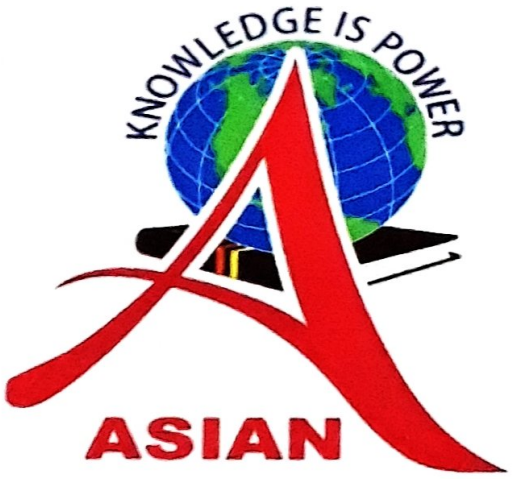
Asian Educational Institute, Patiala(PB).

(An Autonomous College)

School of Science and Mathematics



GROUP OF COLLEGES
ESTD. 2010

SYLLABUS

B.Sc./ B.Sc(Hons.) & B.A. /B.A(Hons.)

Mathematics- (Major, Minor, IDC/MDC and SEC)

(Semester- III & IV)

Session: 2025-2026

ASIAN EDUCATIONAL INSTITUTE, PATIALA (PB)

UG PROGRAMME (Bachelor of Science)

B.Sc./B.Sc.(Honours)/B.A./B.A.(Honours)

SESSION: 2025-2026

Code	Title of paper	Hours (Per Week)	Max. Marks			Credits	Examination Time (Hours)
SEMESTER-III			**Total**	**Ext.**	**Int.**		
BMATH201T	**MAJ:** Calculus –II	04	100	70	30	04	03
BMATH201T (M)	**MIN:** Calculus –II	04	100	70	30	04	03
BSEC201	**SEC:** Numerical Analysis	03	100	70	30	03	03

SEMESTER-IV							
BMATH202T	**MAJ:** Ordinary and Partial Differential Equations	04	100	70	30	04	03
BMATH202T (M)	**MIN:** Ordinary and Partial Differential Equations	04	100	70	30	04	03
BMDC202	**IDC/MDC:** Probability	03	100	70	30	03	03

MAJ: Discipline Specific Core Course; **MIN:** Minor Core Course; **IDC/MDC**: Inter Disciplinary Course / Multi-Disciplinary Course, **SEC:** Skill Enhancement Course.

(Semester III)
Calculus –II
Paper Code: BMATH201T
(Major Theory)

Max. Marks: 100
External Exam: 70 Marks
Internal Assessment: 30 Marks
Passing Marks: 35%

Credits: 04
Total Teaching hours: 55

Course Outcomes	
CO1	To learn about the concept of Asymptotes, Multiple points, Points of inflexion and Tracing of curves
CO2	Understand and use parametric equations and polar coordinates in mathematical modeling.
CO3	Solve problems involving limits and partial differentiation
CO4	Analyze and compute the area, volume, and other applications using double and triple integrals.
CO5	To learn about Maxima and Minima of a function

INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and Section C will consist of one compulsory question having ten short answer type questions covering the entire syllabus uniformly. Each question in Sections A and B will be of 10 marks and Section C will be of 30 marks.

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt five questions in all selecting two questions from each of the Section A and B and compulsory question of Section C.

Section-A

Asymptotes, Multiple points, Tests for concavity and convexity, Points of inflexion, Tracing of curves in Cartesian, parametric and polar form. Limit and continuity of function of several variables, Differentiability of real valued functions of two variables, Partial differentiation, Jacobians and their properties, Schwarz's and Young's Theorem, Euler's Theorem on homogeneous functions.

Section- B

Taylor's Theorem for function of two variable, Maxima and Minima, Lagrange's multiplier method for function of several variables.Double and triple integrals. Change of order of integration in double integrals. Change of variables. Application to evaluation of areas and volumes. Centre of Gravity and moments of Inertia.

References

1. Thomas and Finney (2005). *Thomas' Calculus* (11th ed.). Pearson Education.
2. Malik and Arora, (2017). *Mathematical Analysis*. New Academic Science.
3. R.K. Jain and S.R.K. Iyengar : Advanced Engineering Mathematics, Narosa Publishing House

(Semester III)
Calculus –II
Paper Code: BMATH201T (M)
(Minor Theory)

Credits: 04
Total Teaching hours: 55

Max. Marks: 100
External Exam: 70 Marks
Internal Assessment: 30 Marks
Passing Marks: 35%

Course Outcomes	
CO1	To learn about the concept of Asymptotes, Multiple points, Points of inflexion and Tracing of curves
CO2	Understand and use parametric equations and polar coordinates in mathematical modeling.
CO3	Solve problems involving limits and partial differentiation
CO4	Analyze and compute the area, volume, and other applications using double and triple integrals.
CO5	To learn about Maxima and Minima of a function

INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and Section C will consist of one compulsory question having ten short answer type questions covering the entire syllabus uniformly. Each question in Sections A and B will be of 10 marks and Section C will be of 30 marks.

