

**Solapur University, Solapur**  
**Semester Pattern**  
**Choice Based Credit System (CBCS) Syllabus**  
**B.Sc.I**  
**Mathematics**  
**(w.e.f. June 2016)**

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

Class	Periods / Week	Marks
B.Sc.- I	9	500
B.Sc.- II	9	600
B.Sc.-III	18	1200

**Details of Re-Draft Syllabus of B. Sc. Part-I (MATHEMATICS)**  
**Semester-wise pattern(Commencing from JUN – 2016)**

B.Sc.I (Mathematics) (Honours) semester-wise Choice Based Credit System [CBCS] pattern to be implemented from June 2016. This syllabus of Mathematics carries 500 marks. In semester –I Internal examination (college examination) of 30 marks and external examination (university examination) of 70 marks [Total 70 +30 =100] for Theory paper –I, paper-II, also in semester – II for Theory paper –III, Paper-IV and at the end of second term for **Numerical Technique Laboratory [NTL] [NTL – I]** will be held. The distribution of marks is as follows.

**Semester -I**

- (1) **Paper-I ALGEBRA** (Marks 70+30 = 100)  
(2) **Paper-II CALCULUS** (Marks 70+30 = 100)

**Semester -II**

- (3) **Paper –III GEOMETRY** (Marks 70+30 = 100)  
(4) **Paper –IV DIFFERENTIAL EQUATIONS** (Marks 70+30 = 100)

- (5) **Numerical Technique Laboratory [NTL] [NTL – I](Marks 70 +30 =100)**

Internal exam of 30 marks and annual examination of 70 marks on all the above four papers.

**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 NTL –I are four(4) per week for whole class as one batch.

**Duration of Annual Examination :**

- (i) For Paper –I/II (Two & half hours ) in semester -I  
(ii) For Paper –III/IV (Two and half hours ) in semester -II  
(ii) For NTL –I (Two and half 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 and their inverses and Hyperbolic function of a complex variable with their inverses. [10]

**Paper –II (Calculus)**

**40 Periods**

**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  $e^x$ ,  $\cos x$ ,  $\sin x$ ,  $(1+x)^n$ ,  $\log(1+x)$  [10]

**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 :**

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

(Note that reductions to these forms are not expected)

[10]

**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]

### **Numerical Technique Laboratory[NTL –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 70** each. Distribution is as follows. All five questions are compulsory and each of marks **Ten (14)**. [Total 70]

**Q. No. 1:** Total 14 Multiple Choice Questions each of mark 1. [14]

**Q. No. 2:** Attempt any SEVEN Questions out of EIGHT ( each of 2 marks) [14]

**Q. No. 3:** A) Attempt any TWO out of THREE (each of marks 5)  
B) One compulsory question of marks 4 [14]

**Q. No. 4:** Attempt any TWO out of THREE each of Marks 7 [14]

**Q. No. 5:** Attempt any ONE out of TWO each of marks 14 [14]

**OR**

Attempt any TWO out of THREE each of Marks 5 [14]

## Numerical Laboratory Technique- I [NTL- I]

There is ONE NTL-I of 2.5 hours for a batch of 20 students at the end of the year. (similar to Practicle)

Numerical Laboratory Technique- I [NTL- I]

There is ONE NTL of 2.5 hours each for a batch of 20 students at the end of the year.

Numerical Laboratory Technique- I [NTL- I]                      Marks 70

Q.1 Attempt any SIX out of EIGHT    10 marks each    (60marks)  
Journal    (10 marks )  
Total    (70 marks)

## References

**Paper -I : Algebra**

**Paper -II : Calculus**

**Paper – III : Geometry**

**Paper -IV : Differential Equation**

**Numerical Technique Laboratory – I [NTL – I]**

1. **ALGEBRA , B. Sc. – I (Semester –I) MATHEMATICS- Paper-I by Prof. S. J. Alandkar, Prof. N. I. Dhanshetti, Prof. Dhone A. S. Prof. R. D. Mahimkar, Nirali Prakashan (Edition- July 2014) ISBN 978-93-5164-169-8.**
2. **CALCULUS, B. Sc. – I (Semester –I) MATHEMATICS- Paper-II by Prof. S. J. Alandkar, Prof. N. I. Dhanshetti, Prof. Dhone A. S. Prof. R. D. Mahimkar, Nirali Prakashan (Edition- July 2014) ISBN 978-93-5164-162-9.**
3. **GEOMETRY, B. Sc. – I (Semester –II) MATHEMATICS- Paper-III by Prof. S. J. Alandkar, Prof. N. I. Dhanshetti, Prof. Dhone A. S. Prof. R. D. Mahimkar, Nirali Prakashan (Edition- November 2014) ISBN 978-93-5164-339-5.**
4. **DIFFERENTIAL EQUATION , B. Sc. – I (Semester –II) MATHEMATICS- Paper-IV by Prof. S. J. Alandkar, Prof. N. I. Dhanshetti, Prof. Dhone A. S. Prof. R. D. Mahimkar, Nirali Prakashan (Edition- December 2014) ISBN 978-93-5164-445-3.**
5. **Algebra and Geometry by R. B. Kulkarni , J. D. Yadav , S. J. Alandkar, N. I. Dhanshetti. (SUMS Publication) B.Sc.-I Paper-I**
6. **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]**
7. **Text Books of Matrices by Shanti Narayan.**
8. **A Text Book of Analytical Geometry of Two dimensions, by P. K. Jain and Khalil Ahmid , Wiley Eartern Ltd. 1994.**
9. **Calculus and Differential Equations (B.Sc. –I ,Paper –II)**  
**By H. T. Dinde , A. D. Lokhande , P. D. Sutar , U. H. Naik.(SUMS Pub.)**
10. **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]**
11. **Differential Calculus by Shanti Narayan**
12. **A text book of Vector Calculus , by Shanti Narayan.**
13. **Differential equations, by G. S. Diwan, D. S. Agashe. Popular Prakashn , Bombay.**
14. **Introductory course in Differential Equation by D. A. Murray Orient Longman**

=====