ONE Ordinary Differential Equation of the First Order 1.1. Basic concept and ideas 1.2. Separable equation 1.3. Homogeneous equations 1.4. Exact differential equations 1.5. Integrating factors 1.6. Linear first order differential equation 1.7. Application of first order differential (project)	Erwin kreyszing, advanced engineering mathematics, 9th edition. Page 2-44 Solomon Amsalu, Advanced Engineering Mathematics
UNIT TWO Ordinary Differential Equation of the Second Order 2.1. Homogeneous linear equation of the second order 2.2. Homogeneous second –order equations with constant coefficients 2.3. General solution 2.4. Real root, complex roots and double root of a characteristic equation. 2.5. A method for solving non homogeneous linear equations 2.6. Application of second order differential equation (project II)	Erwin kreyszing, advanced Engineering Mathematics, 9th edition. Page 45- 104 Solomon Amsalu, Advanced Engineering Mathematics

UNIT THREE Laplace Transform 3.1. Laplace transforms of standard functions 3.2. Inverse Laplace transform 3.3. Transform of derivative and integral 3.4. Differentiation and integration of transforms 3.5. Convolution: integral equations 3.6. Solving differential equation using Laplace transform	Erwin kreyszing, advanced engineering mathematics, 9th edition. Page 220-270 Solomon Amsalu, Advanced Engineering Mathematics
UNIT FOUR Fourier Series and Fourier Integral 4.1. Periodic function; trigonometric series 4.2. Fourier series and Fourier integral 4.3. The complex Fourier series and integrals 4.4. Fourier cosine and sine transformation 4.5. Fourier transformation	Erwin kreyszing, advanced engineering mathematics, 9th edition. Page 477-534 Solomon Amsalu, Advanced Engineering Mathematics
UNIT FIVE Vector Calculus 5.1. Scalar field and vector field 5.2. Curve , arc length and tangent 5.3. Gradient of scalar field; divergence and curl of a vector field 5.4. Line integrals and Greens theorem 5.5. Surface integral; divergence theorem of gauss; application 5.6. Stocks theorem; applications 5.7. Line integral independent of path	Erwin kreyszing, advanced engineering mathematics, 9th edition. Page 420-476 Solomon Amsalu, Advanced Engineering Mathematics

UNIT SIX Complex Analytic Functions 6.1 Complex number; the triangle inequality 6.2 Functions of complex variables; limit derivative, analytic functions 6.3 Cauchy-Riemann equation; Laplace equation 6.4 Elementary equations: exponential, trigonometric, hyperbolic and logarithmic functions: general power	Rv. Churchill, complex variable and application Solomon Amsalu, Advanced Engineering Mathematics
UNIT SEVEN Complex Integral 7.1 Line integral in the complex plane 7.2 Cauchy integral theorem and formula 7.3 The derivative of analytic functions	Rv. Churchill, complex variable and application Solomon Amsalu, Advanced Engineering Mathematics

References

- Erwin kreyszing, advanced engineering mathematics, 9th edition
- Solomon Amsalu, Advanced Engineering Mathematics
- R.v. Churchill, complex variable and application
- James Stewart , calculus
- Paul Dawkins, differential equations.
- Robert Ellis and Denny Gulick, Calculus with analytic geometry,5th edition,