

KABI JAGADRAM ROY GOVERNMENT GENERAL DEGREE COLLEGE

Department of Mathematics

Programme Outcome & Course Outcomes W.e.f. 2023-2024

For UG NEP syllabus of Mathematics in Bankura University click link below:

<https://www.bankurauniv.ac.in/uploads/tempimagepdflink/1725560143.pdf>

Introduction:

The syllabus for Mathematics at undergraduate level using the Choice Based Credit system has been framed in compliance with UGC, NEP 2020.

The main objective of framing this new syllabus is to give the students a holistic understanding of the subject giving substantial weightage to both the core content and techniques used in Mathematics. Keeping in mind and in tune with the changing nature of the subject, adequate emphasis has been given on new techniques of mapping and understanding of the subject.

Mathematics is the study of quantity, structure, space and change. It has very broad scope in science, engineering and social sciences. The syllabus has given equal importance to the six main branches of mathematics –Calculus, Geometry and Algebra. The syllabus has also been framed in such a way that the basic skills of subject are taught to the students, and everyone might not need to go for higher studies and the scope of securing a job after graduation will increase.

It is essential that Mathematics students select their multidisciplinary courses from Physics, Chemistry and/or any branch of Life Sciences disciplines and/or any course from graduation level.

While the syllabus is in compliance with UGC, NEP 2020 curriculum, some changes have been made to ensure all topics are covered and any of the subjects don't become difficult to be completed in one semester. For example, Major (DSC) Core course 1 on "Calculus, Geometry & Vector Analysis" and major core course 2 on "Algebra" now also has introductory concepts on Geometry, Algebra and has been renamed accordingly. The syllabus of Minor Stream (MN), MN-1 and MN-2 courses are same as of the syllabus of the Major (DSC) core courses, MJC-1 and MJC-2 respectively, but the standard (level) of the question paper may be different.

In generally, evaluation process of each course is carried out through Internal Assessment (IA) and End- Semester Examination (ESE). 10 marks is allotted for Internal Assessment (IA) and 40 marks is allotted for End-Semester Examination (ESE).

Question paper of each course for End Semester Examination contains three contents. 05(five) questions to be answered out of 08(eight) questions carrying 02(two) marks of each in Unit –I. 04 (four) questions to be answered out of 06(six) questions carrying 05 (five) marks of each in Unit –II and similarly, 01(one) question to be answered out of 02(two) questions carrying 10(ten) marks of each in Unit–III. Otherwise, the marks distributions of the particular course should be clearly mentioned.

The Bachelor's Degree in B.Sc. (Hons./ Hons. with research) is awarded to the students on the basis of knowledge, understanding, skills, attitudes, values and academic achievements sought to be acquired by learners at the end of these programmes. Hence, the course outcomes and course specific outcomes of mathematics for these courses are aimed at facilitating the learners to acquire these attributes, keeping in view of their preferences and aspirations for knowledge of mathematics.

The course outcomes and course specific outcomes of each paper are designed so that these may help learners to understand the main objectives of studying the course. This



will enable learners to select elective papers depending on the individual inclinations and contemporary requirements. These syllabi in Mathematics under NEP 2020 are recommended keeping in view of the wide applications of Mathematics in Science, Engineering, Social science, Business and a host of other areas. The study of the syllabi will enable the students to be equipped with the state of the art of the subject and will empower them to get jobs in technological and engineering fields as well as in business, education and healthcare sectors.

The text books mentioned in references are denotative/demonstrative. The divisions of each paper in units are specified to the context mentioned in courses. These units will help the learners to complete the study of concerned paper in certain periods and prepare them for examinations.

Hence, the programme has been chalked out in such manner that there is scope of flexibility and innovation in modifications of prescribed syllabi, teaching-learning methodology, assessment technique of students and knowledge levels, learning outcomes of courses, inclusion of new elective courses subject to availability of experts in across the country.

Programme Objectives (POs):

PO1: Mathematical Reasoning: Applications of the mathematical knowledge to the solutions of more complex problems in academic and in real life.

