

# Solapur University, Solapur

## Revised Semester Pattern Syllabus

### B.Sc.I

### Mathematics

(w.e.f. June 2013)

For undergraduate course as per the sanctioned workload of Thirty Six (36) Periods.

Class	Periods / Week	Marks
B.Sc.- I	9	250
B.Sc.- II	9	300
B.Sc.-III	18	600

### Syllabus of B. Sc. Part-I (MATHEMATICS) Semester-wise pattern(Commencing from JUN – 2013)

B.Sc.I (Mathematics) (Honours)semester-wise pattern to be implemented from June 2013. This syllabus of Mathematics carries 250 marks. In semester –I university examination of Theory paper –I and paper-II only and in semester – II university examination of Theory paper –III and Paper-IV and the university examination of Problem Solving Session [PSS – I] will be held. The distribution of marks is as follows.

#### Semester -I

- (1) Paper-I ALGEBRA (Marks 50)  
(2) Paper-II CALCULUS (Marks 50)

#### Semester -II

- (3) Paper –III GEOMETRY (Marks 50)  
(4) Paper –IV DIFFERENTIAL EQUATIONS (Marks 50)

#### (5) Problem Solving Session-I [ PSS – I]

Only annual examination of 50 marks.

#### Note:-

- (1) Total teaching periods for Paper –I / Paper –II and for Paper –III / Paper –IV are five(5) per week for each semester.  
(2) Total teaching periods for PSS –I are four(4) per week for whole class as one batch.

**Duration of Annual Examination :**

- (i) For Paper –I /II (Two hours ) in semester -I
- (ii) For Paper –III/IV (Two hours ) in semester -II
- (ii) For PSS –I (Three hours for a batch of 20 students) annually.

**Semester -I**

**Paper –I (Algebra)**

**40 Periods**

**Unit 1 : Matrices :** Symmetric and Skew symmetric, Elementary transformations, Rank of a Matrix(Echelon and Normal form), Characteristic equation of a matrix, Cayley Hamilton theorem and its use in finding the inverse of a matrix. [10]

**Unit 2 :Linear Equations :** Applications of matrices to a system of linear ( both homogeneous and non-homogeneous) equations. Eigen values and eigen vectors. [10]

**Unit 3 : Complex Number :** Modulus and Argument of a Complex Number, DeMoivre’s theorem and its applications, Roots of Unity, Roots of Complex Numbers. [10]

**Unit 4 : Transcendental Functions :** Circular Functions with their inverses and Hyperbolic function of a complex variable along with their inverses. [10]

**Paper –II (Calculus)**

**40 Periods**

**Unit 1 : Differentiation:** Indeterminate forms and L’ Hospital’s Rule, Successive differentiations, n<sup>th</sup> derivatives of standard functions, Leibnitz rule.Taylor’s theorem and Maclaurin’s Theorem (Only Statements). Series expansions of e<sup>x</sup>, cos x, sin x, (1+x)<sup>n</sup>, log(1+x) [15]

**Unit 2: Function of two variables :** Limit and Continuity of functions of two variables, Partial derivative, partial derivative of higher orders, Homogeneous functions, Euler’s theorem on Homogeneous functions. [10]

**Unit 3: Reduction formulae :** [05]

$$\int_0^{\frac{\pi}{2}} \sin^n x \, dx \quad \int_0^{\frac{\pi}{2}} \cos^n x \, dx \quad \int_0^{\frac{\pi}{2}} \sin^n x \cos^m x \, dx$$

(Note that reductions to these forms are not expected)

**Unit 4 :Vector Calculus** : Scalar point function , Vector point function , Directional derivative, Gradient , divergence and Curl and its properties. [10]

## Semester -II

### Paper –III (Geometry)

40 Periods

**Unit 1 :-Change of Axis:** Translations, Rotations, Invariants, Identifications of conics from general form of second degree equations, Polar Coordinates, Conversion formulae. [10]

**Unit 2 :-Plane :**General equation of plane, Normal equation, Intercept form Angle between two planes, Plane through three points, Plane through a given point, Sides of a plane, Distance of a point from a plane, Family of planes. [15]

**Unit 3 : Sphere:** Centre radius form, General form , Diameter form, Equation of Tangent Plane and condition for tangency, Family of spheres  $S+\lambda S'=0$ ,  $S+\lambda P=0$ . [15]

### Paper-IV (Differential Equation)

40 periods

**Unit 1:- Differential Equations of first order and first degree :[Part-I]**  
Variables separable, Homogeneous, non- homogeneous differential equations. [10]

**Unit 2 :- Differential Equations of first order and first degree :[Part-II]**  
Exact differential equations. Necessary and sufficient condition for exactness, Integrating factor with four rules, Linear differential equations of the form:  $dy/dx+py=Q$ ;  
Bernoulli's Equation  $dy/dx+Py=Qy^n$ . [10]

