Syllabus
Gyanmanjari Diploma Engineering College
Semester-2 (Diploma)

Subject: Mathematics for Programmers- DET1XX10106

Type of course: Major (Core)

Prerequisite: Basic algebra, Determinants, Matrices, Functions, Limits

Rationale: Mathematics for Programmers bridge the gap between theoretical mathematics and practical problem-solving in engineering. While reinforcing core concepts like sequences, series, vectors, matrices, functions, limits, differentiation, and integration, the course introduces real-world applications in optimization, data calculation, and engineering modeling. Emphasizing conceptual clarity and analytical reasoning, students learn to solve engineering problems methodically and apply mathematics effectively in practical and industrial contexts.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks		Total Marks
CI	T	P	C	SEE	CCE	
4	0	0	4	100	50	150

Course Content:

Sr. No	Course Content	Hrs.	% Weightage
1	**Vectors:** Vector and scalar quantities, Types of vector.(Position vector , Equal vector , Opposite vector , Coplanar vectors , Co-initial vectors), Geometrical representation of vectors. Addition and scalar multiplication of vectors, Magnitude of vector and unit vector, Dot and Cross product of vectors, Applications.	12	20%

Sr No.	Evaluation Methods	SEE	CCE
1	Open Book Exam	20	
2	**ALA:** Vectors Everywhere: Direction, Distance & Decisions		10
	Total:	**20**	**10**

Description of ALA (10 Marks):
In this task, students will prepare and deliver a presentation on "Vectors in the Real World", highlighting how vectors are applied in practical situations such as physics (force, velocity), engineering, navigation, graphics, robotics, and daily life examples. The topic will be aligned with the syllabus and assigned/approved by the faculty. This task is designed to assess students' conceptual understanding, application skills, and presentation ability.
The presentation should include:

- Introduction to vectors
- Real-life applications with diagrams/examples

Gyanmanjari Innovative University

Syllabus
Gyanmanjari Diploma Engineering College
Semester-2 (Diploma)

Subject: Mathematics for Programmers- DET1XX10106

Type of course: Major (Core)

Prerequisite: Basic algebra, Determinants, Matrices, Functions, Limits

Rationale: Mathematics for Programmers bridge the gap between theoretical mathematics and practical problem-solving in engineering. While reinforcing core concepts like sequences, series, vectors, matrices, functions, limits, differentiation, and integration, the course introduces real-world applications in optimization, data calculation, and engineering modeling. Emphasizing conceptual clarity and analytical reasoning, students learn to solve engineering problems methodically and apply mathematics effectively in practical and industrial contexts.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks		Total Marks
CI	T	P	C	SEE	CCE	
4	0	0	4	100	50	150

Course Content:

Sr. No	Course Content	Hrs.	% Weightage
1	**Vectors:** Vector and scalar quantities, Types of vector.(Position vector , Equal vector , Opposite vector , Coplanar vectors , Co-initial vectors), Geometrical representation of vectors. Addition and scalar multiplication of vectors, Magnitude of vector and unit vector, Dot and Cross product of vectors, Applications.	12	20%

Sr No.	Evaluation Methods	SEE	CCE
1	Open Book Exam	20	
2	**ALA:** Vectors Everywhere: Direction, Distance & Decisions		10
	Total:	**20**	**10**

Description of ALA (10 Marks):
In this task, students will prepare and deliver a presentation on "Vectors in the Real World", highlighting how vectors are applied in practical situations such as physics (force, velocity), engineering, navigation, graphics, robotics, and daily life examples. The topic will be aligned with the syllabus and assigned/approved by the faculty. This task is designed to assess students' conceptual understanding, application skills, and presentation ability.
The presentation should include:

- Introduction to vectors
- Real-life applications with diagrams/examples

<table>
<tr><td></td><td>

Mathematical representation (magnitude & direction)
Conclusion and key takeaways
Use of visual aids (PPT, charts, or simulations)

</td><td></td><td></td></tr>
<tr><td>2</td><td>
Determinants & Matrix : Determinants, Minors & Cofactors, Adjoint & Inverse of a matrix, Matrix operations, Solution of system of linear equations, Types of matrices: diagonal, scalar, identity, singular, non-singular, Rank of a matrix (basic introduction), Elementary row/column operations
<table>
<tr><th>Sr No.</th><th>Evaluation Methods</th><th>SEE</th><th>CCE</th></tr>
<tr><td>1</td><td>Problem Solving Task</td><td>20</td><td></td></tr>
<tr><td>2</td><td>Matrix Magic:
Visualizing Mathematics</td><td></td><td>10</td></tr>
<tr><td></td><td>Total:</td><td>20</td><td>10</td></tr>
</table>
Description of Matrix Magic(10 Marks):
In this task, students will design an interactive poster based on matrix concepts such as matrix operations, determinants, inverse matrices, or real-world applications (e.g., image processing, cryptography, data organization, networks). The topic will be assigned or approved by the faculty. This task is designed to assess students' conceptual clarity, creativity, and ability to connect matrices with real-life applications.
The poster should include:

Introduction to the selected matrix concept
Mathematical representation and examples
Real-life or practical application
Diagrams, charts, or visual elements
Clear explanation of results and conclusions

