Institute for Excellence in Higher Education (IEHE), Bhopal (MP)

**NAAC Re-accredited (Third Cycle) Autonomous College
Under the UGC Scheme with 'A' Grade (CGPA-3.10)**

Program Outcomes (POs),
Program Specific Outcome (PSOs)
&
Course Outcomes (COs)
of
Department of Mathematics

B.Sc. (Honours) Mathematics
(Session: **2021-2022**)

COURSES OFFERED IN THE INSTITUE

Under Graduate Courses

- B.Com. Honours (Management/Account)

- B.A. Honours (Economics/History/Psychology/Sociology/Political Science/English Literature/Hindi Literature/Geography/Fashion Designing)

- **B.Sc. Honours** (Physics/Chemistry/**Mathematics**/Electronics/Biotechnology/Geography/ Forensic-Science)

Post Graduate Courses

- MA (English)
- MA (Economics)
- MA (Social Work)
- MA (History)
- MA (Public Administration)
- MA (Political Science)
- M.Com. (Management)
- M.Sc. (Physics)
- M.Sc. (Chemistry)
- M.Sc. (Biotechnology)
- **M.Sc. (Mathematics)**

Diploma Programme

- 14 Vocational Programmes

Certificate Programme

- 31 Vocational Programmes

Training Programmes

- 09 Vocational Programmes

Special Programmes

- 03 Vocational Programmes

Program Outcomes (PO) of the Under-Graduate Courses Offered

PO1: **Domain Knowledge:** Capable of demonstrating comprehensive knowledge &understanding of one or more other disciplines that form a part of an undergraduate programme of study.

PO2: **Critical Thinking:** Critically evaluate practices, policies and theories by following scientific approach to knowledge development. Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

PO3: **Problem Solving and Analytical Skills:** Ability to think rationally, analyse situations and solve problems adequately.

PO4: **Information and Digital Literacy:** Capability to use ICT in a variety of learning situations. Demonstrate ability to access, evaluate and use a variety of relevant information sources; and use appropriate software for analysis of data.

PO5: **Communication Skills:** The capacity to communicate effectively using appropriate media, to present complex information in a clear & concise manner. Acquire the learning abilities by focusing on LSRW (Listening, Speaking, Reading & Writing skill, which provide a stage to the students to sharpen their capacity to learn more.

PO6: **Social Interaction and sensitivity towards the societal issues:** Work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group and act together as a group or a team in the interests of a common cause. Elicit views of others, mediate disagreements and help reach conclusions in group settings.

PO7: **Self-directed & Life-long Learning:** Acquire the potential to engage in independent & life-long learning in the broadest context socio-technological changes. Critical sensibility to live experiences, with self-awareness and reflexivity of both and society.

PO8: **Environment and Sustainability:** Understand the issues of environmental contexts & sustainable development.

PO9: **Moral and Ethical Awareness:** Ability to embrace moral/ ethical values in conducting one's life, possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.

PO10: **Effective Citizenship:** Demonstrate empathetic social concern and equity centred national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

PO11: **Research-related skills:** A sense of inquiry and capability for asking relevant/appropriate questions, problematizing, synthesizing and articulating; Ability to recognize cause and effective relationships, define problems, formulate hypotheses, interpret and draw conclusions from data, ability to plan, execute and report the results of an experiment or investigation. Efficiency to apply one's learning to real life situations or in interdisciplinary areas.

PO12: **Leadership and Management Skills:** Competence to use skills in organizing for people to reach a shared goal. During leading a project, ability to motivate others to complete a series of tasks, often according to a schedule.

PO13: **Employability and Entrepreneurial Skill:** Ability to develop employability skills such as, positive attitude, good business sense, willingness to learn, resilience, ability to work under pressure, optimism, adaptability, perseverance and motivation, and a host of similar skills.