**Unit 3 :- Linear Differential Equations With Constant Coefficients :[Part-I]**  
Complementary function and particular integral, General solution of  $f(D)y=X$ , Solution of  $f(D)y=0$  for non-repeated , repeated, real and complex root. [10]

**Unit 4 :- Linear Differential Equations With Constant Coefficients : [Part-II]**  
Solution of  $f(D)y=X$  , where X is of the form  $e^{ax}$ ,  $\sin(ax)$ ,  $\cos(ax)$ ,  $x^m$ ,  $e^{ax}V$ ,  $xV$  [10]

**Problem Solving Session [PSS –I]**

**4 Periods per week.**

**Assignment –1 :** Inverse of Matrix by Cayley-Hamilton Method.

**Assignment –2 :** Solution of system of Linear Homogeneous Equation

**Assignment –3 :** Solution of system of Linear non-homogeneous Equation.

**Assignment –4 :**  $n^{\text{th}}$  roots of a complex number.

**Assignment –5:** Leibnitz Rule

**Assignment –6 :** Reduction formulae

**Assignment– 7:** Partial differentiation

**Assignment –8 :** Numerical examples on gradient, divergence and curl.

**Assignment – 9 :** Change of axis and invariants.

**Assignment –10 :** Conversion between Polar and Cartesian of points and equations

**Assignment –11 :** Family of Planes.

**Assignment –12 :** Family of Spheres.

**Assignment – 13 :** Linear differential equations.

**Assignment –14 :** Particular Integrals of  $e^{ax}$  and  $x^m$ .

**Assignment –15 :** Particular Integrals of  $\sin(ax)$  and  $\cos(ax)$ .

**Assignment –16 :** Particular Integrals of  $e^{ax}V$ ,  $xV$ .

## Nature of question paper

### Theory Papers (Paper- I, II, III and IV)

Each Paper is of **Marks 50** each. Distribution is as follows.

All five questions are compulsory and each of marks **Ten (10)**.

- [Total 50]**
- Q. No. 1:** Total 10 Multiple Choice Questions each of mark 1. **[10]**
- Q. No. 2:** Attempt any FIVE Questions out of SIX( each of 2 marks) **[10]**
- Q. No. 3:** A) Attempt any TWO out of THREE (each of marks 3)  
B) One compulsory question of marks 4 **[10]**
- Q. No. 4:** Attempt any TWO out of THREE each of Marks 5 **[10]**
- Q. No. 5:** Attempt any ONE out of TWO each of marks 10 **[10]**

### Problem Solving Session- I [PSS- I]

**There is ONE PSS-I of 3 hours for a batch of 20 students at the end of the year. ( similar to Practicle)**

#### Problem Solving Session[PSS]

**There is ONE PSS of 3 hours each for a batch of 20 students at the end of the year.**

#### Problem Solving Session [ PSS – I ] Marks 50

- Q.1 Attempt any FOUR out of EIGHT 10 marks each (40marks)  
Journal (10 marks)  
**Total (50 marks)**

## Reference Books

Paper -I : Algebra  
Paper -II : Calculus  
Paper – III : Geometry  
Paper -IV : Differential Equation  
Problem Solving Session – I [PSS – I]

1. Algebra and Geometry by R. B. Kulkarni , J. D. Yadav , S. J. Alandkar, N. I. Dhanshetti. (SUMS Publication) B.Sc.-I Paper-I
2. Algebra and Geometry (B.Sc.-I Paper-I ) by L. G. Kulkarni , Dr. B. P. Jadhav ,Dr. Mrs. P. D. Patwardhan , Dr. M. K. Kubade. [Phadke Prakashan]
3. Text Books of Matrices by Shanti Narayan.
4. A Text Book of Analytical Geometry of Two dimensions, by P. K. Jain and Khalil Ahmid , Wiley Eartern Ltd. 1994.
5. Calculus and Differential Equations (B.Sc. –I ,Paper –II)  
By H. T. Dinde , A. D. Lokhande , P. D. Sutar , U. H. Naik.(SUMS Pub.)
6. Calculus and Differential Equations (B. Sc. I , Paper- II) by L. G. Kulkarni ,Dr. B. P. Jadhav , Dr. Mrs P. D. Patwardhan , Dr. M. K. Kubade [Phadke Prakashan]
7. Differential Calculus by Shanti Narayan
8. A text book of Vector Calculus , by Shanti Narayan.
9. Differential equations, by G. S. Diwan, D. S. Agashe. Popular Prakashn , Bombay.
10. Introductory course in Differential Equation by D. A. Murray Orient Longman