The poster may be printed or digitally designed, and students may be asked to explain their poster during evaluation and upload on ERP.
</td><td>12</td><td>20%</td></tr>
<tr><td>3</td><td>
Functions & Limits: Functions: introduction, types of functions, Logarithmic and trigonometric functions with formulas, Standard limits: algebraic, trigonometric, exponential, Properties and examples of limits, Domain, co domain & range, Graphs of basic functions, Composite functions & inverse functions, left & right limits
<table>
<tr><th>Sr No.</th><th>Evaluation Methods</th><th>SEE</th><th>CCE</th></tr>
<tr><td>1</td><td>Function Fundamentals Check</td><td>10</td><td></td></tr>
<tr><td>2</td><td>Journey to the Limit</td><td>10</td><td></td></tr>
<tr><td>3</td><td>Graph Sketching :
Visualizing Functions: Learn by Interaction</td><td></td><td>10</td></tr>
<tr><td></td><td>Total:</td><td>20</td><td>10</td></tr>
</table>
Description of Graph Sketching(10 Marks):
Students will create a visual, activity-based assignment using non-coding tools such as charts, GeoGebra (graphical use only), PowerPoint, and posters to explore graph sketching and interpretation of functions and limits. The activity, approved by the faculty, assesses students' conceptual clarity,
</td><td>12</td><td>20%</td></tr>
</table>

	• Mathematical representation (magnitude & direction) • Conclusion and key takeaways • Use of visual aids (PPT, charts, or simulations)		
2	**Determinants & Matrix :** Determinants, Minors & Cofactors, Adjoint & Inverse of a matrix, Matrix operations, Solution of system of linear equations, Types of matrices: diagonal, scalar, identity, singular, non-singular, Rank of a matrix (basic introduction), Elementary row/column operations **Description of Matrix Magic(10 Marks):** In this task, students will design an interactive poster based on matrix concepts such as matrix operations, determinants, inverse matrices, or real-world applications (e.g., image processing, cryptography, data organization, networks). The topic will be assigned or approved by the faculty. This task is designed to assess students' conceptual clarity, creativity, and ability to connect matrices with real-life applications. The poster should include: • Introduction to the selected matrix concept • Mathematical representation and examples • Real-life or practical application • Diagrams, charts, or visual elements • Clear explanation of results and conclusions The poster may be printed or digitally designed, and students may be asked to explain their poster during evaluation and upload on ERP.	12	20%
3	**Functions & Limits:** Functions: introduction, types of functions, Logarithmic and trigonometric functions with formulas, Standard limits: algebraic, trigonometric, exponential, Properties and examples of limits, Domain, co domain & range, Graphs of basic functions, Composite functions & inverse functions, left & right limits **Description of Graph Sketching(10 Marks):** Students will create a visual, activity-based assignment using non-coding tools such as charts, GeoGebra (graphical use only), PowerPoint, and posters to explore graph sketching and interpretation of functions and limits. The activity, approved by the faculty, assesses students' conceptual clarity,	12	20%

Sr No.	Evaluation Methods	SEE	CCE
1	Problem Solving Task	20	
2	Matrix Magic: Visualizing Mathematics		10
	Total:	**20**	**10**

Sr No.	Evaluation Methods	SEE	CCE
1	Function Fundamentals Check	10	
2	Journey to the Limit	10	
3	**Graph Sketching :** Visualizing Functions: Learn by Interaction		10
	Total:	**20**	**10**

<table>
<tr><td></td><td>graphical interpretation, and visualization skills.
The assignment should include:
• Introduction to the selected function or concept
• Mathematical definition of the function
• Hand-drawn or tool-based graph sketch (using graph sheets, GeoGebra – graphical use only, spreadsheets, Canva, or PowerPoint)
• Identification of key features such as domain, range, intercepts, symmetry, and behavior near critical points
• Interpretation of function behavior using the graph (including limit behavior where applicable)
• Clear explanation and conclusion or learning outcome
The assignment may be printed or digitally designed, and students may be required to briefly explain their work during evaluation and upload the final submission on ERP.</td><td></td><td></td></tr>
<tr><td>4</td><td>Differentiation: Differentiation: Definition, Rules of Sum, Product, Division, Chain Rule, Derivatives of algebraic, trigonometric, logarithmic, exponential functions, Derivatives of inverse trigonometric functions (basic list), Successive Differentiation up to second order

