		Artificial Intelligence and Machine Learning/Automobile Engineering/Civil Engineering,
Programme Name	**:**	**Computer Engineering/Electrical engineering/Electronics and Telecommunication/Information Technology/Mechanical Engineering.**
Programme Code	**:**	**AN/AE/CE/CO/EE/ET/IT/ME**

Course Code	Course Title	Course Title Abbr.	Semester
7G501	**Basic Mathematics**	**BMS**	**FIRST**

I. RATIONALE

Basic Mathematics plays a crucial role in diploma programmes as it fosters the development of critical thinking skills, enhances quantitative literacy, prepares students for higher education, promotes problem-solving abilities, cultivates logical and abstract thinking, and fosters mathematical literacy. By engaging with Mathematics, students acquire logical reasoning, problem-solving techniques, and analytical thinking, which are valuable for lifelong learning and professional growth. Calculus is a branch of Mathematics that calculates how matter, particles and heavenly bodies move. Derivatives are useful to find maxima and minima of the function, are also useful for many engineering optimization problems. Hence the course provides the insight to analyze engineering problems scientifically using logarithms, matrices, trigonometry, and differential calculus. By incorporating these topics, students comprehend to approach engineering problems from a mathematical perspective, enabling them to devise efficient and effective solutions and this leads to preparing Diploma graduates well-rounded, adaptable, and capable of making significant contributions to the branch-specific problems.

II. INDUSTRY/EMPLOYER EXPECTED OUTCOME

The aim of this course is to help the students to attain the following industry identified outcome through various teaching learning experiences: "Apply the concept of Mathematics to solve industry-based technology problems"

III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following Co's on completion of course based learning.
CO1 – Study the concepts of algebra to solve engineering (discipline) related problems.
CO2 – Utilize trigonometry to solve branch specific engineering problems.
CO3 – Understand the concept of function and limit to solve engineering related problems.
CO4 – Apply differential calculus to solve discipline specific problems.
CO5 – Apply the concept of derivative to find gradient, maxima, minima, and radius of curvature

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Paper Duration	Assessment Scheme										Total Marks
				Actual Contact Hrs./Week			SLH	NLH			Theory				Based on LL &TSL				Based on SLA		
															Practical						
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
7G501	Basic Mathematics	BMS	AEC	4	2	-	2	8	4	3	30	70	100	40	-	-	-	-	25	10	125

Total IKS Hrs for Sem.: 06 Hrs.

Abbreviations: CL-Class Room Learning ,TL-Tutorial Learning ,LL-Laboratory Learning ,SLH-Self Learning Hours, NLH-Notional Learning Hours ,FA-Formative Assessment, SA-Summative assessment IKS-Indian Knowledge System, SLA-Self Learning Assessment

Legends:@Internal Assessment ,#External Assessment,*#On Line Examination,@$Internal Online Examination Note:

1. FA-TH represents average of two Progressive tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-Prof any course then the candidate shall be declared as "Detained" in that course.
3. If candidate is not securing minimum passing marks in SLA of any course, then the candidate shall be declared as fail and will have to repeat and resubmits SLA work.
4. Notional Learning hours for the semester are(CL+LL+TL+SL)hrs.*15Weeks
5. 1creditisequivalentto30 Notional hrs.
6. *Self-learning hours hall not be reflected in the Time Table.
7. *Self-learning includes micro-project/assignment/other activities.

V. THEORYLEARNINGOUTCOMESANDALIGNEDCOURSECONTENT

Sr. No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO1.1.Solve the given simple problem based on laws of logarithm TLO1.2.Solve the given simple problem based on Cramer's Rule. TLO1.3. Solve given problems using algebraic operations on matrices. TLO1.4. Solve given system of linear equations using matrix inversion method TLO1.5. Obtain the proper and improper partial fraction for the given simple rational function. TLO 1.6 Solve simultaneous equations by using concept given in Ancient Indian Mathematics	**Unit – I Algebra** 1.1. Logarithm: Concept and laws of logarithm. 1.2. Determinant of order 3X3 and solution of simultaneous equation using Cramer's Rule. 1.3. Matrices: Matrices, algebra of matrices, transpose, value of determinant of matrix of order 3x3, adjoint and inverse of matrices. 1.4. Matrices: Solution of simultaneous equations by matrix inversion method. 1.5. Partial Fractions: Types of partial fraction based on nature of factors and related Problems. 1.6. Algebra in Indian Knowledge System: Solution of simultaneous equations (Indian Mathematics).	Improved Lecture Tutorial Assignment Demonstration Simulation
2	TLO2.1. Apply the concept of Compound angle, allied angle and multiple angles to	**Unit – II Trigonometry** 2.1 Trigonometric ratios of allied angles, compound angles, multiple angles (2A, 3A), submultiples angles. (Without proof)	Improved Lecture Tutorial Assignment Demonstration Simulation Flipped Classroom approach