PROGRAMME OUTCOMES (PO): **B.Sc.**

Predefined Programme Outcomes	*Students taking admission to this program of B.Sc. get equipped with following outcomes:*
PO1	**Domain Knowledge:** Acquiring knowledge of fundamentals, basic Mathematics, domain knowledge of proper scientific models and Computing Specialization from defined problems and explaining the basic scientific principles and methods.
PO2	**Scientific thinking:** Inculcating scientific thinking and awareness, getting an ability to use necessary current techniques, skills, and modern tools.
PO3	**Problem Analysis:** Identifying, formulating, &analysing complex problems, reaching substantiated conclusions using first principles of Mathematics, natural sciences and electronic sciences.
PO4	**Communication:** Communicate concepts, designs, and solutions of scientific activities effectively and professionally with society at large.
PO5	**Information & Digital Literacy:** Capability to use ICT in a variety of learning situations. Demonstrate ability to access, evaluate and use a variety of relevant information sources; and use appropriate software for analysis of data.
PO6	**Ethical Awareness:** Ability to embrace moral/ ethical values in conducting one's life, possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to support the values required for collaborative work such as mutual trust & fairness.
PO7	**Environment &Sustainability:** Understanding the impact of scientific solutions on societal and environmental contexts and demonstrate knowledge of and need for sustainable development.
PO8	**Self-Directed and Life-Long Learning:** Acquire the ability to engage in independent and life- long learning in the broadest context socio-technological changes. Critical sensibility to live experiences, with self-awareness and reflexivity of both and society.
PO9	**Research-Related Skills:** • Acquiring familiarity with emerging areas of different subjects in science and their applications in various spheres of sciences and getting appraise of its relevance in future studies. • Getting ability to apply various statistical tools to research problems and ability to build statistical knowledge and knowing the statistical organization in India and abroad. • Developing scientific intuition, ability and techniques to tackle problems either theoretical or experimental in nature.
PO10	**Employability Skill:** Ability to develop employability skills such as, positive attitude, good business sense, willingness to learn, resilience, ability to work under pressure, optimism, adaptability, perseverance and motivation, and a host of similar skills.

Programme Specific Outcomes (PSO): **BSc (Honours) Mathematics**
(Honours/Major Subject)

Programme Specific Outcomes	*The students taking up this program of B.Sc. with Mathematics (Honours/Major) as a special subject of study, receive the following outcomes:*
PSO-1	**Strong Foundation in Knowledge:** Bachelor's degree in mathematics is the culmination of in-depth knowledge of algebra, calculus, geometry, differential equations and several other branches of mathematics. This also leads to study of related areas like computer science and statistics. Thus, this programme helps learners to acquire good knowledge and understanding in advanced areas of mathematics for further higher studies.
PSO-2	**Research-Related Skills:** Capability for inquiring about appropriate questions relating to the concepts in various fields of mathematics and to know about the advances in various branches of mathematics.
PSO-3	**Self-Directed Learning:** Ability to work independently and do in-depth study of various notions of mathematics.
PSO-4	**Abstract Skills:** Evaluate hypotheses, theories, methods and evidence within their proper contexts
PSO-5	**Problem Solving Skills:** Solve complex problems by critical understanding, analysis and synthesis
PSO-6	**Competency in Skills:** The skills and knowledge gained has intrinsic beauty, which leads to proficiency in analytical reasoning, critical understanding, analysis and synthesis in order to solve theoretical and practical problems. This can orient students towards applications of mathematics in other disciplines and moreover, can also be utilised in modelling and solving real life problems.
PSO-7	**Interdisciplinary Skills:** Students completing this programme will be able to present mathematics clearly and precisely, make vague ideas precise by formulating them in the language of mathematics, describe mathematical ideas from multiple perspectives and explain fundamental concepts of mathematics to non-mathematicians.
PSO-8	**Proficiency in Employments:** 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.

