GANPAT UNIVERSITY			
FACULTY OF MARITIME STUDIES			
Programme	Bachelor of Technology	Branch/Spec.	Mechanical Engineering/ Mechatronics Engineering/ Automobile Engineering/ Marine Engineering
Semester	II	Version	1.0.0.0
Effective from Academic Year	2026-27	Effective from the batch admitted in	July 2026
Course Code	2BSC1116	Course Name	Applied Calculus
Course Category	Basic Science Course (BSC)		

Teaching & Learning Scheme							Examination scheme (Marks)			
	L	TU	P	Total	SL	TSL		CE	SEE	Total
Credit	3	1	0	4	60	120	Theory	50	50	100
Hours (per week)	3	1	0	4			Practical	0	0	0

L: Lecture, TU: Tutorial, P: Practical/Lab., SL: Minimum Self-Learning or Term Work Hours per Semester, TSL: Minimum Total Teaching & Self-Learning Hours per Semester, CE: Continuous Evaluation, SEE: Semester End Examination.

Pre-requisites:

Introduction to Merchant Shipping

Course Outcomes

COs	Description
CO1	**Understand** Finite differences, interpolation techniques, Numerical differentiation and Integration and apply it to various practical problems.
CO2	**Apply** Numerical methods to solve first order ordinary differential equations and Algebraic and Transcendental equations
CO3	**Use** these techniques to generate data from various distributions, calculate Correlation and Regression of given set of values, Fit curves according to the given data.
CO4	**Application** of polar, spherical and cylindrical co-ordinate system.

Theory Syllabus

Unit	Content	Hours
1	**Fourier Series:** Definition of periodic function, Euler's formula, Functions having points of discontinuity, Change of intervals, Odd and Even functions, Expansion of odd or even periodic functions, Half range sine and cosine series, Elements of harmonic analysis	**6**
2	**Finite Difference and Interpolation:** Differences, forward difference, backward difference, Interpolation, Newton's Forward difference interpolation formula, Newton's backward difference interpolation formula, Lagrange's interpolation formula for Un-equal intervals, Newton's divided difference formula	**6**
3	**Numerical differentiation and integration:** Taylor's series method, Euler's method, Picard's method, Runge-Kutta Second order method, Runge-Kutta Fourth order method, Trapezoidal rule, Simpson's one third & three by eight rules	**8**
4	**Ordinary Differential Equation (Higher Order):**	**10**

	Ordinary differential equation with constant coefficient, variation of parameter methods, Cauchy – Euler differential equations, simultaneous differential equations with constant coefficient, applications of ordinary differential equation	
5	**Moment of Area:** First moment of area and the position of a centroid of an area; Work done by variable forces; mean values, Root mean square values of Sin nx and Cos nx. The rules of Guldinus. Theorems of parallel and perpendicular axes. Second moments of area and moments of inertia of a rectangular and circular laminas.	**10**
6	**Reducible Equations:** Equations reducible to exact IF, Linear differential equation. Of first order first degree, reducible to linear, Applications to electrical circuits and orthogonal trajectories, nth order LDE - def. and complementary solution, Methods of obtaining PI, Method of variation of parameters, Method of undetermined coefficients, Cauchy's homogeneous LDE and Legendre's equation., System of Ordinary differential equations. Simultaneous equations. in symmetrical form, Applications to deflection of beams, struts and columns, Applications to electrical circuits and coupled circuits.	**5**
Practical and Self Learning Content		
Practical, assignments, quiz, industrial visit, field survey and tutorials are based on the above syllabus.		
Text Books		
1	Hand out by Faculty	
Reference Books		
1	Textbook of engineering mathematics By A. B. Mathur and V. P. Jaggi.	
2	Higher engineering mathematics. By B. S. Grewal.	
3	Introduction to Vector Analysis Davis & Snider.	
ICT/MOOCs Reference		
1	NA	

Mapping of CO with PO and PSO:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	1	0	0	0	1	2	0	1	2	1	0	2
CO2	3	1	2	1	1	0	1	0	1	0	1	1	0	0	2
CO3	3	1	1	1	0	1	0	1	0	1	2	0	2	0	3
CO4	3	1	1	1	0	0	0	1	1	0	1	0	1	0	3
CO5	3	1	2	1	1	0	1	0	2	0	3	0	2	0	0
CO6	3	1	1	1	0	1	0	2	1	0	1	1	0	1	2

Bloom's Taxonomy Level

Unit	Unit Title	Aligned COs	Learning Hours	BTL Level
1	Fourier Series	CO1	6	U, A
2	Finite Difference and Interpolation	CO1	6	A
3	Numerical Differentiation and Integration	CO2	8	A
4	Ordinary Differential Equations (Higher Order)	CO2	10	A, N
5	Moment of Area	CO4	10	U, A
6	Reducible Equations and Applications	CO2, CO4	5	A, N

Note:

- Version 1.0.0.0 (First Digit= New syllabus/Revision in Full Syllabus, Second Digit=Revision in Teaching Scheme, Third Digit=Revision in Exam Scheme, Forth Digit= Content Revision)
- 1 Hour Lecture = 1 Credit, 1 Hour Tutorial = 1 Credit, 2 Hours Practical = 1 Credit, 2 Hours Internship/Project/Seminar = 1 Credit
- As per NCrF/NEP 2020, Minimum Self-Learning or Term Work Hours per Semester should be calculated in such a way that 1 Credit should have a minimum 30 Hours of Teaching and Self Learning Engagement per semester
- Bloom's Taxonomy Level (BTL) : R: Remember, U: Understand, A: Apply, N: Analyze, E: Evaluate, and C: Create