FACULTY OF SCIENCES

SYLLABUS

of

Bachelor of Science (Honours)
Mathematics (Semester: I -VI)

(Under Continuous Evaluation System)

Session: 2022-23

The Heritage Institution

KANYA MAHA VIDYALAYA
JALANDHAR

(Autonomous)

Programme Specific Outcomes

Upon successful completion of this course, students will be able to:

PSO1: Solve complex Mathematical problems by critical understanding, analysis and synthesis. Students will also be able to provide a systematic understanding of the concepts and theorem of Mathematics and their applications in the real world to an advanced level, enhance career prospects in a huge array of field suitable to succeed at an entry level position in Mathematics post graduate program.

PSO2: Demonstrate proficiency in Mathematics and the Mathematical concepts needed for a proper understanding of Physics, Chemistry, Electronics, Computer Science and Economics.

PSO3: Create and develop Mathematical software application using a systematic approach & apply discrete Mathematical concept to practical application.

PSO4: Demonstrate knowledge of Calculus I & II, Matrices and Theory of Equations, Analytical and Solid Geometry, Statics & Tensor Calculus and able to apply this knowledge to analyze a variety of Mathematical Phenomena.

PSO5: Demonstrate knowledge of physical chemistry & apply this knowledge to analyze a variety of chemical phenomena & will be able to interpret and analyze quantitative data.

PSO6: Understand and demonstrate the knowledge of Mechanics, area, volume and displacement with differential equation of the orbit.

PSO7: Understand the basic concepts and basic principles of Demand and Supply, Measurement of Price Elasticity of Demand and apply Economic theories to derive cost function from Production Function.

PSO8: Learn implications of Revenue curves and their mutual relationships.

PSO9: Develop statistical approach and mathematical thinking among students to problem solving on a diverse variety of disciplines.

PSO10: Have knowledge of computer fundamentals, able to handle practical programming problems using C and analyze large volume of data using various statistical techniques

Bachelor of Arts/ Bachelor of Science (Medical) / Bachelor of Science (Non Medical) / Bachelor of Science(Honours) Maths/ Bachelor of Science (Honours) Physics/Bachelor of Science (Computer Science) / Bachelor of Science (Economics) / Bachelor of Commerce / Bachelor of Business Administration/ Bachelor of Arts (Journalism & Mass Communication) / Bachelor of .Science (Fashion Design) / Bachelor of Science (Home Science) / /Bachelor of Computer Application /Bachelor of Science(Information Technology)/ Bachelor of Science (Bio Technology) / Bachelor of Arts (Honours.)English

(Semester-I)

Session 2022-23

Course Title: Punjab History and Culture (From Earliest Times to C 320) (Special paper in lieu of Punjabi Compulsory)

(For those students who are not domicile of Punjab)

Course Code: BARL-1431/ BSML-1431/ BSNL-1431/ BOML-1431/ BOPL-1431/ BCSL-1431/

BECL-1431/ BCRL-1431/ BBRL-1431/ BJML-1431/ BFDL-1431/ BHSL-1431/ BCAL-1431/

BITL-1431 / BBTL-1431/BOEL-1431

COURSE OUTCOMES

After completing Semester I and course on Punjab History and Culture students of History will be able to identify and have a complete grasp on the sources & writings of Ancient Indian History of Punjab.

CO1: Identify and describe the emergence of earliest civilizations in: Indus Valley Civilization and Aryan Societies.

CO2: Identify and analyses the Buddhist, Jain and Hindu faith in the Punjab

CO3: Analyses the emergence of Early Aryans and Later Vedic Period, their Society, Culture, Polity and Economy

CO4: To make students understand the concepts of two faiths Jainism and Buddhism, its principles and their application and relevance in present times

BACHELOR OF VOCATION (RETAIL MANAGEMENT) / BACHELOR OF VOCATION (MANAGEMENT & SECRETARIAL PRACTICES)/ BACHELOR OF VOCATION (ANIMATION)/ BACHELOR OF VOCATION (TEXTILE DESIGN & APPAREL TECHNOLOGY)/ BACHELOR OF VOCATION (NUTRITION EXERCISE & HEALTH)/ BACHELOR OF VOCATION (BEAUTY AND WELLNESS)/BACHELOR OF VOCATION (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE)/ BACHELOR OF VOCATION (HOSPITALITY AND TOURISM)