Department of Mathematics

Mapping of PSOs of BSc Mathematics *(Honours/Major)* **with POs of (Under-Graduate)**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
PSO-1	√	√	√	√	√	√	√	√	√	√			
PSO-2		√		√	√		√	√	√				
PSO-3			√			√		√		√			
PSO-4	√	√		√	√		√			√			
PSO-5	√		√		√	√	√	√	√				
PSO-6		√		√		√			√	√			
PSO-7		√	√		√		√	√		√			
PSO-8	√		√	√		√		√	√	√			
PSO-9													
PSO-10													

Course Outcomes (CO)s

Semester: I

Title: Algebra, Vector Analysis and Geometry (Major) Code: **MJS-161**

Course Outcomes	*The students taking up this course of B.Sc. with Mathematics (Major) as a special subject of study receive the following outcomes:*
CO-1	Recognize consistent and inconsistent system of linear equations by the row echelon form of the augmented matrix by using rank of matrix.
CO-2	Find the Characteristic equation, eigen values and corresponding eigen vectors of a given matrix.
CO-3	Solve the matrix equation Ax=b using row operations and matrix operations.
CO-4	Analyse vector functions to find limits, derivatives, tangent lines, integrals, arc length, curvature etc.
CO-5	Understand geometrical terminology for angles, triangles, quadrilaterals and circles.
CO-6	Enhance the knowledge of three-dimensional geometrical figures (*i.e.* cone and cylinders)

Semester: I

Title: Calculus and Differential Equations (Minor) Code: **MJS-162**

Course Outcomes	*The students taking up this course of B.Sc. with Mathematics (Minor) as a special subject of study receive the following outcomes:*
CO-1	Sketch curves in a plane using its mathematical properties in the different coordinate systems of reference.
CO-2	Using the derivatives in Optimization, Social sciences, Physics and Life sciences etc.
CO-3	Identify different types of differential equations and solve them.
CO-4	Formulate the differential equations for various Mathematical models.
CO-5	Using techniques to solve and analyse various Mathematical models.

Department of Mathematics

Semester: I

Title: Elementary Algebra & Trigonometry (Generic Elective)   Code: **GES-161(OA)**

Course Outcomes	*The students taking up this course of BA/BSc/BCom with Mathematics, Generic Elective-1 (O) (Theory) as a special subject of study receive the following outcomes:*
CO-1	Use the permutation, combinations, binomial theorem, matrices, determinant and trigonometry approach in different areas of business and science like budgeting, sales projection, cost estimation, analysing any data/ survey report / experimental result.
CO-2	To develop a basic ability to solve applications using the algebraic techniques covered throughout the course.
CO-3	To acquire a basic understanding of linear equations (and inequalities) in two variables including their graphs.
CO-4	An understanding of exponential, logarithmic, trigonometric and inverse trigonometric functions as well as their applications.

Semester: I

Title: Linear Programming *(Generic Elective) BA/BSc/BCom*   Code: **GES-161(OB)**

Course Outcomes	*The students taking up this course of B.A./B.Sc./B.Com. with Mathematics, Generic Elective-1 (b) (Theory) as a special subject of study receive the following outcomes:*
CO-1	Find out optimal solution for linear optimization problems subject to certain constraints.
CO-2	Determine dual to a production problem with profits to be maximized and to keep total cost down.
CO-3	Formulate the model and find solutions through LPP.
CO-4	Solve the system of linear equations using Simplex method and Big-M method.
CO-5	Use the sensitivity analysis for changes in cost and resource vector.

Semester: II

Title: Calculus and Differential Equations (Major)   Code: **MJS-261**

Course Outcomes	*The students taking up this course of B.Sc. with Mathematics (Major) as a special subject of study receive the following outcomes:*
CO-1	Sketch curves in a plane using its mathematical properties in the different coordinate systems of reference.
CO-2	Using the derivatives in Optimization, Social sciences, Physics and Life sciences etc.
CO-3	Identify different types of differential equations and solve them.
CO-4	Formulate the differential equations for various Mathematical models.
CO-5	Using techniques to solve and analyse various Mathematical models.

Semester: II

Title: Algebra, Vector Analysis and Geometry (Minor)   Code: **MJS-262**

Course Outcomes	*The students taking up this course of B.Sc. with Mathematics (Minor) as a special subject of study receive the following outcomes:*
CO-1	Recognize consistent and inconsistent system of linear equations by the row echelon form of the augmented matrix, using the rank matrix.
CO-2	Find the Characteristic equation, Eigen values and corresponding Eigen vectors of a given matrix.
CO-3	Solve the matrix equation Ax=b using row operations and matrix operations.
CO-4	Analyse vector functions to find limits, derivatives, tangent lines, integrals, arc length, curvature etc.
CO-5	Understand geometrical terminology for angles, triangles, quadrilaterals and circles.

