GAUHATI UNIVERSITY

FOUR YEAR UNDERGRADUATE PROGRAMME (FYUGP)

SUBJECT: MATHEMATICS
Syllabus: Version-I

Programme Code: MAT027

Programme name & Programme Code: MAT027	Eligibility Criteria of the programme, if any	Semester	Course name	Course code	credits	Credit distribution of the course			Pre-requisite of the course (if any)	Internal marks	External Marks
						Lecture	Tutorial	Practical			
FYUGP in Mathematics (Major/ Minor)	Nill	1	**Classical Algebra**	MAT010104	4	4	0	0	Mathematics in 10+2 or equivalent standard	40	60
		2	**Calculus**	MAT020104	4	4	0	0	Do	40	60
		3	**Ordinary Differential Equations**	MAT030104	4	4	0	0	MAT020104	40	60
		4	**Real analysis**	MAT040104	4	4	0	0	Mathematics in 10+2 or equivalent standard	40	60
			Complex Analysis-I (with practical)	MAT040204	4	3	0	1	Mathematics in 10+2 or equivalent standard	Practical 25+Internal 30	45
			Analytical Geometry	MAT040304	4	4	0	0	Do	40	60

			Number Theory-I	MAT040404	4	4	0	0	Do	40	60
		5	**Abstract Algebra**	MAT050104	4	4	0	0	Do	40	60
			Multivariate Calculus	MAT050204	4	4	0	0	MAT020104	40	60
			Theory of Real Functions	MAT050304	4	4	0	0	MAT040104	40	60
			Numerical Analysis (with practical)	MAT050404	4	3	0	1	Mathematics in 10+2 or equivalent standard	Practical 25+Internal 30	45
		6	**Linear Algebra**	MAT060104	4	4	0	0	MAT050104	40	60
			Partial Differential Equations (with practical)	MAT060204	4	3	0	1	MAT030104	Practical 25+Internal 30	45
			Metric Spaces	MAT060304	4	4	0	0	MAT040104	40	60
			Mechanics	MAT060404	4	4	0	0	Mathematics in 10+2 or equivalent standard	40	60
Honours/ Honours with Research		7	**Algebra**	MAT070104	4	4	0	0	MAT050104	40	60
			Real Analysis and Lebesgue Measure	MAT070204	4	4	0	0	MAT040104 & MAT050304	40	60
			Complex Analysis-II	MAT070304	4	4	0	0	MAT040204	40	60

			Differential Equations	MAT070404	4	4	0	0	MAT030104 & MAT060204	40	60
			Research Methodology	MAT070504	4	4	0	0	Nil	40	60
Honours		8	**Topology**	MAT080104	4	4	0	0	MAT040104	40	60
			Number Theory-II	MAT080204	4	4	0	0	MAT040404	40	60
			Mechanics and Tensor Calculus	MAT080304	4	4	0	0	MAT060404	40	60
			Mathematical Methods	MAT080404	4	4	0	0	MAT050404	40	60
			Seminar/ Project	MAT080504	4	4	0	0		40	60
Honours with Research		8	**Dissertation**	MAT080116	16					160	240
			Seminar/ Project	MAT080204	4					40	60

Programme Specific Outcomes:

PSO1: Demonstrate mathematical ability effectively by oral, written, computational and graphical means.

PSO2: Measure the hypothesis, theories, techniques and proofs provisionally through analytic ability.

PSO3: Utilize mathematics to solve theoretical and applied/ real world problems by critical understanding, analysis and synthesis.
PS04: Develop a spirit of lifelong learning through continued education and research.

SEMESTER-I

MAT010104: Classical Algebra

Total Marks: 100 (External 60, Internal Assessment 40)
No. of Credits: 4
No. of Contact classes: 60

No. of Non-Contact classes: 0

Prerequisites: Mathematics in 10+2 or equivalent standard

Course Outcomes:

The students who take this course will be able to:

CO1 Identify symmetric functions of the roots for cubic and biquadratic equations, solve cubic and biquadratic equations.

CO2 Recognize consistent and inconsistent systems of linear equations by the row echelon form of the augmented matrix and calculate the inverse and rank of a matrix.

CO3 Classify and compute Learn how to find the nature of the roots of a given polynomial equation by Descartes' rule

CO4 Express the basic concepts of exponential, logarithmic and hyperbolic functions of complex numbers.

CO5 Apply De Moivre's theorem in a number of applications to solve numerical problems.

UNIT 1: Polar representation of complex number, De Moivre's theorem (both integral and rational index), Roots of complex numbers, n^{th} roots of unity, Application of De Moivre's Theorem, Exponential and logarithmic functions of complex numbers, Hyperbolic functions.

[1] Chapter 2 (Sections 2.7-2.13, 2.16)

(No. of classes: 20, Marks: 20)

UNIT 2: Algebraic equations: Deduction from Fundamental Theorem of Classical Algebra, Descartes' rule of signs, relation between roots and coefficients of a polynomial equation of degree n, symmetric functions of roots, Transformation of equations, Cardon's method of solution of a cubic equation, Euler's method of solution of a biquadratic equation.

[1] Chapter 5; Theorem 5.1.1, Theorem 5.2.1, Section 5.3 - 5.6, 5.11,5.12.

(No. of classes: 20, Marks: 20)

UNIT 3: Matrix Algebra, Addition, Transposition, Symmetry, Multiplication of matrices and their properties, Matrix inversion and properties, Row Echelon form and Rank of a matrix, Reduced row Echelon form, Consistency of linear systems, Solutions of system of homogeneous linear equations with number of equations and unknowns up to four.

[2] Chapter 3 (Sections 3.2, 3.5, and 3.7) Chapter 2 (Sections 2.1 to 2.4)

(No. of classes: 20, Marks: 20)
Text Books:

1. Mappa, S.K., Higher Algebra (Classical), Revised 8^{th} Edition, 2011, Levant Books.

2. Meyer, Carl D. (2000). Matrix Analysis and Applied Linear Algebra. Society for Industrial and Applied Mathematics (Siam).

Reference Books:

1. Dickson, Leonard Eugene (2009). First Course in The Theory of Equations. The Project Gutenberg eBook (http://www.gutenberg.org/ebooks/29785)

2. Gilbert, William J., & Vanstone, Scott A. (1993). Classical Algebra (3rd ed.). Waterloo Mathematics Foundation, Canada.

3. Titu Andreescu and Dorin Andrica, Complex Numbers from A to Z, Birkhauser,2006.