(Semester I)

Session 2022-23

COMMUNICATION SKILLS IN ENGLISH

(Theory)

Course Code: BJML/BFDL/BHSL/BCAL/BITL/

BBTL /BOML/BOPL/BVRL/BVML/BVAL/BVTL/BVNL/BVBL / BVAI/BVHL-1102

COURSE OUTCOMES

At the end of this course, the students will develop the following Skills:

CO 1: Reading skills that will facilitate them to become an efficient reader

CO 2: Through reading skills, the students will have an ability to have a comprehensive understanding of the ideas in the text and enhance their critical thinking

CO 3: Writing skills of students which will make them proficient enough to express ideas in clear and grammatically correct English

CO 4: The skill to use an appropriate style and format in writing letters (formal and informal) and resume, memo, notices, agenda, minutes

Bachelor of Science (Honours) Mathematics
Semester–I
Session- 2022-23
Course Title: Calculus-I
Course Code: BOML-1333

Course Outcomes

After passing this course, the students will be able to:

CO 1: Understand real number system, lub & glb of set of real numbers, limit of a function, basic properties of limit, continuity, and classification of discontinuities & to apply it in real world problem.

CO 2: To Classify the difference between increasing and decreasing functions and understand the concept of Differentiability of functions and maxima & minima.

CO 3: Demonstrate Asymptotes, points of inflexion, multiple points on a curve & also to differentiate between concavity and convexity & hence tracing of curve.

CO 4: To understand the concepts of Riemann sum, definite integrals and their properties, the fundamental theorem of calculus, applications to length of arc and area bounded between curves, Reduction Formulae & to apply in a wide variety of disciplines like Bio, Eco, Physics & Engineering.

Bachelor of Science (Honours) Mathematics
Semester–I
Session- 2022 -23
Course Title: Coordinate Geometry
Course Code: BOML-1334

Course Outcomes

After passing this course, the students will be able to:

CO 1: Understand the concept of the geometry of lines in the Euclidian plane. Additionally, they will be able to develop geometry with a degree of confidence and will gain fluency in the basics of 2-d geometry.

CO 2: Gain deeper insight in core concepts and geometry related to circles including wider characteristics like tangent, normal, radical axis etc.

CO 3: Demonstrate the concept of parabola, ellipse, hyperbola and the general quadratic equation; and sketch conic sections, identify conic sections, their focal properties and classifications.

CO 4: Understand the concept of coordinate geometry on a wider scale with the help of shifting of origin and rotation of axis.

Bachelor of Science (Honours) Mathematics
(Semester–I)
Session: 2022-23
Course Title: Physical Chemistry Course
Course Code: BOMM-1085

Course outcomes:

Students will be able to:

CO1: understand the various thermodynamic properties and laws of Thermodynamics, acquire knowledge about the various thermodynamic terms like enthalpy of formation, enthalpy of ionisation, entropy, internal energy

CO2: calculate entropy change for reversible and irreversible processes under isothermal and non-isothermal conditions and also absolute entropies of substances

CO3: understand the relation between free energy change and equilibrium constants K_p, K_c and $K_{f,}$: describe the Phases and Phase rule and its thermodynamic derivation

CO4: draw and explain the phase diagrams of water system, sulphur system

CO5: understand the concept of Electrochemistry and various terms related to it like resistance, conductance, specific resistance, cell constant, EMF, importance of Nernst Equation

CO6: determine the transference number of ions using Hittorf and moving boundary methods

CO7: understand the concept of reaction rates and determine the rate law from initial rate data, determine the order of reaction with respect to each reactant, the overall order of reaction, the rate constant with units

Bachelor of Science (Honours) Mathematics
(Semester–I)
Session: 2022-23
Course Title: Physical Chemistry Practical
Course Code: BOMM-1085 (P)

Course outcomes:

Students will be able to:

CO1: determine the surface tension of different liquids and solutions

CO2: determine the viscosity of different liquids and solutions

CO3: efficiently use of calorimeter in various experiments

CO4: determine heat of neutralization and heat of solution

Bachelor of Science (Honours) Mathematics

Semester–I

Session 2022-2023

Course Code: BOML-1175

Microeconomics

Course outcomes:

After passing this course students will be able to:

CO1: describe and apply the methods of analyzing consumer behavior through demand ,supply and elasticity.