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt five questions in all selecting two questions from each of the Section A and B and compulsory question of Section C

Section-A

Asymptotes, Multiple points, Tests for concavity and convexity, Points of inflexion, Tracing of curves in Cartesian, parametric and polar form. Limit and continuity of function of several variables, Differentiability of real valued functions of two variables, Partial differentiation, Jacobians and their properties, Schwarz's and Young's Theorem, Euler's Theorem on homogeneous functions.

Section- B

Taylor's Theorem for function of two variable, Maxima and Minima. Lagrange's multiplier method for function of several variables.Double and triple integrals. Change of order of integration in double integrals. Change of variables. Application to evaluation of areas and volumes. Centre of Gravity and moments of Inertia.

References

1. Thomas and Finney (2005). *Thomas' Calculus* (11th ed.). Pearson Education.
2. Malik and Arora, (2017). *Mathematical Analysis*. New Academic Science.
3. R.K. Jain and S.R.K. Iyengar : Advanced Engineering Mathematics. Narosa Publishing House

(Semester-III)
Numerical Analysis
Paper Code: BSEC201
Skill Enhancement Course (SEC)

Max. Marks: 100
External Exam: 70 Marks
Internal Assessment: 30 Marks
Passing Marks: 35%

Credits: 03
Total Teaching hours: 40

Course Outcomes	
CO1	Students will be able to analyze and estimate the error in numerical solutions.
CO2	Students will be able to apply numerical methods for solving algebraic and transcendental equations (e.g., bisection, Newton-Raphson).
CO3	Apply numerical techniques to solve ordinary differential equations using methods like Euler's and Runge-Kutta.
CO4	Understand and use Numerical differentiation and Integration
CO5	Students will used different types of numerical techniques to solve ODEs

INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and Section C will consist of one compulsory question having ten short answer type questions covering the entire syllabus uniformly. Each question in Sections A and B will be of 10 marks and Section C will be of 30 marks.

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt five questions in all selecting two questions from each of the Section A and B and compulsory question of Section C

Section-A

Newton's forward and backward interpolation formulae, Numerical differentiation and integration: Trapezoidal rule, Simpson $\frac{1}{3}$ Rule and Simpson $\frac{3}{8}$ rule. Newton Cotes integration and Gaussian integration.

SectionB

Taylor's series method, Picard's method. Numerical solution of ordinary differential equations using Euler's method, Modified Euler's method and Runge-Kutta method of order 4, Convergence analysis, Application to differential equations.

References

1. Neumaier, Arnold, and Arnold Neumaier. *Introduction to numerical analysis*. Cambridge University Press, 2001.
2. Fröberg, Carl Erik. Introduction to Numerical Analysis, Reading, Mass., Addison-Wesley Pub. Co 1969.
3. R.S. Gupta *Elements of numerical analysis*. Cambridge University Press, 2015.

Semester IV
Ordinary and Partial Differential Equations
Paper Code: BMATH202T
Major Theory

Max. Marks: 100
External Exam: 70 Marks
Internal Assessment: 30 Marks
Passing Marks: 35%

Credits: 04
Total Teaching hours: 55

Course Outcomes	
CO1	To learn about the concept of order and degree of differential equation
CO2	Understand the methods for solving separable differential equations, Homogeneous differential equations, Linear differential equations and Exact differential equations
CO3	Solve non- exact differential equations by reducing it to an exact differential equation. Separable differential equations.
CO4	To study the method for solving linear partial differential equations of first order and higher degree.
CO5	To learn and solve Solution of partial differential equations of higher order with constant coefficients

INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and Section C will consist of one compulsory question having ten short answer type questions covering the entire syllabus uniformly. Each question in Sections A and B will be of 10 marks and Section C will be of 30 marks.

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt five questions in all selecting two questions from each of the Section A and B and compulsory question of Section C

Section-A

First order differential equations: Order and degree of differential equation, Differential equation of first order and first degree, Separable differential equations, Homogeneous differential equations, Linear differential equations, Exact differential equations, Integrating factor, Non- Exact differential equations, First order and higher degree differential equations solvable for x, y and p, Clairaut's form, Singular solutions and Geometrical interpretation of first order differential equation.