	solve the given simple engineering problem(s). TLO2.2. Apply the concept of Sub- multiple angles to solve the given simple engineering related problem(s). TLO2.3. Apply concept of factorization and de factorization formulae to solve the given simple engineering problem(s). TLO2.4. Investigate given simple problems by utilizing inverse trigonometric ratios. TLO2.5 Use concept given in Ancient Indian Mathematics for trigonometry to solve given problems.	2.2 Factorization and De factorization formulae. (Without proof). 2.3 Inverse Trigonometric Ratios and related problems. 2.4 Principle values and relation between trigonometric and inverse trigonometric ratios. 2.5 Trigonometry in Indian Knowledge System : Introduction and Terminology (From Ancient Beginnings to Nilakantha), The Evolution of Sine Function in India. Pythagorean triples in Sulabasutras.	
3	TLO 3.1 Find value of function at the given point TLO 3.2 Solve the given simple problems based on functions. TLO 3.3 Familiar with concept of limit.	**Unit III – Function and Limit** 3.1 Defination of function, domain co domain of a function,types of function & Value of a function at given point. 3.2 Different types of examples on function. 3.3 Definition and concept of limit (without proof and examples)	Improved Lecture Tutorial Assignment
4	TLO 4.1 Solve the given simple problems based on rules of differentiation. TLO 4.2 Obtain the derivatives of composite, TLO 4.3 Obtain the derivate of implicit, parametric function TLO 4.4 Obtain the derivate of inverse, logarithmic, exponential functions TLO 4.5 Obtain the derivate of one function w.r.t other. TLO 4.6 Familiar with concept of calculus given in Indian Mathematics.	**Unit –IV Differential Calculus** 4.1 Definition, Rules of derivatives such as sum, Product, Quotient of functions. 4.2 Derivative of composite functions (chain Rule) 4.3 Derivative of implicit and parametric functions. 4.4 Derivatives of inverse, logarithmic and exponential functions. 4.5 Derivative of one function with respect to other. 4.6 Calculus in Indian Knowledge System: The Discovery of Calculus by Indian Astronomers. (Indian Mathematics).	Improved Lecture Tutorial Assignment Demonstration Simulation

5	TLO5.1. Apply the concept of differentiation to find the second order derivative. TLO5.2. Apply the concept of differentiation to find the given equation of tangent and normal. TLO5.3. Apply the concept of differentiation to calculate maxima, minima and radius of curvature for given function. TLO 5.4 Familiar with concept of calculus given in Indian Mathematics.	**Unit – V Application of Derivative** 5.1 Second order derivative 5.2 Equation of tangent and normal 5.3 Maxima and minima 5.4 Radius of curvature.	Improved Lecture Tutorial Assignment Demonstration Simulation

VI. LABORATORY LEARNING OUTCOME AND ALIGNEDP RACTICAL/TUTORI ALEXPERIENCES.

Practical/Tutorial/Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment/Practical Titles/Tutorial Titles	Number of hrs.	Relevant Cos
LLO 1.1 Solve simple problems of Logarithm based on given applications.	1*	Solve simple problems of Logarithms based on given applications.	2	CO1
LLO 1.2 Solve elementary problems on Algebra of matrices for branch specific engineering related applications.	2	Solve elementary problems on Algebra of matrices	2	CO1
LLO1.3Applytheconceptofmatrixtosolveengineering problems.	3	Solve simple problems based on transpose of matrices.	2	CO1
LLO1.3Applythe concept to matrix to solve engineering problems.	4*	Solve Simultaneous Equation using inversion method.	2	CO1
LLO1.3Applytheconceptofmatrixtosolveengineering problems.	5	Apply Matrix Inversion method to determine currents through various branches of given electrical networks.	2	CO1
LLO1.3Applytheconceptofmatrixtosolveengineering problems.	6	Determine inverse of a non-singular matrix by using open-source software.	2	CO1
LLO 1.4Applythe concept of partial fraction to solve engineering problems.	7*	Resolve into partial fraction using linear non-repeated and irreducible quadratic factors.	2	CO1
LLO 2.1 & 2.2 Solve problems on Compound, Allied, multiple and sub multiple angles for related shapes.	8*	Solve problems on Compound Allied, multiple and sub multiple angles.	2	CO2
LLO 2.3 Utilize the concept of trigonometry to solve engineering problems.	9*	Practice problems on factorization and de-factorization.	2	CO2
LLO 2.4 Utilize the concept of trigonometry to solve engineering problems.	10	Solve problems on inverse trigonometric ratios based on applications.	2	CO2