CO2: have an in-depth understanding of consumer behavior.

CO3: analyze and demonstrate knowledge of the basic theories and laws in economics suchas laws of production.

CO4: learn about the various cost and revenue curves and production function.

Bachelor of Science (Honours) Mathematics
Semester–I
Session-2022 -23
Course Title: Statics
Course Code: BOML-1336

Course Outcomes

After passing this course, the students will be able to:

CO 1: Apply parallelogram law of forces, triangle law of forces, Lami's theorem to real life problems.

CO 2: Understand that how one can resolve number of coplanar forces, parallel forces and concurrent forces acting at a body.

CO 3: Understand the concept of equilibrium and its related properties.

CO 4: Find the applications of CG of a rod, triangular lamina, solid hemisphere, hollow hemisphere, solid cone and hollow cone.

Bachelor of Science (Hons.) Mathematics Semester–I

(Session 2022-23)

Course Name: Mechanics

Course Code: BOMM-1396

Course Outcomes: Mechanics -Paper (A)

After passing this course, students will be able to:

CO1: Understand the various coordinate systems and its applications. Students will be able to know the conservations laws and the symmetries of space & time.

CO2: Know the fundamental forces of nature, concept of centreof mass, central forces and the motion of particle under central force and to determine the turning points of orbit.

CO3: Understand the frames of reference, coriolis forces and its applications and effect of rotation of earth on g.

CO4: understand the elastic collision in different systems, cross section of elastic scattering as well as Rutherford scattering and know the motion of rigid body.

Session 2022-23

Punjabi (Compulsory)

BACHELOR OF SCIENCE (HONOURS)MATHEMATICS/ BACHELOR OF ARTS (HONOURS) ENGLISH/ BACHELOR OF SCIENCE (HONOURS) PHYSICS
SEMESTER–II

COURSE CODE- BOEL/BOML/BOPL-2421

COURSE OUTCOMES

CO1:‘ਸਾਹਿਤ ਦੇ ਰੰਗ’ ਪੁਸਤਕ ਦੇ ਵਾਰਤਕ ਭਾਗ ਨੂੰ ਪੜ੍ਹਾਉਣ ਦਾ ਮਨੋਰਥ ਵਿਦਿਆਰਥੀਆਂ ਅੰਦਰ ਵਾਰਤਕ ਪ੍ਰਤੀ ਦਿਲਚਸਪੀ, ਸੂਝ ਨੂੰ ਪੈਦਾਕਰਨਾ ਹੈ।

CO2:ਇਸ ਦਾ ਹੋਰ ਮਨੋਰਥ ਭਾਸ਼ਣ ਕਲਾ ਤੇ ਲਿਖਣ ਕਲਾ ਦੀ ਨਿਪੁੰਨਤਾ ਪੈਦਾ ਕਰਨਾ ਹੈ।

CO3:‘ਸਾਹਿਤ ਦੇ ਰੰਗ’ ਪੁਸਤਕ ਦੇ ਰੇਖਾ ਚਿੱਤਰ ਭਾਗ ਨੂੰ ਸਿਲੇਬਸ ਵਿਚ ਸ਼ਾਮਿਲ ਕਰ ਕੇ ਵਿਦਿਆਰਥੀਆਂ ਅੰਦਰ ਰੇਖਾ ਚਿੱਤਰ ਨੂੰ ਪੜ੍ਹਣ ਦੀ ਰੁਚੀ ਨੂੰ ਪੈਦਾ ਕਰਨਾ ਹੈ ਤੇ ਇਹਨਾਂ ਮਹਾਨ ਸ਼ਖ਼ਸੀਅਤਾਂ ਦੀ ਸਫ਼ਲਤਾ ਪਿੱਛੇ ਘਾਲੀਆਂ ਘਾਲਣਾਵਾਂ ਤੋ ਵਾਕਫ਼ ਕਰਵਾਉਂਦਿਆਂ ਜੀਵਨ ਸੇਧ ਪ੍ਰਦਾਨ ਕਰਨਾ ਹੈ।

CO4:ਪੈਰ੍ਹਾ ਪੜ੍ਹ ਕੇ ਪ੍ਰਸ਼ਨਾਂ ਦੇ ਉੱਤਰ ਦੇਣ ਦਾ ਮਨਰੋਥ ਵਿਦਿਆਰਥੀਆਂ ਦੀ ਬੁੱਧੀ ਨੂੰ ਤੀਖਣ ਕਰਦਿਆਂ ਉਨਾਂ ਦੀ ਲਿਖਣ ਪ੍ਰਤਿਭਾ ਨੂੰ ਉਜਾਗਰ ਕਰਨਾ ਹੈ।

