Kanya Maha Vidyalaya, Jalandhar (Autonomous)

Scheme and Curriculum of Examinations of Four Year Undergraduate Degree Programme

(Under Credit Based Continuous Evaluation Grading System) (CBCEGS)

Bachelor of Arts/ Bachelor of Science (Honours)
Semester-V

Session: 2026-27

Bachelor of Arts/ Bachelor of Science (Honours) Semester-V											
Programme Name	Course Code	Course Title	Course Type	Hours per week L-T-P	Credits L-T-P	Total Credits	Marks				Examination Time (in Hours)
							Total	Ext.		CA	
								TH	P		
Bachelor of Arts/ Bachelor of Science (Honours)	BARL-5333 BECL-5333 BSNL-5333 BCSL-5333	Mathematics (Statics and Dynamics)	DSC	4-0-0	4-0-0	4	100	70	-	30	3
Bachelor of Arts/ Bachelor of Science (Honours)	BARP-5333 BECP-5333 BSNP-5333 BCSP-5333	Statics and Dynamics Laboratory		0-0-2	0-0-1	1	50	-	35	15	3

DSC- Discipline Specific Course

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

Scheme and Curriculum of Examinations of Four Year Undergraduate Degree Programme

(Under Credit Based Continuous Evaluation Grading System) (CBCEGS)

Bachelor of Arts/ Bachelor of Science (Honours)
Semester-VI

Session: 2026-27

Bachelor of Arts/ Bachelor of Science (Honours) Semester-VI											
Programme Name	Course Code	Course Title	Course Type	Hours per week L-T-P	Credits L-T-P	Total Credits	Marks				Examination Time (in Hours)
							Total	Ext.		CA	
								TH	P		
Bachelor of Arts/ Bachelor of Science (Honours)	BARL-6333 BECL-6333 BSNL-6333 BCSL-6333	Mathematics (Multivariate Calculus)	DSC	4-0-0	4-0-0	4	100	70	-	30	3
Bachelor of Arts/ Bachelor of Science (Honours)	BARP-6333 BECP-6333 BSNP-6333 BCSP-6333	Multivariate Calculus Laboratory		0-0-2	0-0-1	1	50	-	35	15	3

DSC- Discipline Specific Course

Bachelor of Arts/ Bachelor of Science (Honours)
Semester–V
Session: 2026-27
Course Title: Mathematics (Statics and Dynamics)
Course Code: BARL/ BECL/ BSNL/ BCSL -5333
Course Outcomes

CO1: Students will be able to analyze systems of coplanar forces using laws of composition and resolution, and determine conditions of equilibrium.

CO2: Students will be able to apply concepts of moments and friction to solve problems involving equilibrium on rough planes and parallel force systems.

CO3: Students will be able to apply Newton's laws of motion to analyze linear and curvilinear motion, including projectile motion and connected particle systems.

CO4: Students will be able to analyze motion using concepts of work, energy, and simple harmonic motion, and apply the principle of conservation of energy.

Bachelor of Arts/ Bachelor of Science (Honours)
Semester–V
Session: 2026-27
Course Title: Mathematics (Statics and Dynamics)
Course Code: BARL/ BECL/ BSNL/ BCSL -5333

Examination Time: 3 Hours | Max. Marks: 100

L T P | Theory: 70

4 0 0 | CA: 30

Instructions for the Paper Setter:

Eight questions of equal marks (14 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit I

Composition and resolution of forces, parallelogram law, triangle law, polygon law, Lami's Theorem and its converse, (ג-μ) theorem, Resultant of a number of coplanar forces, Condition of equilibrium of a number of coplanar forces.

Unit II

Parallel forces, Moment of a force about a point, Varignon's theorem of moments, Friction, Kinds of Friction, Laws of friction, Problems of a body placed on a rough inclined plane, Equilibrium of a particle on a rough plane.

Unit III

Definition of velocity and acceleration, Newton's laws of motion. Weight carried by a lift, Motion of two particles connected by a string, Motion of two bodies connected by a string. Curvilinear motion of particle in a plane, Projectile and its equation of motion, time of flight, horizontal range, greatest height attained.