Semester: II

Title: Logic and Sets *(Generic Elective) BA/BSc/BCom*   Code: **GES-261(OA)**

Course Outcomes	*The students taking up this course of BA/BSc/BCom with Mathematics, Generic Elective (OA) (Theory) as a special subject of study receive the following outcomes:*
CO-1	Analyze the logical structure of statements symbolically, including the proper use of logical connectives, predicates, and quantifiers
CO-2	Construct truth tables for logical expressions and represent Mathematical statements in the predicate language.
CO-3	Solve problems and write proofs by using the concepts of set theory, including the methods of Venn diagrams and truth tables.
CO-4	Using the principles of logic to distinguish between sound and unsound resoning in discourse of everybody.
CO-5	Using the appropriate set theoretic concepts, thinking process, tools and techniques in the solution to various conceptual or real-world problems.

Semester: II

Title: Statistics and Probability *(Generic Elective) BA/BSc/BCom* Code: **GES-261(OB)**

Course Outcomes	*The students taking up this course of BA/BSc/BCom with Mathematics, Generic Elective (OB) (Theory) as a special subject of study receive the following outcomes:*
CO-1	Describe and calculate the mean deviation, standard deviation, range, quartiles and percentiles.
CO-2	Determine whether two events are mutually exclusive and independent.
CO-3	Calculate probabilities using the addition and multiplication rules.
CO-4	Recognize and understand about discrete and continuous functions, binomial, uniform and exponential probability distribution.
CO-5	Calculate and interpret the correlation coefficient.
CO-6	Understand the basic ideas of regression and correlation.
CO-7	Differentiate between type I and type II errors.
CO-8	Interpret the Student's t probability distribution, Chi-square goodness-of-fit, F and Z test.

Semester: III

Title: MATLAB Advanced (Honours-I) Code: S-361

Course Outcomes	The students taking up this course of B.Sc. with Mathematics, Honours-I as a special subject of study receive the following outcomes:
CO-1	Using of MATLAB and Math works Statistics and machine learning toolbox.
CO-2	Create and troubleshoot basic m scripts.
CO-3	Import database for analysis and Plot datasets.
CO-4	Write efficient, well-documented MATLAB code and present numerical results in an informative way
CO-5	Solve the algebraic equation of higher order, ordinary differential equation, various function, Laplace transform, Fourier transform and plotting graph in 2D and 3D by using MATLAB.

Semester: III
Title: Advanced Calculus (Honours-II) Code: S-362(A)

Course Outcomes	The students taking up this course of B.Sc. with Mathematics, Honours-II(A)/Subsidiary(A)as a special subject of study receive the following outcomes:
CO-1	Understand conceptual variations while advancing from one variable to several variables in calculus.
CO-2	Develop an understanding to apply calculus in optimization problems.
CO-3	Understand Inter-relationship amongst the line integral, double and triple integral formulations and the architecture of curves and surfaces in plane and space etc.
CO-4	Apply calculus as a tools in physics, economics, optimization.
CO-5	Found skills to Create Taylor and Maclaurin series by using the definition and/or by deafferenting or integrating and know about power series.
CO-6	Realize importance of Green, Gauss and Stokes' theorems in other branches of Mathematics.

Semester: III
Title: Numerical Methods (Honours-II) Code: S-362(B)

Course Outcomes	The students taking up this course of B.Sc. with Mathematics, Honours-II(B)/Subsidiary(B) as a special subject of study receive the following outcomes:
CO-1	Obtain numerical solutions of algebraic and transcendental equations.
CO-2	Find numerical solutions of system of linear equations and check the accuracy of the solutions.
CO-3	Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and non-linear equations and solution of differential equations.
CO-4	Solve initial and boundary value problems in differential equations using numerical methods.
CO-5	Implement numerical methods in MATLAB.
CO-6	Apply various numerical methods in real life problems.