CO6:ਸ਼ਬਦ ਸ਼੍ਰੇਣੀਆਂਨੂੰ ਪੜ੍ਹਾਉਣ ਦਾ ਮਨੋਰਥ ਵਿਦਿਆਰਥੀਆਂ ਅੰਦਰ ਪੰਜਾਬੀਭਾਸ਼ਾ ਦੀ ਅਮੀਰੀ ਦਾ ਅਤੇ ਬਾਰੀਕੀਆਂ ਨੂੰ ਸਮਝਣ ਲਈ ਵੱਖਰੇ -ਵੱਖਰੇ ਸਿਧਾਂਤਾਂ ਦਾ ਵਿਕਾਸ ਕਰਨਾ ਹੈ।

CO7:ਮੁਹਾਵਰਿਆਂ ਦੀ ਵਰਤੋਂ ਨਾਲ ਗੱਲਬਾਤ ਵਿਚ ਪਰਪੱਕਤਾ ਆਉਂਦੀ ਹੈ।ਇਹ ਵਿਦਿਆਰਥੀਆਂ ਦੀ ਗੱਲਬਾਤ ਵਿਚ ਨਿਖਾਰ ਲਿਆਉਣ ਦਾ ਕੰਮ ਕਰਨਗੇ।

Bachelor of Arts/ Bachelor of Science (Medical) / Bachelor of Science (Non Medical) / Bachelor of Science(Honours) Maths/ Bachelor of Science (Honours) Physics/Bachelor of Science (Computer Science) / Bachelor of Science (Economics) / Bachelor of Commerce / Bachelor of Business Administration/ Bachelor of Arts (Journalism & Mass Communication) / Bachelor of .Science (Fashion Design) / Bachelor of Science (Home Science) / /Bachelor of Computer Application /Bachelor of Science(Information Technology)/ Bachelor of Science (Bio Technology) / Bachelor of Arts (Honours.)English

(Semester-II)
Session 2022-23
Course Title: Punjab History and Culture (C. 320 to 1000 B.C.)
(Special paper in lieu of Punjabi Compulsory)
(For those students who are not domicile of Punjab)

Course Code: BARL-2431/ BSML-2431/ BSNL-2431/ BOML-2431/ BOPL-2431/ BCSL-2431/

BECL-2431/ BCRL-2431/ BBRL-2431/ BJML-2431/ BFDL-2431/ BHSL-2431/ BCAL-2431/

BITL-2431 / BBTL-2431/BOEL-2431

COURSE OUTCOMES

After completing Semester II and course on Ancient History of Punjab, students of History will be able to identify and have a complete grasp on the sources & writings of Ancient History of Punjab

CO 1: Analyse the emergence of Mauryan, Gupta empires during the classical age in India

CO 2: To understand the various factors leading to rise and fall of empires and emergence of new dynasties and their Culture, society, administration , polity and religion specifically of Kushans and Vardhanas in the Punjab

CO 3: Students will be adept in constructing original historical argument based on primary source material research

CO 4: To have an insight on the existing Literature of this period and understand the past developments in the light of present scenario.

CO 5: To enable students to have thorough insight into the various forms/styles of Architecture and synthesis of Indo - Muslim Art and Architecture in Punjab

Session 2022-23

COMMUNICATION SKILLS IN ENGLISH

Course Code: BJMM/BFDM/BHSM/BCAM/BITM/

BBTM /BOMM/BOPM/ DGCM/BVRM/BVMM/BVAM/BVTM/BVNM/BVBM / BVAI/BVHM-2102

COURSE OUTCOMES

At the end of this course, the students will develop the following skills:

CO 1: Enhancement of listening skills with the help of listening exercises based on conversation, news and TV reports

CO 2: The ability of Note-Taking to be able to distinguish the main points from the supporting details and the irrelevant information from the relevant one using Listening Skills

CO 3: Acquisition of knowledge of phonetics which will help them in learning about correct pronunciation as well as effective speaking

CO 4: Speaking skills of the students enabling them to take active part in group discussion and present their own ideas

Bachelor of Science (Honours) Mathematics Semester–II
Session-2022-23
Course Title: Calculus-II
Course Code: BOML-2333

Course Outcomes

After passing this course, the students will be able to:

CO 1: Demonstrate an understanding of sequences and series and their convergence, Cauchy criterion, sub sequence and algebra of limit of sequences.