Unit IV

Simple Harmonic Motion, Work, Power and Energy; work done in stretching an elastic string, Conservative forces, Kinetic energy, Potential energy, Work done against gravity, Potential energy of a gravitational field, Principle of work and energy, Principle of conservation of energy

Text Books:-

1. R. S. Varma. A Text Book on Statics, Pothishala, 1962.
2. M. Ray & G.C. Sharma. A Text Book on Dynamics, S. Chand Publishers, 2005

Bachelor of Arts/ Bachelor of Science (Honours)

Semester–V

Session: 2026-27

Course Title: Statics and Dynamics Laboratory

Course Code: BARP/ BECP/ BSNP/ BCSP -5333

Course Outcomes

CO1: Students will be able to simulate particle motion under various forces using Newton's second law and analyze changes in acceleration and trajectory.

CO2: Students will be able to model and analyze oscillatory motion of a simple pendulum and study the effect of parameters like length and amplitude.

CO3: Students will be able to evaluate equilibrium conditions and compute moments (torque) for systems of forces acting on bodies.

CO4: Students will be able to simulate and analyze dynamic systems using numerical methods and predict projectile motion under given initial conditions.

Bachelor of Arts/ Bachelor of Science (Honours)
Semester–V
Session: 2026-27
Course Title: Statics and Dynamics Laboratory
Course Code: BARP/ BECP/ BSNP/ BCSP -5333

Examination Time: 3 Hours | Max. Marks: 50
Practical: 35
CA: 15

L T P
0 0 1

List of Practicals (using any package)

1. To simulate the motion of a particle under various forces using Newton's second law F=ma (Students can input different forces and masses to see how the particle's acceleration and trajectory change).

2. Create a simulation that analyzes the motion of a simple pendulum (Students can explore how the period and amplitude of oscillation vary with different parameters).

3. Calculate the equilibrium of forces acting on an object. (Given the forces' magnitudes, directions, and points of application, determine whether the object is in equilibrium or not).

4. Calculate the moment of force (torque) around a specified point. (Input the force magnitude, distance from the point, and direction. Compute the resulting moment).

5. Simulate the motion of particles or rigid bodies using numerical integration methods (e.g., Euler's method). (Input initial conditions (position, velocity, mass) and external forces. Observe the dynamic behavior over time).

6. Predict the trajectory of a projectile given initial conditions such as angle, velocity, and height. (This can include air resistance and show the path of the projectile in real-time.)

Text Books:-

1. R. P. Adrian. Statics and Dynamics with Background Mathematics, Cambridge University Press, 2003.
2. C. Gomez, C. Bunks, J.P. Chancelier, F. Delebecque, M. Goursat, R. Nikoukhah, and S. Steer. Engineering and Scientific Computing with Scilab, Springer Verlag New York Inc., 1999.

SEMESTER-VI

Bachelor of Arts/ Bachelor of Science (Honours)
Semester–VI
Session: 2026-27
Course Title: Mathematics (Multivariate Calculus)
Course Code: BARL/ BECL/ BSNL/ BCSL -6333
Course Outcomes

CO1: Students will be able to analyze functions of several variables, evaluate limits and continuity, and apply partial differentiation and Taylor's theorem to study differentiability and homogeneous functions.

CO2: Students will be able to compute double and triple integrals over various regions, apply change of variables, and use these integrals to determine area, volume, surface area, and center of mass.

CO3: Students will be able to analyze vector fields by computing gradient, divergence, and curl, and apply line and volume integrals to solve problems involving work, mass, and circulation.

CO4: Students will be able to apply major integral theorems such as Green's theorem, Stokes' theorem, and the Divergence theorem to evaluate integrals and solve physical problems.