LLO 3.1 Apply the concept of function to solve engineering problems.	11	Solve problems related to different types of functions.	2	CO3
LLO 5.1 Apply the concept of derivative to solve engineering problems	13*	Solve elementary problems on Algebra of Derivative & composite function.	2	CO4
LLO 4.1 Apply the concept of derivative to solve engineering problems.	14*	Solve problems to find derivatives of implicit function and parametric function.	2	CO4
LLO 4.2 Apply the concept of derivative to solve engineering problems.	15*	Solve problems to find derivative of logarithmic exponential and inverse functions for engineering applications.	2	CO4
LLO 5.1 Apply the concept of equation of tangent and normal to solve engineering problems.	16*	Solve problems based on second order derivative and finding equation of tangent and normal for engineering applications.	2	CO5
LLO 5.2 Apply the concept of maxima, minima, and radius of curvature to solve engineering problems.	17	Solve problems based on finding maxima, minima of function and radius of curvature at a given point for engineering applications.	2	CO5
LLO 5.1 Apply the concept of equation of tangent and normal to solve engineering problems.	18	Use the concept of tangent and normal to solve the given problem of Engineering Drawing.	2	CO5
LLO 5.2 Apply the concept of Maxima and Minima to solve engineering problems.	19	Use the concept of Maxima and Minima to obtain optimum value for given engineering problem.	2	CO5
LLO 5.3 Apply the concept of radius of curvature to solve engineering problems.	20	Use the concept of radius of curvature to solve given branch specific engineering problem.	2	CO5
LLO 5.1 Utilize the concept of derivative to solve engineering problems.	21	Use the concept of derivative to find the slope of a bending curve for given engineering problem.	2	CO5

Note: 1. Take any 12 tutorials out of 21 and ensured that all the units are covered.
2. Take tutorial in the batch size of 20 to 30 students.
3. Give students at least 10 problems to solve in each tutorial.

VII. SUGGESTED MICROPROJECT/ASSIGNMENT/ACTIVITIES FOR SPECIFIC LEARNING/SKILLS DEVELOPMENT (SELFLEARNING)

Micro project
-- **NA** ---

Assignment

- Collect examples based on real world applications of logarithm and prepare a pdf file.
- Solve the simultaneous system of equation in two variables by Matrix Inversion Method. Write down a Mathematical programming using any open-source software to verify the result.
- Collect an example on coding theory using applications of matrices and prepare a pdf file.
- Represent the Graph of Trigonometric function, Logarithmic function on GeoGebra and interpret the nature of graph and make a pdf file.
- Collect at least 10 examples based on real world uses of trigonometry in day-to-day life.
- Measure height of trees in surrounding locations using trigonometry and prepare presentation.
- Find the derivative of $y = x^{\sin x}$ and visualize the graph of the function and its derivative using any open-source software geometrically.
- Collect at least 10 examples based on real world uses of applications of derivative.
- Attempt any 5-7 Assignment, out of the given list.

VIII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr. No	Equipment Name with Broad Specifications	Relevant LLO Number
	……………………………………………NA………………………………………………………	NA

IX. SUGGESTED FOR WEIGHAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr. No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Algebra	CO1	18	4	12	8	24
2	II	Trigonometry	CO2	14	4	4	8	16
3	III	Function& Limit	CO3	3	2	4	0	06
4	IV	Differential Calculus	CO4	20	2	6	8	16
5	V	Application Of Derivatives	CO5	5	2	2	4	08
		Grand Total		**60**	**14**	**28**	**28**	**70**

Legends: R – Remember Level, U – Understand Level, A – Application Level

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- ➢ Progressive Tests.
- ➢ Self-Learning

Summative Assessment (Assessment of Learning)

➢ End Term Theory Exam.