Semester: IV

Department of Mathematics

Title: Integral Transform (Honours-I)   **Code: S-461**

Course Outcomes	*The students taking up this course of B.Sc. with Mathematics, Honours-I as a special subject of study receive the following outcomes:*
CO-1	Understand about piecewise continuous functions, Dirac delta functions, Laplace transforms and its properties.
CO-2	Solve ordinary differential equations by using Laplace transforms.
CO-3	Familiarise with Fourier transforms of functions and relation between Laplace and Fourier transforms.
CO-4	Explain Parseval's identity and applications of Fourier transforms to BVP.
CO-5	Develop an understanding about Fourier series, Bessel's inequality, term by term differentiation and integration of Fourier series.

Semester: IV

Statics and Dynamics (Honours-II/Subsidiary)   **Code: S-462(A)**

Course Outcomes	*The students taking up this course of B.Sc. with Mathematics, Honours-II(A)/Subsidiary(A) as a special subject of study receive the following outcomes:*
CO-1	Familiarize with subject matter, which has been the single centre, to which were drawn mathematicians, physicists, astronomers, and engineers together.
CO-2	Understand necessary conditions for the equilibrium of particles acted upon by various forces and learn the principle of virtual work for a system of coplanar forces acting on a rigid body.
CO-3	Determine the centre of gravity of some materialistic systems and discuss the equilibrium of a uniform cable hanging freely under its own weight.
CO-4	Develop equilibrium relationships for non-accelerating two- or three-dimensional rigid bodies and calculate the direct (resultant forces) and rotational (resultant moments) effects of external stimuli on a rigid body.
CO-5	Use Work/Energy to determine velocity or position of a particle in motion.

Semester: IV

Partial Differential Equations (Honours-II/Subsidiary)   **Code: 462(B)**

Course Outcomes	*The students taking up this course of BSc with Mathematics, Honours-II(B)/Subsidiary(B) as a special subject of study receive the following outcomes:*
CO-1	Classify partial differential equations and transform into canonical form.
CO-2	Apply a range of techniques to solve first & second order partial differential equations.
CO-3	Apply partial derivative equation techniques to predict the behaviour of certain phenomena.
CO-4	Extract information from partial derivative models in order to interpret reality.
CO-5	Identify real phenomena as models of partial derivative equations.
CO-6	Model physical phenomena using partial differential equations such as the heat and wave equations.

Semester: V

Advanced Mechanics (Honours-I)   Code: S-561

Course Outcomes	The students taking up this course of B.Sc. with Mathematics, Honours-I as a special subject of study receive the following outcomes:
CO-1	Calculate the effect of forces and motion of a particle and calculate centroids and moments of inertia of bodies.
CO-2	Find the loads and accelerations for rigid bodies under planar motion.
CO-3	Develop equilibrium relationships for non-accelerating particles acted on by forces.
CO-4	Understand the reduction of force system in three dimensions to a resultant force acting at a base point and a resultant couple.
CO-5	Analyze systems of interconnected rigid bodies and find the forces generated by the constraints.

Semester: V

Real Analysis (Honours-II/Subsidiary)   Code: S-562(A)

Course Outcomes	The students taking up this course of B.Sc. with Mathematics, Honours-II(A)/Subsidiary(A) as a special subject of study receive the following outcomes:
CO-1	Understand the properties of the real line R and learn to define sequences in terms of functions from R to a subset of R.
CO-2	Define and recognize the basic properties of the field of real numbers.
CO-3	Recognize bounded, convergent, divergent, Cauchy and monotonic sequences and to calculate their limit superior, limit inferior, and the limit of a bounded sequence.
CO-4	Apply the ratio, root, comparison tests etc, and the convergence of an infinite series, absolute convergence of alternating series of real numbers.
CO-5	Demonstrate skills in constructing rigorous mathematical arguments

Semester: V

Abstract Algebra (Honours-II/Subsidiary)   Code: S-562(B)

Course Outcomes	The students taking up this course of B.Sc. with Mathematics, Honours-II(B)/Subsidiary(B) as a special subject of study receive the following outcomes:
CO-1	Understand the concepts of vector spaces, subspaces, basis, dimension and properties.
CO-2	Relate matrices and linear transformations and compute eigen values and eigen vectors of linear transformations.
CO-3	Apply principles of matrix algebra to linear transformations.
CO-4	Realise importance of adjoint of a linear transformation and its canonical form.
CO-5	Apply the concept of eigenvectors and eigen spaces to determine the diagonalizability of a linear transformation.
CO-6	Understand the concepts of the null space, range, and matrix of a linear transformation and how to determine whether a linear transformation is one-to-one and onto.

