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**Syllabus 2023-24**  
**Panjab University**

**BA/BSc**  
**(MATHS)**

**THIRD SEMESTER**

SCO 80-81, Sec.15D, Chandigarh  
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**MATHEMATICS**  
**B.A./B.Sc. (GENERAL) SECOND YEAR EXAMINATION, 2023-2024**  
**SEMESTER-III**

**Paper-I : ADVANCED CALCULUS-I**

Max. Marks	:	30
Time	:	3 Hours
Int. Assessment	:	4 Marks

- Note :*
1. The syllabus has been split into two Units : Unit-I and Unit-II. Four questions will be set from each Unit.
  2. A student will be asked to attempt five questions in all selecting at least two questions from each unit. Each question will be of 6 marks.
  3. The teaching time shall be five periods (45 minutes each) per paper per week including tutorials.
  4. If internal assessment is to be conducted in the form of written examinations, then there will be only one written examination in a Semester.

**Unit-I**

Limit and continuity of functions of two and three variables. Partial differentiation. Change of variables. Partial derivation and differentiability of real-valued functions of two and three variables. Schwarz and Young's theorem. Statements of Inverse and implicit function theorems and applications.

Vector differentiation, Gradient, Divergence and Curl with their properties and applications.

**Unit-II**

Euler's theorem on homogeneous functions. Taylor's theorem for functions of two and three variables. Jacobians. Envelopes. Evolutes. Maxima, minima and saddle points of functions of two and three variables. Lagrange's multiplier method.

***References***

1. Gabriel Klaumber : Mathematical Analysis, Marcel Dekkar, Inc. New York, 1975.
2. T.M. Apostol : Mathematical Analysis, Narosa Publishing House, New Delhi, 1985.
3. R.R.Goldberg : Real Analysis, Oxford & I.B.H. Publishing Co., New Delhi, 1970.
4. D. Soma Sundaram and B. Choudhary : A First Course in Mathematical Analysis, Narosa Publishing House, New Delhi, 1997.
5. P. K. Jain and S. K. Kaushik : An Introduction to Real Analysis, S. Chand & Co., New Delhi, 2000.
6. Gorakh Prasad : Differential Calculus, Pothishala Pvt.Ltd., Allahabad.

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|-----|------------------------------|---|--|
| 7.  | J. D. Murray & M. R. Spiegel | : | Theory and Problems of Advanced Calculus, Schaum Publishing Co., New York. |
| 8.  | S.C.Malik                    | : | Mathematical Analysis, Wiley Eastern Ltd., New Delhi.                      |
| 9.  | Shanti Narayan               | : | A Course of Mathematical Analysis, S. Chand and Company, New Delhi         |
| 10. | J. D. Murray & M.R. Spiegel  | : | Vector Analysis, Schaum Publishing Company, New York.                      |
| 11. | N.Saram and S.N. Nigam       | : | Introduction to Vector Analysis, Pothishala Pvt. Ltd., Allahabad.          |
| 12. | Shanti Narayan               | : | A Text Book of Vector Calculus, S. Chand & Co., New Delhi.                 |

### Paper II : DIFFERENTIAL EQUATIONS- I

Max. Marks	:	30
Time	:	3 Hours
Int. Assessment	:	3 Marks

- Note:**
1. The syllabus has been split into two Units: Unit-I and Unit-II. Four questions will be set from each Unit.
  2. A student will be asked to attempt five questions selecting at least two questions from each Unit. Each question will carry 6 marks.
  3. The teaching time shall be five periods (45 minutes each) per paper per week including tutorial.
  4. If internal assessment is to be conducted in the form of written examinations, then there will be only one written examination in a Semester.

#### Unit-I

Exact differential equations. First order and higher degree equations solvable for  $x$ ,  $y$ ,  $p$ . Clairaut's form. Singular solution as an envelope of general solutions. Geometrical meaning of a differential equation. Orthogonal trajectories. Linear differential equations with constant coefficients.

#### Unit-II

Linear differential equations with variable coefficients- Cauchy and Legendre Equations. Linear differential equations of second order- transformation of the equation by changing the dependent variable/the independent variable, methods of variation of parameters and reduction of order. Simultaneous Differential Equations

#### References

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|----|----------------|---|---|
| 1. | Erwin Kreyszig | : | Advanced Engineering Mathematics, John Wiley & Sons Inc., New York, 1999.     |
| 2. | D.A. Murray    | : | Introductory Course on Differential Equations, Orient Longmen, (India), 1967. |
| 3. | A.R. Forsyth   | : | A Treatise on Differential Equations, Macmillan and Co. Ltd., London.         |
| 4. | Ross, S.L.     | : | Differential Equations, John Willey & Sons, 2004.                             |

**Paper III : STATICS**

Max. Marks	:	30
Time	:	3 Hours

- Note:**
1. The syllabus has been split into two Units: Unit-I and Unit-II. Four questions will be set from each Unit.
  2. A student will be asked to attempt five questions selecting at least two questions from each Unit. Each question will carry 6 marks.
  3. The teaching time shall be five periods (45 minutes each) per paper per week including tutorial.
  4. If internal assessment is to be conducted in the form of written examinations, then there will be only one written examination per paper in a Semester

**Unit-I**

Basic notions. Composition and resolution of concurrent forces – Parallelogram law of forces, Components of a force in given directions, Resolved parts of a force, Resultant of any number of coplanar concurrent forces, Equilibrium conditions for coplanar concurrent forces, equilibrium of a body resting on a smooth inclined plane. Equilibrium of three forces acting at a point – Triangle law of forces,  $\lambda - \mu$  theorem, Lami's theorem. Parallel Forces.

**Unit-II**

Moments and Couples – Moment of a force about a point and a line, Centre of Parallel forces, theorems on moment of a couple, Equivalent couples, Varignon's theorem, generalized theorem of moments, resultant of a force and a couple, resolution of a force into a force and a couple, reduction of a system of coplanar forces to a force and a couple. Equilibrium conditions for any number of coplanar non-concurrent forces.

Friction: definition and nature of friction, laws of friction, equilibrium of a particle on a rough plane, Problems on ladders, rods, spheres and circles.

**References**

1. S.L. Loney : Statics, Macmillan and Company, London.
2. R.S. Verma : A Text Book on Statics, Pothishala Pvt. Ltd., Allahabad.
3. K.R.Chaudhery and A.C.Aggarwal : Elements of Mechanics, Statics and Dynamics. S Chand and Company
4. S. L. Loney : The elements of Statics and Dynamics, 5<sup>th</sup> edition, Cambridge University Press, 1947.

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