

**Solapur University, Solapur**  
**Credit-Grading Semester Pattern Syllabus**  
**B.Sc.I**

**Mathematics**

(w.e.f. June 2014)

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

**Syllabus of B. Sc. Part-I (MATHEMATICS)**

**According to Credit and Grading System**

**Semester-wise pattern (Commencing from JUNE – 2014)**

B.Sc.I (Mathematics) (Honours) semester-wise pattern to be implemented from June 2014. This syllabus of Mathematics carries 300 marks. In semester –I university examination of Theory paper –I (100=70+30) only and in semester – II university examination of Theory paper –II (100=70+30) and the university examination of Problem Solving Session [PSS – I] (100=70+30) will be held. The distribution of marks is as follows.

**Semester –I**

**Paper-I: ALGEBRA & CALCULUS**

(Marks 70: University Exam.)

**Semester –II**

**Paper-II: GEOMETRY & DIFFERENTIAL EQUATIONS**

(Marks 70: University Exam.)

**Problem Solving Session-I [PSS – I] (Marks 70: University Exam.)**

**Internal Evaluation:** Marks 30 = 20 for one Unit Test+10 for Home Assignments/Tutorials/Seminars/Group discussion/Viva/Field Visit/Industry visit For Each Theory Papers and Marks 30 = 20 for one Unit Test on any two Practicals+10 for Lab Journal/viva, attendance, attitude etc.

**Note:-**

- 1.Total teaching periods for Paper –I and for Paper –II 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 (Three hours) in semester –I
- (ii) For Paper –II (Three hours) in semester -II
- (iii) For PSS –I (Three hours for a batch of 20 students) annually.

**Semester -I**

**Paper –I (Algebra & Calculus) [Marks:70 University Exam.]**

**(5 Periods per week)**

**Section-I (Algebra) [Marks:35]**

**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]**

**Section-II (Calculus) [Marks:35]**

**Unit 1: Differentiation:** Indeterminate forms and L' Hospital's Rule, Successive differentiations,  $n^{\text{th}}$  derivatives of standard functions, Leibnitz rule. Taylor's

theorem and Maclaurin's Theorem (Only Statements). Series expansions of  $e^x$ ,  $\cos x$ ,  $\sin x$ ,  $(1+x)^n$ ,  $\log(1+x)$  [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]

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

(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 –II (Geometry & Differential Equation) [Marks:70 University Exam.]**

**(5 Periods per Week)**

**Section-I (Geometry) [Marks:35]**

**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]

## Section-II (Differential Equation) [Marks:35]

### 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

$$e^{ax}, \quad \sin(ax), \quad \cos(ax), \quad x^m, \quad e^{ax}V, \quad xV \quad [10]$$

## Problem Solving Session [PSS –I] [Marks:70 University Exam.]

(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  $e^{ax}V$ ,  $xV$ .

### **Reference Books**

**Paper -I:** Algebra & Calculus

**Paper – II:** Geometry & 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 Eastern 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 Longma.

# Solapur University, Solapur

Nature of Question Paper for Credit-Grading Semester Pattern Syllabus

B.Sc.I

Mathematics

(w.e.f. June 2014)

Time:- 3.00 hrs. Total Marks-70.

- N.B.:-**
1. Answers to the two sections should be written in separate answerbooks.
  2. All questions are compulsory.

## Section – I

**Q. N0. 1) Multiple choice questions** (5)

1).....

a)                      b)                      c)                      d)

2)

3)

4)

5)

**Q. No. 2) Answer any five of the following** (10)

i)

ii)

iii)

iv)

v)

vi)

vii)

**Q. No. 3) Attempt any two of the following** (10)

i)

ii)

iii)

**Q.No. 4) Attempt any one of the following (10)**  
i)  
ii)

**Section - II**

**Q. N0. 1) Multiple choice questions (5)**  
1).....  
a)            b)            c)            d)  
2)  
3)  
4)  
5)

**Q. No. 2) Answer any five of the following (10)**  
i)  
ii)  
iii)  
iv)  
v)  
vi)  
vii)

**Q. No. 3) Attempt any two of the following (10)**  
i)  
ii)  
iii)

**Q.No. 4) Attempt any one of the following (10)**  
i)  
ii)

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