Semester: VI

Advanced Abstract Algebra (Honours-I)   Code: **S-661**

Course Outcomes	*The students taking up this course of B.Sc. with Mathematics, Honours-I as a special subject of study receive the following outcomes:*
CO-1	Understand the basic concepts of group actions and their applications.
CO-2	Understand the fundamental concepts of ring theory such as the concepts of ideals, quotient rings, integral domains, fields, polynomial rings, fundamental properties of finite field extensions and classifications of finite fields etc.
CO-3	Understand elementary facts about subrings and ideals from the relevant definitions relationships between them.
CO-4	Determine whether a mapping between rings is a homomorphism and, if so, identify its kernel determine whether two rings are isomorphic.
CO-5	Prove elementary facts about extension fields from the relevant definitions and other elementary facts and construct extensions to a field F that contain the roots of a polynomial in F[x].
CO-6	Recognize and use the Sylow theorems to characterize certain finite groups.

Semester: VI

Linear Algebra (Honours-II/Subsidiary)   Code: **S-662(A)**

Course Outcomes	*The students taking up this course of B.Sc. with Mathematics, (Honours-II(A)/Subsidiary(A) as a special subject of study receive the following outcomes:*
CO-1	Understand about normal, self-adjoint, and unitary operators and their properties.
CO-2	Understand the notion of an inner product space in a general setting and how the notion of inner products can be used to define orthogonal vectors
CO-3	Understand how to find the singular value decomposition of a matrix.
CO-4	Apply the Gram-Schmidt process to generate an orthonormal set of vectors
CO-5	Understand the Jordan canonical form of matrices when it is not diagonalizable.
CO-6	Demonstrate understanding of inner products and associated norms.
CO-7	Understand the properties of inner product spaces and determine the orthogonality in inner product spaces.

Semester: VI

Real and Complex Analysis Code- S-662(B)

Course Outcomes	The students taking up this course of B.Sc. with Mathematics, Honours-II(B)/Subsidiary(B) as a special subject of study receive the following outcomes:
CO-1	Understand the properties of Riemann integrable functions and the applications of the fundamental theorems of integration.
CO-2	Understand several standard concepts of metric spaces and their properties like openness, closedness, Connectedness, completeness, Bolzano–Weierstrass property etc.
CO-3	Identify the continuity of a function defined on metric spaces.
CO-4	Demonstrate understanding of the basic concepts underlying complex analysis.
CO-5	Understand the significance of differentiability for complex functions and be familiar with the Cauchy-Riemann equations and determine whether a given function is analytic.
CO-6	Visualize complex numbers as points of R and stereographic projection of complex plane on the Riemann sphere.
CO-7	Understand the significance of differentiability and analyticity of complex functions leading to the Cauchy–Riemann equations.

Programme: B.Sc. (Major/Honours-I)   *Subject: Mathematics*

Mapping of COs with PSOs for Semester – I (Major)

Course		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Paper Title: **Algebra, Vector Analysis and Geometry** Paper Code: **MJS-161**	CO1	√	√	√	√	√	√	√	√		
	CO2	√		√		√	√	√	√		
	CO3	√	√		√	√		√	√		
	CO4	√	√	√		√		√			
	CO5			√	√		√				
	CO6	√	√		√	√		√	√		

Mapping of COs and PSOs for Semester – II (Major)

Course		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Paper Title: Calculus and Differential Equations Paper Code: **MJS-261**	CO1	√	√	√	√	√	√	√	√		
	CO2	√	√	√		√	√	√	√		
	CO3	√	√		√		√	√	√		
	CO4	√		√			√				
	CO5	√	√	√	√	√	√		√		

Mapping of COs and PSOs for Semester – III (Honours-I)

