	INSTITUT TEKNOLOGI SEPULUH NOPEMBER FACULTY OF CIVIL PLANNING AND GEO ENGINEERING GEOPHYSICAL ENGINEERING DEPARTMENT UNDERGRADUATE PROGRAM (S1)	
Course	**Course Name**	**Mathematical Geophysics**
	Course Code	**CF234311**
	Credit	**3 (Three)**
	Semester	**3 (Three)**
COURSE DESCRIPTION		
This course covers basic mathematical concepts in geophysics, Fourier analysis (Fourier series, Fourier Transform, Fast Fourier Transform, Discrete Fourier Transform), complex numbers, application of special functions in solving Geophysical cases (signal processing), Gamma Function, Beta Function, Laplace, Legendre and Bessel		
PROGRAM LEARNING OUTCOMES (PLO)		
PLO-4	Able to explain the principles of mathematics, natural science, geology, geospatial, instrumentation, information technology, engineering principles and design into geophysical engineering procedures, processes, systems or methodologies.	
COURSE LEARNING OUTCOMES (CLO)		
CLO-1	[C3, P3, A3] Able to apply the basic concepts of Geophysical Mathematics and apply them in the field/problems of Geophysics. Able to solve Fourier Analysis problems, Complex & Euler Numbers, Special Functions, Solutions to Series of Differential Equations, Functions; Legendre, Bessel, Hermite and other special functions.	
SUB COURSE LEARNING OUTCOMES (SUB CLO)		
Sub CLO-1	Able to understand and apply Fourier Analysis	
Sub CLO-2	Able to solve complex algebraic problems and calculations with Euler's Formula	
Sub CLO-3	Able to solve Gamma function equations, Betha and Legendre equations	
Sub CLO-4	Able to explain the importance of mathematics in solving geophysical problems using written tests	
Sub CLO-5	Able to understand the properties and use the Bessel Equation	
Sub CLO-6	Able to understand the properties and use the Hermite Function	
Sub CLO-7	Able to understand the properties and use the Laguerre Function	
Sub CLO-8	Able to apply applications in geophysical exploration problems	
STUDY MATERIALS		
• Introduction, basic mathematical concepts in geophysics • Fourier Series (FS), Fourier Transform (FT) • Fast Fourier Transform (FFT), Discrete Fourier Transform (DFT) • Complex numbers, complex fields, complex algebra, Euler's formula, complex power series, powers and roots of complex numbers • Definition of Gamma Function, Recursion Relation Function, Applications of Gamma Function • Gamma Functions – Beta Functions, Error Functions, Integrals, Stirling Formulas, Elliptic • Legendre equation, Leibinz rule, Rodrigues Formula • Generating Functions of Legendre Polynomials, Orthogonal Functions; association, Normalization and Legendre series		

- Bessel equation; equation solutions, Recursion Relations, Differential Equation Solutions, other Bessel Functions
- Multiple integral, double integral, triple integral
- Case Base Study & Case Base Project in the exploration of the Geophysics Method

PRECONDITION

Calculus 1, Calculus 2, Physics of Mechanics, Physics of Electricity and Magnetism

REFERENCES

1. Hubral, P., Mathematical Methods for Geophysics, University of Karlsruhe Press, 2001.
2. Michael S. Zhdanov, Geophysical Inverse Theory and Regularization Problems, Elsevier, 2002.
3. Boas, ML, Mathematical Method in Physical Sciences, Jhon Wiley and Sons 3rd edition, 2006.
4. Kreyzig, Erwin, advance Engineering Mathematics, Jhon Wiley and Sons 9th edition, 2006
5. Geophysical journal