Higher order Differential Equations: Wronskian, Linear Independence, Linear dependence, Homogenous and non homogeneous linear differential with constant coefficients. Method of Variation of Parameter, Method of undetermined coefficients, using differential operator, Second order linear differential equation with variable coefficient. Cauchy's and Legendre's equations.

Section-B

First order Partial differential equations: Linear partial differential equations of first order. Lagrange's solution. Integral surfaces passing through a given curve. Partial differential equations of higher degree with constant coefficients, Charpit's method.

Higher order Partial Differential Equations: Partial differential equations of second order and their classification, Canonical forms, Solution of partial differential equations of higher order with constant coefficients, An introduction to heat, wave and Laplace's equations.

References

1. M.D. Raisinghania: *Ordinary and Partial Differential Equations*, S.Chand & Company Ltd., 2009.
2. Shepley L. Ross: *Differential Equations*, 3rd Edition, John Wiley & Sons, 1984.
3. Ian N. Sneddon: *Elements of Partial Differential Equations*, McGraw-Hill, 1967.

Semester IV
Ordinary and Partial Differential Equations
Paper Code: BMATH202T(M)
Minor Theory

Max. Marks: 100
External Exam: 70 Marks
Internal Assessment: 30 Marks
Passing Marks: 35%

Credits: 04
Total Teaching hours: 55

Course Outcomes	
CO1	To learn about the concept of order and degree of differential equation
CO2	Understand the methods for solving separable differential equations, Homogeneous differential equations, Linear differential equations and Exact differential equations
CO3	Solve non- exact differential equations by reducing it to an exact differential equation. Separable differential equations.
CO4	To study the method for solving linear partial differential equations of first order and higher degree.
CO5	To learn and solve Solution of partial differential equations of higher order with constant coefficients

INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and Section C will consist of one compulsory question having ten short answer type questions covering the entire syllabus uniformly. Each question in Sections A and B will be of 10 marks and Section C will be of 30 marks.

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt five questions in all selecting two questions from each of the Section A and B and compulsory question of Section C

Section-A

First order differential equations: Order and degree of differential equation, Differential equation of first order and first degree, Separable differential equations, Homogeneous differential equations, Linear differential equations, Exact differential equations, Integrating factor, Non- Exact differential equations, First order and higher degree differential equations solvable for x, y and p, Clairaut's form, Singular solutions and Geometrical interpretation of first order differential equation.

Higher order Differential Equations: Wronskian, Linear Independence, Linear dependence, Homogenous and non homogeneous linear differential with constant coefficients. Method of Variation of Parameter, Method of undetermined coefficients, using differential operator, Second order linear differential equation with variable coefficient. Cauchy's and Legendre's equations.

Section-B

First order Partial differential equations: Linear partial differential equations of first order. Lagrange's solution. Integral surfaces passing through a given curve. Partial differential equations of higher degree with constant coefficients, Charpit's method.

Higher order Partial Differential Equations: Partial differential equations of second order and their classification, Canonical forms, Solution of partial differential equations of higher order with constant coefficients, An introduction to heat, wave and Laplace's equations.

References

1. M.D. Raisinghania: *Ordinary and Partial Differential Equations*, S.Chand & Company Ltd., 2009.
2. Shepley L. Ross: *Differential Equations*, 3rd Edition, John Wiley & Sons, 1984.
3. Ian N. Sneddon: *Elements of Partial Differential Equations*, McGraw-Hill, 1967.

(Semester-IV)
Probability
Paper Code: BMDC202
Multidisciplinary Course (MDC)

Max. Marks: 100
External Exam: 70 Marks
Internal Assessment: 30 Marks
Passing Marks: 35%

Credits: 03
Total Teaching hours: 55

Course Outcomes	
CO1	Able to develop logical reasoning that is necessary for building a stable career foundation.
CO2	Able to understand the probability concepts used in day to day life
CO3	Able to develop numerical fluency.
CO4	Able to develop logical thinking to draw conclusions
CO5	Students will be able to learn decision making and critical thinking.

INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and Section C will consist of one compulsory question having ten short answer type questions covering the entire syllabus uniformly. Each question in Sections A and B will be of 10 marks and Section C will be of 30 marks.

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt five questions in all selecting two questions from each of the Section A and B and compulsory question of Section C

Section-A

Mathematical or classical probability, Empirical probability. Sample space Event Algebra of events. Probability- Mathematical notions, Probability function, Law of addition of probabilities. Multiplication law of probability and conditional probability.

Section-B

Probability of occurrence of at least one of the n independent events. Independent events. Pairwise independent events. Conditions for independence of n events. Baye's theorem. Random variable, Distribution function, Properties of distribution function, Discrete random Probability density function.

References:

Fundamental of Mathematical Statistics, S. C. Gupta, V.K. Kapoor S. Chand & Co. 10th edition.