XI. SUGGESTED COS-POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (PO's)							Programme Specific Outcomes* (PSOs)	
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society ,Sustain ability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2
CO1	3	3	1	-	-	-	3	-	-
CO2	2	2	1	-	-	-	2	-	-
CO3	1	-	-	-	-	-	2	-	-
CO4	3	3	1	-	-	-	3	-	-
CO5	1	2	-	-	-	-	2	-	-
Legends:-High:03,Medium:02,Low:01,NoMapping:-									

XII. SUGGESTED LEARNING MATERIALS/BOOKS

Sr. No	Author	Title	Publisher
1	Grewal B. S.	Higher Engineering Mathematics	Khanna publication New Delhi, 2013 ISBN:8174091955
2	Dutta. D	A text book of Engineering Mathematics	New age publication New Delhi, 2006 ISBN: 978-81-224-1689-3
3	Kreysizg, Ervin	Advance Engineering Mathematics	WileypublicationNewDelhi2016ISBN:978-81-265-5423-2
4	Das H.K.	Advance Engineering Mathematics	S Chand publication New Delhi 2008 ISBN:9788121903455
5	Marvin L. Bittinger David J. Ellenbogen ScottA. Surgent	Calculus and Its Applications	Addison-Wesley10thEditionISBN-13:978-0-321-69433-1
6	C. S. Seshadri	Studies in the History of Indian Mathematics	Hindustan Book Agency, New Delhi 110016.ISBN 978-93-80250-06-9
7	George Gherghes Joseph	Indian Mathematics Engaging with the World from Ancient to Modern Times	WorldScientificPublishingEuropeLtd.57ISBN978-17-86340-61-0
8	Deepak Singh	Mathematics-I	Khanna Book Publishing Co. (P) Ltd. ISBN: 978-93-91505-42-4
9	Garima Singh	Mathematics-II	Khanna Book Publishing Co. (P) Ltd. ISBN: 978-93-91505-52-3
10	Gareth James, Daniela Witten, Trevor Hastie Robert and Tibshirani.	An Introduction to Statistical Learning with Applications in R	Springer New York Heidelberg Dordrecht London ISBN 978-1-4614-7137-0 ISBN 978-1-4614-7138-7 (eBook)
11	Gunakar Muley	Sansar Ke Mahan Ganitagya	t Edition, Rajkamal Prakashan, ISBN-10.8126703571, ISBN-13. 978-8126703579.
12	T. S. Bhanumurthy	A Modern introduction to Ancient Indian Mathematics	New Age International Private Limited, 1 January2008 ISBN- 10. 812242600X, ISBN- 13. 978-2426007
13	M.P. Trivediand P. Y Trivedi	Consider Dimension and Replace Pi	ion Press; 1st edition (2018), ISBN-978-1644291795

XIII.   LEARNING WEBSITES & PORTALS

Sr. No.	Link / Portal	Description
1	http://nptel.ac.in/courses/106102064/1	Online Learning Initiatives by IITs and IISc
2	www.scilab.org/-SCILab	Signal processing, statistical analysis, image enhancement.
3	www.mathworks.com/product/matlab/-MATLAB	Applications of concepts of Mathematics to coding.
4	Spread sheet Applications	Use of Microsoft Excel, Apple Numbers, Google Sheets.
5	https://ocw.mit.edu/	MIT Course ware
6	https://www.khanacademy.org/math?gclid=CNqHuabCys4CFdOJaddHoPig	Concept of Mathematics through video lectures and notes
7	http://ocw.abu.edu.ng/courses/mathematics/	List of Mathematical Courses.
8	https://libguides.furman.edu/oer/subject/mathematics	Open Education Resources (OER) in Mathematics.
9	https://phet.colorado.edu/en/simulations/filter?subjects=math&type=html,prototype	Phet Simulation for Mathematics.
10	https://libguides.cmich.edu/OER/mathematics	Mathematics with OER.

XIV. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Sr. No	Name of Faculty	Designation	Sign
1.	**Ms. A.S.Salunkhe**	**Lect. In Mathematics**	
2.	**Ms. S.G.Jirewar**	**Lect. In Mathematics**	

XV. COURSE CURRICULUM REVIEW COMMITTEE

Sr. No	Name of Faculty	Designation	Sign
1.	**Mrs. H.H.Bhumkar**	**Lect. In Mathematics**	