STUDY UNIT DESCRIPTION

Faculty of Geological Prospecting

CODE	<mark>EPC2101</mark>
TITLE	**HIGHER MATHEMATICS**
LEVEL	2 - Years 1, 2, 3 in Modular Undergraduate Course
ECTS CREDITS	
DEPARTMENT	Higher Mathematics
DESCRIPTION	

Linear algebra: Addition and Subtraction of Matrices, Multiplication of a Matrix by a Scalar, Multiplication of Two Matrices, Inverse Matrix, Determinants, Sets of Linear Equations, Gaussian Elimination.

Vector Algebra: Scalars and Vectors, Addition and Subtraction of Vectors, Scalar Product, Vector Product, Application: Equation of a Line and a Plane.

Differential Calculus: Sequences and Limits, Differentiation of a Function, Higher Derivatives, Extreme Values and Points of Inflexion, Determination of Limits by Differentiation.

Integral Calculus: The Primitive Function and Indefinite Integral, Methods of Integration, The Definite Integral, The Area Problem, Lengths of Curves, Volume of a Solid of Revolution.

Complex Numbers: Definition and Properties of Complex Numbers, Graphical Representation of Complex Numbers, Polar Form of a Complex Number, Exponential Form of Complex Numbers, Operations with Complex Numbers.

Taylor Series and Power Series: Series, Expansion of a Function in a Power Series , Interval of Convergence of Power Series, Approximate Values of Functions, Applications of Series: Polynomials as Approximations, Integration of Functions when Expressed as Power Series.

Differential Equations: Concept and Classification of Differential Equations, General Solution of DE, Homogeneous and Linear DE, Bernoulli's Equations, Second-Order DE with Constant Coefficients, Simultaneous DE.

Laplace Transforms: Laplace Transform of Standard Functions, Solution of Linear DE with Constant Coefficients, Solution of Simultaneous DE with Constant Coefficients.

Multiple Integrals: Decomposition of a Multiple Integral into a Product of Integrals, Multiple Integrals in Polar, Cylindrical and Spherical Coordinates, Applications.

Vector Analysis: Flow of a Vector Field through a Surface Element, Surface Integrals, Divergence of a Vector Field, Curl, Gauss's Theorem, Stokes' Theorem, Potential

Probability Calculus: Random Experiment, Outcome Space and Events, Discrete and Continuous Probability Distributions, Mean Values of Discrete and Continuous Variables, The Normal Distribution as the

Limiting Value of the Binomial Distribution, Method of Least Squares, Regression Line, Correlation and Correlation Coefficient.

Study-unit Aims:

Mathematics is an essential tool for physicists and engineers which students must use from the very beginning of their studies. This course aims to develop as rapidly as possible the student' ability to understand and use those parts of mathematics which they will most frequently encounter.

Learning Outcomes:

1.<u>Knowledge & Understanding;</u>
By the end of the study-unit the student will be able to:
- Formulate and understand the basic mathematical theorems and axioms.
- Formulate the constitutive definitions of elements contained in Differential, Integral and Probability Calculus.
- Understand a practical appliance of constitutive theorems and definitions.

2.<u>Skills:</u>

By the end of the study-unit the student will be able to:
- Perform calculations relating to the Differential and Integral Calculus.
- Determine the physics values based on Differential and Integral calculus and Probability analysis.

Main Text/s and any supplementary readings:

- Klaus Weltner et al., Mathematics for Physicists and Engineers;
- Paul Urban et al., Mathematics for the international student;
- Huw Fox, W. Bolton, Mathematics for Engineers and Technologists.

ADDITIONAL NOTES   **Pre-requisite Study-units:**

STUDY-UNIT TYPE   Lecture and Tutorial

METHOD OF ASSESSMENT

Assessment Component/s	Resit Availability	Weighting
Practical	No	10%