Course		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Paper Title: MATLAB Advanced Paper Code: S-361	CO1	√	√	√	√	√	√	√	√		
	CO2	√	√			√	√	√	√		
	CO3	√	√	√	√		√	√			
	CO4	√	√	√	√	√		√	√		
	CO5	√	√	√		√	√	√	√		

Mapping of COs and PSOs for Semester – IV (Honours-I)

Course		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Paper Title: Integral Transform Paper Code: S-461	CO1	√	√	√	√	√	√	√	√		
	CO2		√	√		√	√	√			
	CO3	√	√	√	√			√	√		
	CO4	√		√	√	√		√	√		
	CO5	√	√		√	√	√		√		

Mapping of COs and PSOs for Semester – V (Honours-I)

Course		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Paper Title: Advanced Mechanics Paper Code: S-561	CO1	√	√		√	√	√	√	√		
	CO2	√	√	√		√	√	√			
	CO3	√	√	√	√	√		√	√		
	CO4	√	√	√				√	√		
	CO5		√	√	√	√	√		√		

Mapping of COs and PSOs for Semester – VI (Honours-I)

Course		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Paper Title: Advanced Abstract Algebra Paper Code: S-661	CO1	√	√	√		√	√	√			
	CO2	√	√	√	√	√	√	√	√		
	CO3	√			√	√		√	√		
	CO4		√	√	√	√	√		√		
	CO5	√	√	√			√	√			
	CO6	√	√		√	√		√	√		

Programme: B.Sc. (Minor/Honours-II/Subsidiary)   *Subject-* Mathematics

Mapping of COs with PSOs for Semester-I (Minor)

Course		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Paper Title: Calculus and Differential Equations	CO1	√	√	√	√	√	√	√	√		
	CO2	√	√	√		√	√	√	√		
	CO3	√	√		√		√	√	√		
Paper Code: MNS-162	CO4	√		√			√				
	CO5	√	√	√	√	√	√		√		

Mapping of COs and PSOs for Semester-II (Minor)

Course		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Paper Title: Algebra, Vector Analysis and Geometry	CO1	√	√	√	√	√	√	√	√		
	CO2	√		√		√	√	√	√		
	CO3	√	√		√	√		√	√		
Paper Code: MNS-262	CO4	√	√	√		√		√			
	CO5			√	√		√				
	CO6	√	√		√	√		√	√		

Mapping of COs and PSOs for Semester-III (Honours-II/Subsidiary)

Course		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Paper Title: Advanced Calculus	CO1	√	√		√	√	√		√		
	CO2	√		√	√	√	√	√			
	CO3	√	√	√			√	√			
Paper Code: S-362(A)	CO4	√	√	√	√	√	√	√	√		
	CO5	√	√		√	√			√		
	CO6		√	√	√	√		√	√		

Mapping of COs and PSOs for Semester-III (Honours-II/Subsidiary)

Course		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Paper Title: Numerical Methods	CO1	√	√	√	√	√	√	√	√		
	CO2		√		√	√	√	√			
Paper Code: S-362(B)	CO3	√		√	√	√	√		√		
	CO4	√	√	√			√	√	√		
	CO5		√	√	√	√		√	√		
	CO6	√		√	√		√	√	√		

Mapping of COs and PSOs for Semester-IV (Honours-II/Subsidiary)

Course		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Paper Title: Statics & Dynamics	CO1	√	√		√	√	√		√		
	CO2			√	√	√	√	√	√		
Paper Code: S-462(A)	CO3	√	√	√	√	√			√		
	CO4	√	√	√		√	√	√			
	CO5	√	√	√	√		√		√		

Mapping of COs and PSOs for Semester-IV (Honours-II/Subsidiary)

Course		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Paper Title: Partial Differential Equations	CO1	√	√	√	√	√		√	√		
	CO2		√	√	√	√	√	√	√		
Paper Code: S-462(B)	CO3	√	√	√	√	√		√	√		
	CO4	√	√	√	√	√	√	√			
	CO5	√	√	√			√		√		
	CO6	√		√	√	√	√	√	√		

Mapping of COs and PSOs for Semester- V (Honours-II/Subsidiary)