Bachelor of Arts/ Bachelor of Science (Honours)
Semester–VI
Session: 2026-27
Course Title: Mathematics (Multivariate Calculus)
Course Code: BARL/ BECL/ BSNL/ BCSL -6333

Examination Time: 3 Hours | Max. Marks: 100
L T P | Theory: 70
4 0 0 | CA: 30

Instructions for the Paper Setter:
Eight questions of equal marks (14 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit I

Functions of several variables, limit and continuity of functions of two variables Partial differentiation, Differentiability of real valued functions of two variables, Total differentiability, sufficient condition for differentiability, Schwarz's Theorem, Young's Theorem, Euler's Theorem on homogeneous functions of two variables, Euler's Theorem on homogeneous functions of three variables, Taylor's theorem for functions of two variables.

Unit II

Double integration over rectangular and non-rectangular region, Change of variables in double integrals, Triple integrals, Triple integral over a parallelepiped and solid regions, Change of variables in triple integrals, Area by use of double integrals, Volume by use of triple integration, Surface Area by use of double integrals, Centre of Gravity (or Centre of Mass) in R^2, Centre of Mass in R^3

Unit III

Definition of vector field, divergence and curl, directional derivatives, Divergence of a vector point function, Solenoidal Vector, Irrotational Vector, Physical interpretation of Curl of a vector point function, Laplacian operator, Integration of Vectors, the gradient, Tangential Line integrals, Applications of line integrals: Mass and Work, conservative vector fields, Circulation, Volume Integral .

Unit IV

The Divergence theorem, Green's theorem in a plane, Stoke's theorem and problems based on these theorems.

Text Books:-

1. G.B. Thomas and R.L. Finney. Calculus, 9th Ed., Pearson Education, Delhi, 2005.
2. M.J. Strauss, G.L. Bradley, and K. J. Smith. Calculus, 3rd Ed., Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), Delhi, 2007.
3. E. Marsden, A.J. Tromba, and A. Weinstein. Basic Multivariable Calculus, Springer (SIE), Indian reprint, 2005.
4. J. Stewart. Multivariable Calculus Concepts and Contexts, 2nd Ed., Brooks /Cole, Thomson Learning, USA, 2001

Reference Books:-

1. S.R. Ghorpade & B.V. Limaye. A Course in Multivariable Calculus and Analysis, Springer, 2020.
2. M. Fitzpatrick. Advanced Calculus, American Mathematical Society, 2006.
3. T.M. Apostol. Calculus-II: An Indian Adaptation, Wiley India, 2023

Bachelor of Arts/ Bachelor of Science (Honours)

Semester–VI

Session: 2026-27

Course Title: Multivariate Calculus Laboratory

Course Code: BARP/ BECP/ BSNP/ BCSP -6333

Course Outcomes

CO1: Students will be able to determine and visualize maxima and minima of functions of two variables and plot surfaces z=f(x,y).

CO2: Students will be able to approximate areas and volumes using double integrals.

CO3: Students will be able to approximate triple integrals for evaluating volumes and related quantities.

CO4: Students will be able to represent and analyze vector fields in a plane graphically.

Bachelor of Arts/ Bachelor of Science (Honours)
Semester–VI
Session: 2026-27

Course Title: Multivariate Calculus Laboratory

Course Code: BARP/ BECP/ BSNP/ BCSP -6333

Examination Time: 3 Hours

Max. Marks: 50
Practical: 35
CA: 15

L T P
0 0 1

List of Practicals (using any package)

1. Finding and visualizing extremes of function of two variables.

2. Approximating area and volume using double integration.

3. Plotting graph of the surface z=f (x, y).

4. Approximating triple Integrals.

5. Draw vector fields in plane.

Text Books:-

1. G.B. Thomas and R.L. Finney. Calculus, 9th Ed., Pearson Education, Delhi, 2005.
2. M.J. Strauss, G.L. Bradley, and K. J. Smith. Calculus, 3rd Ed., Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), Delhi, 2007.
3. E. Marsden, A.J. Tromba, and A. Weinstein. Basic Multivariable Calculus, Springer (SIE), Indian reprint, 2005.
4. J. Stewart. Multivariable Calculus, Concepts and Contexts, 2nd Ed., Brooks /Cole, Thomson Learning, USA, 2001.