CO 2: Know and describe the behaviour of Infinite series using various tests like comparison test, Cauchy Integral test. Ratio test, Raabe's test, logarithmic test and Gauss test etc.

CO 3: Distinguish between the absolute convergence and conditional convergence.

CO 4: Manage to solve the problem related to Fourier series expansion, Fourier series for even and odd functions and half range series.

Bachelor of Science (Honours) Mathematics Semester–II
Session-2022-23
Course Title: Matrices and Theory of Equations
Course Code: BOML-2334

Course Outcomes

After passing this course, the students will be able to:

CO 1: Understand the concept of matrix congruence of skew symmetric matrices and its reduction in real field.

CO 2: Explain how all polynomials can be broken down by using Fundamental Theorem of Algebra to provide structure for abstraction into fields like Modern Algebra. Also able to solve system of linear equations and obtain Eigen values, Eigen vectors, minimal and characteristic equation of a matrix and to apply it in advanced dynamics and electric current.

CO 3: To find the relations between the roots and coefficients of general polynomial equation in one variable.

CO 4: Distinguish between solution of cubic equations and Bi-quadratic equations.

Bachelor of Science (Honours) Mathematics Semester–II
Session-2022-23
Course Title: Solid Geometry
Course Code: BOML-2335

Course Outcomes

After passing this course, the students will be able to:

CO 1: Describe the concept of planes, its classification, and trace different types of conicoids by thoroughly understanding shifting of origin and rotation of axis.

CO 2: Understand the geometry of sphere in depth including the concepts of tangent, normal and intersection.

CO 3: Demonstrate the concept of cone, classification of cone, intersection of line and cone, reciprocal cone. They will be able to understand the concept of cylinder including enveloping cylinder and its limiting form.

CO 4: Manage to find surface of revolution and identify the conicoids and represent it in the form of hyperboloid, ellipsoid, paraboloid.

B.Sc. (Hons.) Mathematics Semester–II

(Session 2022-23)

Course Name: Modern Physics

Course Code: BOMM-2396

Course Outcomes

On passing this course the students will be able to

CO1: understand wave particle duality and use of this duality in studying crystal structure.

CO2: understand radioactivity and use of radio isotopes and radiation.

CO3: understand working and uses of nuclear radiation detectors.

CO4: Know about elementary particles and cosmic rays, their properties and conservation rules.

Text and Reference Books:

1. Practical Physics Vol.II, T.S. Bhatia, Gursharan Kaur, Iqbal Singh, Vishal Publications
2. Practical Physics, C.L. Arora, S. Chand & Co.

Bachelor of Science (Honours) Mathematics Semester–II

Session 2022-23

Course Code: BOMM-2137

Computer Fundamentals and Introduction to C Programming Language

Course Outcome:

After passing course the student will be able to:

CO1: Articulate various kind of software and hardware used in computers.

CO2: Work with different set of operations in C programming.

CO3: Apply various control statements of C Programming Language for designing solutions to different real world problems.

CO4: Implement single and multidimensional arrays for representing complex data collections.

Bachelor of Science (Honours) Mathematics
Semester–III
Session- 2022-23

Course Title: Calculus III

Course Code: BOML-3331

Course Outcomes

After passing this course, the students will be able to:

CO1: Evaluate Partial derivatives, Limits and continuity, Homogenous Functions, Euler's Theorem and recognize the various notations used in partial derivatives.

CO2: Analyze functions using Chain Rule, Jacobians, Directional Derivatives and Gradient Vectors.

CO3: To find optimization value for a function of two variables.

CO4: Apply double integration technique in finding the area of a region and triple integrals to find volume.

Reference Books:
1. Sudhir R. Ghorpade and B.V. Limaye, A course in calculus and real analysis, Springer, 2006.
2. E. Kreyszig, Advanced Engineering Mathematics, Wiley Publication, 10th Edition, 2011.