Course		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Paper Title: **Real Analysis** Paper Code: S-562(A)	CO1	√		√	√	√		√	√		
	CO2	√	√	√	√	√	√	√	√		
	CO3	√	√	√		√	√	√	√		
	CO4	√	√	√	√		√		√		
	CO5		√	√		√	√	√	√		

Mapping of COs and PSOs for Semester- V (Honours-II/Subsidiary)

Course		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Paper Title: **Abstract Algebra** Paper Code: S-562(B)	CO1	√	√	√	√	√	√	√	√		
	CO2	√		√	√	√		√	√		
	CO3	√	√	√	√	√	√	√	√		
	CO4	√	√	√		√	√	√	√		
	CO5	√	√	√	√		√		√		
	CO6		√	√		√	√	√	√		

Mapping of COs and PSOs for Semester- VI (Honours-II/Subsidiary)

Course		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Paper Title: **Linear Algebra** Paper Code: S-662(A)	CO1	√	√	√	√		√	√	√		
	CO2	√		√	√	√		√	√		
	CO3	√	√	√	√	√	√	√	√		
	CO4	√	√	√		√	√	√	√		
	CO5	√	√	√	√		√		√		
	CO6		√	√		√	√	√			
	CO7	√	√		√	√	√	√	√		

Mapping of COs and PSOs for Semester-VI (Honours-II/Subsidiary)

Course		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Paper Title: **Real and Complex Analysis** Paper Code: S-662(B)	CO1	√		√	√	√		√	√		
	CO2	√	√	√	√	√	√	√	√		
	CO3	√	√	√		√	√	√	√		
	CO4	√	√	√	√		√		√		
	CO5		√	√		√	√	√	√		
	CO6	√	√	√	√	√	√		√		
	CO7	√	√		√	√		√	√		

Programme: BA/BSc/BCom (Generic Elective)   *Subject: **Mathematics***

Mapping of COs with PSOs for Semester-I (Generic Elective I(a) (Theory)

Course		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Paper Title: Elementary Algebra & Trigonometry	CO1	√	√		√	√	√	√	√		
	CO2	√			√	√	√	√	√		
	CO3	√	√	√	√	√	√				
Paper Code: GES-161(OA)	CO4	√	√	√	√			√	√		

Mapping of COs and PSOs for Semester-I (Generic Elective I(b) (Theory)

Course		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Paper Title: Linear Programming	CO1	√	√	√	√	√		√	√		
	CO2	√	√	√	√	√	√	√	√		
Paper Code: GES-161(OB)	CO3	√	√			√	√	√			
	CO4	√	√	√	√		√				
	CO5		√	√		√	√				

Mapping of COs and PSOs for Semester-II (Generic Elective II(a) (Theory)

Course		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Paper Title: Logic and Sets	CO1	√	√	√	√	√		√			
	CO2	√	√	√		√	√	√	√		
Paper Code: GES-261(OA)	CO3	√			√	√	√				
	CO4	√	√	√	√		√		√		
	CO5	√	√	√		√	√	√	√		

Mapping of COs and PSOs for Semester-II (Generic Elective II(b) (Theory)

Course		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Paper Title: Linear Algebra Statistics and Probability	CO1	√	√	√	√		√	√	√		
	CO2	√	√	√	√	√		√	√		
	CO3	√	√	√		√	√	√	√		
Paper Code: GES-261(OB)	CO4	√	√		√	√	√	√			
	CO5	√		√	√		√		√		
	CO6	√	√	√	√	√	√	√			
	CO7		√	√	√	√	√	√	√		
	CO8	√	√		√	√		√			

(IQAC Coordinator)   (Convenor, Academic Committee)   (HOD, Mathematics)

24/05/2021

संयोजक
शाकादमिक समिति
उच्चशिक्षा उत्कृष्टता संस्थान
भोपाल

Professor
Department of Mathematics
Govt. Institute for Excellence
in Higher Education, Bhopal (M.P

(Dr Pragyesh Kumar Agarwal)
Director
DIRECTOR,
INSTITUTE FOR EXCELLEN
IN HIGHER EDUCATION
BHOPAL-