PO2: Analysing Ability: Identification, formulation and solution of a problem which leads to conclusion using basic principles.

PO3: Developing Confidence: Analysing more complicated problems and getting solutions helps to build up confidence.

PO4: Design/development of more accuracy: Design and development of methods/procedures for solutions of problems which meet the specific queries in industry as well as real life.

PO5: Ability of investigations for more complex problems: Use of research-based knowledge and research methods to handle more complex problems.

PO6: Applications of theory-based knowledge: Ability to apply the theoretical knowledge including theory, experiment and computational data; analysis and interpretation of data, to get the definite conclusions.

PO7: Ability of Modern tool usage: Application of appropriate techniques, resources, updated software and modern mathematical tools to solve mathematical activities with a good understanding of their limitations.

PO8: Team work practice: Collective efforts for functioning effectively as a member or leader in diverse teams, and/or in multidisciplinary settings.

PO9: Communication skill: Effective Communication skill for scientific activities helps to establish a good researcher with popular face in the scientific community.

PO10: Ability of presentation: Writing the effective reports and design document to give and receive clear instructions/limitations/restrictions for good presentations.

PO11: Life-long learning process: Recognize the needs, proper learning and ability to engage in lifelong learning in the broadest context of scientific & technological changes.

PO12: Students undergoing this programme learn to logically question assertions, to recognise patterns and to distinguish between essential and irrelevant aspects of problems. They also share ideas and insights while seeking and benefitting from knowledge and insight of others. This helps them to behave responsibly in a rapidly changing interdependent society.



Programme Specific Outcomes (PSOs):

The Department of Mathematics offers exciting opportunities to talented students pursuing a Degree/Diploma/Certificate for acquiring a rigorous and modern education in mathematics and for pursuing master's degree in both pure and applied mathematics as well as higher studies based on Mathematics. This Program will introduce the classical topics of mathematics, which helps in acquiring thinking skills to undertake cutting-edge research in a higher education programme.

Programme Career Opportunities:

This program will enable the students to take part and qualify for the state and national level examinations such as JAM, NBHM, etc. After completion of this programme, the students are well prepared for higher studies such as M. Sc. and Integrated Ph.D. program in Mathematics. This programme will also help students to enhance their employability for government jobs, jobs in banking, insurance and investment sectors, data analyst jobs and jobs in various other public and private enterprises. Completion of this programme will also enable the learners to join teaching profession in primary and secondary schools. The skills and knowledge gained has intrinsic beauty, which also leads to proficiency in analytical reasoning which also helps them to become more professional.

Course Outcomes for the Academic Year: 2023-2024 & 2024-2025:

Semester-I	
Course Title and Course Code	Course Outcomes
Calculus, Geometry & Vector Analysis (S/MTH/101/MJC-1 and S/MTH/102/MN-1)	The main objective of this course is to give a deep insight of the differentiations and its consequence applications and techniques of sketching for curves in Cartesian and polar coordinate systems. This course also gives the outstanding knowledge of two- and three-dimensional geometry also the concept vector calculus. After completion of this course a student would have 1. A vast knowledge of Calculus which they can use for their further study. 2. A clear idea of characterizations of two dimensional as well as three-dimensional geometry. 3. A clear concept of vector analysis and its applications
Basics of Set Theory & Numbers (S/MTH/103/MD-1)	The course will enable the students to: i) Obtain the conceptual idea of Sets and related topics like Venn diagram, cardinality of a set etc. ii) Idea of the relations and different types of mappings. iii) Learn about the algebraic structure of real numbers. This course specifically enables to the students- i) Prime numbers and different properties along with operations of these numbers. ii) Knowing about the idea of real number series.
Logic & Sets (S/MTH/104/SEC-1)	The course will enable the students to i) Learn the syntax of first-order logic and semantics of first-order languages. ii) Understand the propositional logic and basic theorems like compactness theorem, meta theorem and post-tautology theorem. iii) Familiarize with syntax of propositional logic, sets and their consequences. The student acquires the knowledge of 1. Knowing about the concept of the Post tautology theorem.