Bachelor of Science (Honours) Mathematics
Semester–III

Session- 2022 -23

Course Title: Ordinary Differential Equations and Special Functions

Course Code: BOML-3332

Course Outcomes

After the successful completion of this course, the students will be able to:
CO1: Identify differential equation, its order and degree, exact differential equations. Solve equations of first order and higher degree and demonstrate the concept of Linear Differential equation with constant coefficients.

CO2: Demonstrate the concept of linear differential equations with variable coefficients and find its solution using power series method

CO 3: Understand the concept of Bessel's Function with their properties like Orthogonal Property, Recurrence Relations, and Generating Function etc. and to recognize some of the Partial Differential Equations that can be solved by application of Bessel Function.

CO 4: Understand the concept of Legendre's Function with their properties like Orthogonal Property, Recurrence Relations, Rodrigue's formula and Generating Function etc. and to recognize some of the Partial Differential Equations that can be solved by application of Legendre Function.

Text Book:

M.D.Raisinghania, Ordinary and Partial Differential Equations, S Chand Publishing, New Delhi, 11th Edition, 2009.

Reference Books:

1. E.A. Coddington, An Introduction to Ordinary Differential Equations, Dover Publications, Inc., New York.
2. D.A.Murray, Introductory Course in Differential Equations, Orient Longman Private Limited, Hyderabad, 11th edition,2003.
3. G.F.Simmons, Differential Equations, McGraw Hill Education, 2nd edition, 2017.
4. E.D. Rainville, Special Functions, The Macmillan Company, New York.

Bachelor of Science (Honours) Mathematics

Semester–III

Session- 2022-23

Course Title: Probability Theory

Course Code: BOML-3333

Course Outcomes

After passing this course, the students will be able to:

CO1: Translate the real world problem into probability based mathematical model. They will be able to analyze, examine and control real time data.

CO2: Distinguish between discrete and continuous random variable primarily in their application and usage in real life.

CO3: Apply general properties and applications of expectation, variance and moments.

CO4: Identify the characteristics of different continuous and discrete distribution. In particular they will be able to differentiate between widely used events with Binomial and Poisson distribution; and apply Normal distribution in real time applications.

:

Sample Space, Probability axioms, Probability on finite sample space, Conditional probability and Independence, Baye's theorem.

Unit II

Random variables, Probability mass function, Probability density function, Distribution function, Function of a random variable and its distribution. Multiple random variables, Joint distribution, Marginal and Conditional distributions.

Unit III

Mathematical Expectation, Conditional Expectation, Variance, Covariance, Moments, Moment generating function, Chebychev's inequality, Bernoulli's Law of large numbers.

Unit –IV

Discrete Probability Distributions: Bernoulli, Binomial, Poisson, Negative Binomial, Geometric distribution. Continuous Probability Distributions: Uniform, Normal, Gamma, Beta, Exponential distribution (For All distributions only Mean, Variance, Moment Generating Function)

Text Book:

S.C Gupta and V.K Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand and Sons, New Delhi, 11^{th} edition, 2018. (Scope in Chapters 2-8).

Reference Book:

A.M. Mood , F.A. Graybill , D.C. Boes: Introduction to the Theory of Statistics, Chennai: McGraw Hill Education (India) Pvt. Ltd, 3rd edition, 2017.

Bachelor of Science (Honours) Mathematics

Semester–III

Session- 2022-23

Course Title: Linear Algebra

Course Code: BOML-3334

Course Outcomes

After passing this course, the students will be able to:

CO1: Express the algebraic concepts such as binary operation, groups, rings

and fields. Define a vector space and subspace of a vector space and check the linear dependence and linear independence of vectors

CO2: To understand the concepts of basis and dimension of vector space.

CO3: To understand matrix representation of a linear transformation

CO4: To find rank and normal form of a matrix, invertible matrix and to solve system of linear equations.

Bachelor of Science (Honours) Mathematics Semester III

Session 2022-23

PYTHON PROGRAMMING

Course Code: BOMM-3135

Course Outcomes:

After completion of this course, the students will be able to:

CO1: Comprehend basics of Python programming like operators, data types, I/O, etc.

CO2: Apply various control statements of Python Programming Language for designing solutions to different real world problems.

CO3: Implement various built-in and user defined function, packages and modules to solve mathematical problems.

CO4: Apply different matrix operations using NumPy and perform file manipulations.

