

Syllabus Template (First year of 25-26 entry Batch and second year of 24-25 entry Batch)

Hours/Sem.	Course Code	:	1BMAC101C	DIFFERENTIAL CALCULUS AND LINEAR ALGEBRA FOR CV STREAM	Semester	:	I
	L:T:P	:	3 : 1 : 0		Course Type	:	BSC
	Teaching	:	42+28Hrs		CIE Marks	:	50
	Learning (TW+SL)	:	44Hrs		SEE Marks	:	50
	Exam	:	6Hrs		Total Marks	:	100
	Total Hrs.	:	120Hrs		Credits	:	04

Professional Competency:

Apply calculus, differential equations, and matrix theory using computational tools to solve complex engineering problems.

Course Outcomes:

After completion of the course, student will be able to:

- CO1:** Apply foundational concepts of calculus for geometric properties of curves,
- CO2:** Apply the concepts of multivariable calculus to compute the derivatives, optimize the functions
- CO3:** Apply the concepts of differential calculus to solve first and higher-order ordinary differential equations in science and engineering.
- CO4:** Employ the principles of linear algebra to solve systems of linear equations, determine eigen values & eigen vectors

Unit-I

11Hrs.

Differential Calculus: Polar coordinates, Polar curves, angle between the radius vector and the tangent, angle between two curves. Pedal equations.

Curvature and Radius of Curvature - Cartesian, Polar (with proof), Parametric and Pedal forms (without proof) - Problems

Unit-II

10Hrs.

Multivariable Calculus: Statement and problems on Taylor's and Maclaurin's series expansion for one variable. Partial differentiation, total derivative -differentiation of composite functions, Jacobian, Maxima and minima for the function of two variables.

Unit-III

11Hrs.

Ordinary Differential Equations: Linear and Bernoulli's differential equation. Exact and reducible to exact differential equations with integrating factors and Orthogonal trajectories, Law of natural growth and decay.

Higher-order linear ordinary differential equations with constant coefficients, homogeneous and non-homogeneous equations (e^{ax} , $\sin(ax+b)$, $\cos(ax+b)$, x^n only), Method of variation of parameters, Cauchy's homogeneous differential equations. Applications: Solving governing differential equations of Mass Spring

Unit-IV

10Hrs.

Linear Algebra: Elementary row transformation of a matrix, Rank of a matrix. Consistency and Solution of system of linear equations - Gauss-elimination method and approximate solution by Gauss-Seidel method. Eigen values and Eigen vectors, Rayleigh's power method to find the dominant Eigen value and Eigen vector. Applications-Traffic flow.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Ed., 2021.
2. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed., 2018.
3. Gilbert Strang, Linear Algebra and its Applications, Cengage Publications, 4th Ed., 2022.

Reference Books:

1. B.V. Ramana, Higher Engineering Mathematics, McGraw-Hill Education, 11th Ed., 2017
2. Srimanta Pal & Subodh C. Bhunia, Engineering Mathematics, Oxford University Press, 3rd Ed., 2016.
3. N.P. Bali and Manish Goyal, A Text book of Engineering Mathematics, Laxmi Publications, 10th Ed., 2022.
4. H.K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand Publication, 3rd Ed., 2014.
5. David Clay, Linear Algebra and its Applications, Pearson Publishers, 4th Ed., 2018.

Web Links and Video Lectures:

<https://drive.google.com/file/d/1KtCtZmnJnOvV1S68wXS9FZPXUFvRktBQ/view?usp=sharing>

Table: Matrix to describe the mapping of COs with POs (considering WKs) and PSOs

Course Outcomes (COs)	Program Outcomes and (WKs)											Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	3 (WK1, WK2, WK3, and WK4)	2 (WK1, WK2 and WK3)						1			1		
CO2	3 (WK1, WK2, WK3, and WK4)	2 (WK1, WK2 and WK3)						1			1		
CO3	3 (WK1, WK2, WK3, and WK4)	2 (WK1, WK2 and WK3)						1			1		
CO4	3 (WK1, WK2, WK3, and WK4)	2 (WK1, WK2 and WK3)						1			1		

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Scheme (from 2025-26)

Sl. N o.	Cour se Code	Course Title	Teaching-Learning Scheme				Examina tion Duration (Hrs/Sem .)		Tot al Hou rs	Examination Scheme and Evaluation			Credits (C)= Tot al Ho urs /30
			L Hrs/ Week (Hrs/ Sem.)	T Hrs/ Week (Hrs/Se m.)	P Hrs/ Week (Hrs/S em.)	Term Work (TW) and Self Learnin g (SL) (TW+SL) Hrs/ Sem.				CIE Mar ks	SEE Mar ks	Tota l Mar ks	
							CIE	SEE					
1	1BM AC10 1C	Differ ential calculu s and linear algebra for CV stream	3(42)	28	0	44	3	3	120	50	50	100	4= 120 /30