Course learning outcomes of Four years UG programme (FYUGP) in Mathematics as a Subject are to

1. Create deep interest in learning mathematics.
2. Develop broad and balanced knowledge and understanding of definitions, concepts, principles and theorems.
3. Familiarize the students with suitable tools of mathematical analysis to handle issues and problems in mathematics and related sciences.
4. Enhance the ability of learners to apply the knowledge and skills acquired by them during the programme to solve specific theoretical and applied problems in mathematics.
5. Provide students/learners sufficient knowledge and skills enabling them to undertake further studies in mathematics and its allied areas on multiple disciplines concerned with mathematics.
6. Encourage students to develop core competency skills that are helpful in employability, internships and social activities.

INSTRUCTION TO QUESTION SETTER

Semester Internal Examination (SIE) 20+5 = 25 marks:

The Semester Internal Examination shall have two components.

a) One Semester Internal Assessment Test (SIA) of 20 marks.
b) Class Attendance Score (CAS) including the behaviour of the students towards teachers and students activity in the institution of 5 marks.

End Semester Examination (ESE) 75 marks:

There will be two groups of questions.

Group A is compulsory which will contain three questions.

a) **Question No.1** very short answer types consisting of five questions of ***one*** mark each.
b) **Questions No.2 and 3** will be short answer type questions of ***five*** marks each.

Group B will contain descriptive type seven questions of ***fifteen*** marks each, out of which any four are to be answered.

Note: There may be subdivisions in the questions of group B.

Subject name	Code	Credit	Teaching hours
Introduction Course in Mathematics	IRC-1	**3**	**45 hours**

Course Learning Outcomes: This course will enable the students to:

a) Understand the notions of logic and Mathematical Induction with proofing strategies.
b) Basic concepts of sets relation and functions.
c) A basic concept of number theory.
d) A basic concept of real Analysis.

Unit 1: Logic: statement, truth table, quantifiers, proof strategies, Tautology, Mathematical induction.

[1 Question]

Unit 2: Sets and functions and relations: reflexive, symmetric, asymmetric and transitive relations, injective, surjective and bijective functions.

[1 Question]

Unit 3: Theory of numbers: Modular arithmetic, divisibility, Congruence relation,Linear congruence and Chinese remainder theorem, Fermat's little theorem, Wilson's theorem, arithmetic functions and.

[1 Question]

Unit 4: Real number system: Field and order structure, bounded sets, Supremum and infimum of sets, Completeness property of R.

[2 Question]

Unit 5: Sequences and series: Limit of a sequence, convergent and Non- convergent sequence, Limit points of a sequence, Positive term series, convergent and divergent series, Comparison test of positive term series.

[2 Question]

Suggested Books:

1. **Real Analysis, 1st Ed., R. K. Dwivedi, Pragati Prakashan, 2019.**
2. **R.G. Bartle and D. R. Sherbert, Introduction to Real Analysis(3rd Edition), John Wiley and Sons(Asia) Pvt. Ltd., Singapore,2002.**
3**. S.C. Mallik and S. Arora-Mathematical Analysis, New Age International Publications.**
4. An Introduction to The Modern Theory of Equations, Florian Cajori, The Macmillan Company ' London: Macmhian & Co., Ltd., 1904.
5. Discrete Mathematical Structure, 4 th Ed., Kolman, Busby and Ross, Pearson Education Asia, 2002.
6. V. Rajaraman, Computer oriented numerical methods, Prentice Hall India, 1993.

Subject name	Code	Credit	Teaching hours
Algebra	**MJ-1**	**6**	**90 hours**

Course Learning Outcomes: This course will enable the students to:

a) Learn and apply DeMoivre's theorem.
b) Understand relation and functions.
c) Basic concept of theory of Numbers.
d) Rank of matrix and solution of system of linear equations.
e) Evaluation of Eigen values and Eigen vectors of a matrix.
f) Introduction to vector space and linear trasformations.

UNIT 1: Trigonometry: Polar form of complex number, Nth roots of unity, De Moivre's Theorem, Applications of De Moivre's Theorem in expansions of $sinnx$ and $cosnx$, and in expansions of $sinx$ and $cos\ x$, Logarithmic of complex numbers. **[1 Question]**

UNIT 2: Relation and function: Equivalence relations, Functions, Composition of functions, Invertible functions; One to one correspondence and cardinality of a set. **[1 Question]**

UNIT 3: Theory of numbers: Well-ordering property (WOP) of positive integers, Division algorithm, Divisibility and Euclidean algorithm, Congruence relation between integers, Principles of Mathematical Induction, Fundamental Theorem of Arithmetic. **[1 Question]**

UNIT 4: Matrix and Linear Algebra: Rank of a matrix, Vector space and subspace, Theorems on subspaces, basis and dimension, Subspace of R^n and their dimension, theorems on basis and dimension, row space, column space, row rank, column rank. **[1 Question]**

UNIT 5: System of linear equations: Matrix form of system of linear equations, augmented matrix, consistent and inconsistent system of linear equations, necessary and sufficient condition consistency of a system of linear equations, method of solving of homogeneous and non-homogeneous linear equations. **[1 Question]**

UNIT 6: Eigen values and Eigen vectors of matrices: Inverse of a matrix, Characterization of invertible matrices, Characteristic polynomial of a matrix, Eigen values and Eigen vectors, Theorems on Eigen values and Eigen vectors. **[1 Question]**

UNIT 7: Linear transformation: ordered basis, linear transformations and their matrix representation, Change of basis, Transition matrix. **[1 Question]**

Suggested Books:

1. Pankaj Kumar Manjhi, Algebra, 1ST edition, Pragati Prakashan, Meerut, 2018.
2. Titu Andreescu and Dorin Andrica, Complex Numbers from A to Z, Birkhauser, 2006.
3. Edgar G. Goodaire and Michael M. Parmenter, Discrete Mathematics with Graph Theory, 3rd Ed., Pearson Education (Singapore) P. Ltd., Indian Reprint, 2005.
4. David C. Lay, Linear Algebra and its Applications, 3rd Ed., Pearson Education Asia, Indian Reprint, 2007.