Bachelor of Science (Honours) Mathematics Semester-IV

Session: 2022-23

Course Title: Vector Calculus

Course Code: BOML-4331

Course Outcomes

After passing this course, the students will be able to:

CO 1: Understand the physical concept of vectors and perform basic calculus on vector-valued functions.

CO 2: Solve physical problems based on calculus using vector-valued functions and calculate the tangent vector and normal vector at a point on a space curve described by a vector-valued position function.

CO 3: Find the values of gradient, divergence and curl operator of given vectors in orthogonal system and understand the concept of line integral.

CO 4: Find the application of Gauss theorem and Stokes's theorem in real life problems.

Bachelor of Science (Honours) Mathematics Semester-IV
Session: 2022-23
Course Title: Group Theory
Course Code: BOML - 4333
Course Outcomes

Upon completion of this course, students should be able to:

CO 1: Understand the concept of integers, divisors, division algorithm and equivalence relation and its classes.

CO 2: Demonstrate understanding of algebraic structures and its properties with regard to working with various number system. Understand the concept of groups, subgroups, centralizer, normalizer and various properties of groups.

CO 3: Explain the notion of cosets, normal subgroup, quotient group, cyclic group, generator of cyclic group.

CO 4: Describe all permutation concepts, order, permutation as a product of two cycles, even odd permutations, alternating group.

Bachelor of Science (Honours) Mathematics Semester-IV
Session: 2022-23
Course Title: Statistical Methods
Course Code: BOMM-4334
Course Outcomes

Upon completion of this course, students should be able to:

CO 1: Understand the concept of correlation, and apply its techniques to identify correlation between given set of data and regression curves depicting relation among the physical quantities.

CO 2: Understand all the concepts related to sampling distribution.

CO 3: Demonstrate understanding the logic and framework of the inference of hypothesis testing as making an argument.

CO 4: Interpret the results of the hypothesis test.

Bachelor of Science (Honours) Mathematics Semester-IV

Session: 2022-23

COURSE CODE: BOMM-4135

FOUNDATION OF STATISTICAL COMPUTING

Course Outcomes:

After passing this course the student will be able to:

CO1: Comprehend basics of Statistical Computing and managing data structures like vector, matrix, etc.

CO2: Create, operate and manage lists and data frames.

CO3: Apply control and I/O statements for generating outputs.

CO4: Simulate various descriptive and analytical algorithms using R language along with their visualization.

Bachelor of Science (Honours) Mathematics
Semester–V
Session 2022 -23
Course Title: Number Theory
Course Code: BOML-5331

Course Outcomes

Successful completion of this course will enable the students to:

CO 1: Find solutions of specified linear Diophantine equation and system of linear congruences.

CO 2: Apply Fermat's to prove relation involving prime numbers.

CO 3: Apply the Wilson's and Euler's theorem to solve numerical problems and explore properties of phi function in real world problems.

CO 4: Understand application of important arithmetic functions.

Bachelor of Science (Honours) Mathematics
Semester–V
Session 2022 -23
Course Title: Discrete Mathematics
Course Code: BOML-5332
Course Outcomes

Successful completion of this course will enable the students to:

CO 1: Understand Boolean algebra , K-Map and application of Boolean Algebra to switching circuits.

CO 2: Understand the use of Graphs and Models.

CO 3: Understand the language of trees with various types of trees and methods of traversing trees.

CO 4: Have substantial experience to comprehend formal logical and write an argument using logical notation and determine if the argument is valid or not.

Bachelor of Science (Honours) Mathematics
Semester–V
Session 2022 -23
Course Title: Linear Integral Equations
Course Code: BOML-5333
Course Outcomes

On satisfying the requirements of this course, students will have the Knowledge of:

CO 1: Concept of Linear Integral equations and various kinds of Kernels, Volterra and Fredholm Integral equations of first and Second kind, reduction of initial value problem to a Volterra Integral equation and solution of Volterra Integral equation using method of Resolvent Kernel.

CO 2: Reduction of Boundary Value Problem to Fredholm Integral Equation and techniques to solve homogeneous and non-homogeneous Fredholm Integral equations.

CO 3: Laplace Transform and its basic properties and how to find solution of Volterra Integral Equations using Laplace Transform.

CO 4: Construction of Green's function and application of Green's function in finding the solution of Boundary Value Problem.