	2. Assimilating the concept of completeness interpretations and their applications with special emphasis on applications in algebra.
Semester-II	
Algebra (S/MTH/201/MJC-2 and S/MTH/202/MN-2)	After successful completion of this course students will be able to 1. Learn elementary complex numbers and its properties, theory of equations along with solving techniques of cubic & bi-quadratic algebraic equation and inequality with special emphasis on the relation AM, GM & HM. 2. Learn the integers in detail along with the elementary principles such as 'well ordering principle', 'principle of induction', 'division algorithm' etc. and also some important concepts such as congruence, properties of prime numbers, fundamental theorem of arithmetic etc. 3. Learn relations and mapping along with the concept of equipotent sets and cardinality. 4. Learn matrix, its inverse, rank of the matrix, concept of eigen value and eigen vectors. 5. Learn to solve a system of linear equations: homogeneous as well as non-homogeneous
Basics of Probability & Statistics (S/MTH/203/MD-2)	The course will enable the students to: i) understand the concept of random experiment and probability. ii) understand distributions and different types of distribution functions. This course specifically enables to the students- 1. Axiomatic idea of probability and its related topics. 2. Different types of distribution functions like Discrete and Continuous.
C Programming Language (Theory & Practical) (S/MTH/204/SEC-2)	The course will enable the students to i) understand and apply the programming concepts of C which are important for mathematical investigation and problem solving. ii) use the mathematical library functions for computational. The student acquires the knowledge of 1. Representing the outputs of programs visually in terms of well formatted text and plots. And student can create problem-based C Coding by yourself. 2. Identifying the specific decision-making loops and commands.
Semester-III	
Analysis of Real Numbers and Real Functions (S/MTH/301/MJC-3)	The course will enable the students to: i) understand the concept of series, and sequence. ii) understand many properties of the real number \mathbb{R} and learn to define sequences in terms of functions from \mathbb{N} to a subset of \mathbb{R} . iii) Recognize bounded, convergent, divergent, Cauchy and monotonic sequences and to calculate their limit superior, limit inferior, and the limit of a bounded sequence. iv) Recognize the series, properties of series and different test for convergence of series. This course will enable the students to: 1. Understand the Real number system in detail, e.g., open and closed sets, limit point of a set, concept of Infimum, Supremum, Archimedean properties, etc., and several topological properties. 2. Gather deep concept of Sequence and Infinite series of real numbers together with graphical interpretations, e.g.,



	<p>convergence and divergence of sequence and series using several Mathematical tools and computation of limits of sequence and series.</p> <p>3. handle fundamental properties of the real numbers that lead to the formal development of real analysis and understand limits and their use in sequences, series, continuity and differentiation. Students will appreciate how abstract ideas and rigorous methods in mathematical analysis can be applied to important practical problems.</p>
<p>Ordinary Differential Equations (ODE) (S/MTH/302/MJC - 4)</p>	<p>The course will enable the students to</p> <p>i) understand the genesis of ordinary differential equations.</p> <p>ii) learn various techniques of getting exact solutions of solvable first order differential equations and linear differential equations of higher order.</p> <p>After successful completion of this course students will be able to</p> <ol style="list-style-type: none"> 1. Learn existence and uniqueness of a differential equation. 2. Learn second order differential equations, concept of Wronskian and its solution by the method of variation of parameters as well as operator methods. 3. Learn the power series solution to the differential equation about an ordinary point. 4. Learn dynamical system, concept of phase plane and equilibrium point.
<p>Python (Theory & Practical) (S/MTH/304/SEC - 3)</p>	<p>The course will enable the students to</p> <ol style="list-style-type: none"> 1. Interpret the fundamental Python syntax and semantics and be fluent in the use of Python control flow statements. 2. Express proficiency in the handling of strings and functions. 3. Determine the methods to create and manipulate Python programs by utilizing the data structures like lists, dictionaries, tuples and sets. 4. Identify the commonly used operations involving file systems and regular expressions. 5. Use functions and represent Compound data using Lists, Tuples and Dictionaries