<table><tr><th>Sr No.</th><th>Evaluation Methods</th><th>SEE</th><th>CCE</th></tr><tr><td>1</td><td>Derivative Drill Test</td><td>10</td><td></td></tr><tr><td>2</td><td>Chain Rule Sprint: Stepwise differentiation problems</td><td>10</td><td></td></tr><tr><td>3</td><td>ALA:
Error Spotting in Differentiation
Find & correct mistakes</td><td></td><td>10</td></tr><tr><td></td><td>Total:</td><td>20</td><td>10</td></tr></table>
Description of ALA (10 Marks):
• In this ALA task, students will be given solved differentiation problems containing intentional errors. The errors may be conceptual, procedural, or calculation-based. Students are required to identify the mistakes and rewrite the correct solution. This task is designed to assess students' analytical ability, conceptual understanding, and attention to detail.
• Each question will require students to clearly point out the error and provide the correct differentiation step.</td><td>12</td><td>20%</td></tr>
<tr><td>5</td><td>Integration: Basic integration formulas, Integration by substitution, Integration by parts , Definite integrals, Basic properties of definite integrals, Evaluation of simple definite integrals, Area under curves (basic), Applications of integrals in simple real-life problems
<table><tr><th>Sr No.</th><th>Evaluation Methods</th><th>SEE</th><th>CCE</th></tr><tr><td>1</td><td>Mixed Integration Challenge</td><td>20</td><td></td></tr><tr><td>2</td><td>ALA:
CurveCraft
A physical / working model for Area Under Curve</td><td></td><td>10</td></tr><tr><td></td><td>Total:</td><td>20</td><td>10</td></tr></table></td><td>12</td><td>20%</td></tr>
</table>

	Description of ALA (10 Marks): In this ALA task, students will design a physical or working model to demonstrate the concept of Area Under the Curve (AUC) for a given function. The model may use charts, cut-outs, graph sheets, cardboard models, or simple working demonstrations. This task is designed to assess students' conceptual understanding, creativity, and ability to visualize integration concepts. The model should clearly represent: • The given curve and coordinate axes • Limits of integration • Shaded area representing the area under the curve • Explanation of how integration is used to calculate the area Students may be required to demonstrate and Upload on ERP.		

Suggested Specification table with Marks:

Distribution of Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage %	10%	15%	30%	25%	10%	10%

Course Outcomes:

After learning the course, the students should be able to:	
CO1	Apply vector operations and vector products to represent and solve basic real-world and geometrical problems.
CO2	Use determinants and matrix methods to solve systems of linear equations and analyze matrix properties.
CO3	Analyze functions and evaluate limits, including left-hand and right-hand limits, using graphical and analytical methods.
CO4	Solve problems involving differentiation by applying appropriate rules to compute first- and second-order derivatives, and analyze and identify errors in differentiation processes.
CO5	Apply integration techniques to evaluate definite integrals and model area under curves and simple real-life applications.

Instructional Method:

The course will be delivered using traditional classroom teaching supported by active and application-based learning strategies appropriate for diploma engineering students. In addition to blackboard teaching, the instructor will use:

- Open-book learning and guided problem-solving for vector operations, matrix methods, and calculus concepts.
- Worksheet-based practice for determinants, matrix operations, limits, differentiation rules, and integration techniques.
- Graphical and visual methods for functions, limits, differentiation, and area under curves.
- Group activities and presentations such as *Vectors in the Real World*, matrix problem-solving challenges, and concept explanation tasks.
- Active Learning Assignments (ALA) including *Journey to the Limit*, *Error Spotting in Differentiation*, and *Curve Craft* model-based activity.
- Mini-projects, interactive posters, and physical/working models to demonstrate real-life applications of vectors, matrices, and integrals.
- Interactive assessments through MCQ worksheets, viva-voce, and drill tests to reinforce understanding.
- Internal evaluation based on SEE and CCE components as prescribed, including worksheets, presentations, ALAs, projects, and viva.

Reference Books:

[1]. Advanced Engineering Mathematics, By Erwin Kreyszig, Wiley India Pvt. Ltd.

[2]. Calculus and Analytical Geometry, By Thomas & Finney, Pearson / Addison-Wesley.

[3]. Higher Engineering Mathematics, By B. S. Grewal, Khanna Publishers, New Delhi.

[4]. Calculus: Early Transcendentals, By James Stewart, Cengage Learning India Pvt. Ltd

Suggestive Rubrics:

Suggestive Assessment Guidelines:
Module 1: **ALA: Vectors Everywhere – Direction, Distance & Decisions** : **10 Marks:** Excellent content, real-world relevance, correct vector concepts, clear visuals, confident explanation **08 Marks:** Content correct, good examples, minor presentation gaps **05 Marks:** Basic concepts covered, weak real-life linkage or visuals **02 Marks:** Very limited understanding, poorly structured **00 Marks:** Incomplete / off-topic
Module 2: **Matrix Magic- Visualizing Mathematics:** **10 Marks:** Accurate matrix concepts, strong visuals, innovative real-life application **08 Marks:** Correct content, good visuals, limited application depth **05 Marks:** Basic matrix operations shown, weak explanation **02 Marks:** Minimal effort, unclear visuals **00 Marks:** Not submitted / incorrect

Module 4: **ALA: Error Spotting in Differentiation:** **10 Marks:** All errors correctly identified and corrected with justification **06 Marks:** Most errors identified, correction partly correct **03 Marks:** Few errors identified, weak correction **00 Marks:** Errors not identified
Module 5: **ALA: CurveCraft – Physical / Working Model (Area Under Curve):** **10 Marks:** Accurate model, correct limits, clear demonstration & explanation **08 Marks:** Correct concept, minor presentation flaws **05 Marks:** Basic model, weak explanation **02 Marks:** Model incomplete or unclear **00 Marks:** Not submitted