Bachelor of Science (Honours) Mathematics
Semester–V
Session: 2022-23
Course Title: Metric Spaces
Course Code: BOML-5335
Course outcomes

After passing this course, the students will be able to:

CO1: Explain the fundamental concepts of Metric Spaces and their role in modern mathematics.

CO2: Understand the concept of compact sets , separated sets and state and prove Heine – borel theorem

CO3: Demonstrate sequence in a metric space and give argument related to convergence.

CO4: Give argument related to continuity, completeness, compactness, connectedness in metric spaces.

Bachelor of Science (Honours) Mathematics
Semester–VI
Session: 2022-23
Course Title: Complex Analysis
Course Code: BOML-6331
Course outcomes

After passing this course, the students will be able to:

CO1: Justify the need for a complex number system and explain how it is related to other existing number system. Define a function of complex variable, limit, continuity and differentiability, Analytic functions, Conjugate function, Cauchy Riemann equations, Harmonic function and carry out basic mathematical operations with complex numbers.

CO2: State and prove Cauchy's theorem, Cauchy's integral formula, Cauchy's inequality, Poisson's integral formula, Morera's theorem and Liouville's theorem.

CO3: Define singularities of a function, know the different types of singularities and be able to determine the Residue at singularities of a function.

CO4: Learn The Fundamental Theorem of Algebra, The Argument principle, Rouche's theorem, Conformal transformations, Bilinear transformations, Critical points, Fixed points, and Problems on cross ratio and bilinear transformation.

Bachelor of Science (Honours) Mathematics
Semester–VI
Session: 2022-23
Course Title: Analytical Skills
Course Code: BOML-6332
Course outcomes

After passing this course, the students will be able to:

CO 1: Understand the concept of sequence and series, clock problems, blood relationship.

CO 2: Demonstrate procedural fluency with real number arithmetic operations and use these operations to represent real world scenarios and to solve stated problems and demonstrate number sense and conversion between fractions, decimals and percentages.

CO 3: Use simple and compound interest to do business calculations such as value of money, maturity value, present value, future value and able to differentiate which math method should be used for different problems and understand the concept of mensuration.

CO 4: Analyze data being presented in the form of tables, Venn diagrams, pie charts.

Bachelor of Science (Honours) Mathematics
Semester–VI
Session 2022 -23
Course Title: Numerical Analysis
Course Code: BOML-6333
Course Outcomes

After passing this course, the students will be able to:

CO 1. Know how to find the roots of transcendental equations.

CO 2. Perform computation for solving a system of equations and understand its application in all branches of engineering.

CO 3. Learn how to interpolate the given set of values and understand the curve fitting for various polynomials. They will be able to compute numerical integration and differentiation, numerical solution of ordinary differential equations.

CO 4. Learn numerical solution of differential equations.

Bachelor of Science (Honours) Mathematics
Semester–VI
Session: 2022 -23
Course Title: Special Functions
Course Code: BOML-6334
Course Outcomes

After passing this course, the students will be able to:

CO 1: Understand the concept of Hyper geometric function, its integral form and Contiguity of Hyper geometric functions and solution of hyper geometric equation as a function of its parameters.

CO 2: Understand the concept of Bessel's Function and their properties like Recurrence Relations, Generating Function etc., modified Bessel Function and to recognize some of the Partial Differential Equations that can be solved by application of Bessel Functions.

CO 3: Understand the concept of Legendre's Function and their properties like Orthogonal Property, Recurrence Relations, Rodrigue's formula and Generating Function etc. and understand Hyper geometric forms of Legendre's function.

CO 4: Understand the concept of Hermite Polynomials, basic properties like Orthogonality, Rodrigue's formula etc. and its relation with $2^{F}{}_{0}$.

Bachelor of Science (Honours) Mathematics
Semester–VI
Session 2022 -23
Course Title: Differential Geometry
Course Code: BOML-6335
Course Outcomes

After passing this course, the students will be able to:

CO 1: Able to explain the concept of theory of space curve tangent, normal, binormal and rectifying plane.

CO 2: Able to understand contact between curves and surfaces , locus of centre of curvature, spherical curvature as well as calculate the curvature and torsion of curve

CO 3: Understand the concept of Spherical indicatrix, envelopes, and two fundamental forms,

CO 4: Understand tensor variables, metric tensor, contra-variant, covariant and mixed tensors & and able to apply tensors among mathematical tools for invariance and the reason why the tensor analysis is used and explain usefulness of the tensor analysis.