



Shri Sangameshwar Education Society's
Sangameshwar College, Solapur [Autonomous]
(Affiliated to Punyashlok Ahilyadevi Holkar Solapur University, Solapur)
Kannada Linguistic Minority Institute
NAAC Accredited with 'A' Grade (III Cycle CGPA 3.39)

Academic Council 1(6)
2nd July, 2020

UG Science Programme: B.Sc.-I To be implemented from A.Y. 2020-2021

System:Choice Based Credit System (CBCS) with SGPA and CGPA

B.O.S. in*: **Mathematics**

*Physics/Chemistry/Mathematis/Statistics/Electronics/Botany/Zoology/Geography/Psychology

Structure and Examination for: Discipline Specific Core Courses(DSC-A and DSC-B)

Table-1

| Semester | Course | | Teaching Scheme/week | | | |
|----------|--------|------------------------------------|----------------------|-------|----------|---------|
| | | | Course Code | Hours | Lectures | Credits |
| I | DSC-A | Theory-I: Algebra | 2031106 | 4 | 5 | 4 |
| | | Theory-II:Calculus | 2031107 | | | |
| | | Practical-I: Mathematics Practical | 2031222 | 3.2 | 4 | 2 |
| II | DSC-B | Theory-I: Geometry | 2031202 | 4 | 5 | 4 |
| | | Theory-II: Differential Equations | 2031203 | | | |
| | | Practical-I:Mathematics Practical | 2031222 | 3.2 | 4 | 2 |

Table-2

| Semester | Course | | EXAMINATION | | | Credits |
|----------|---------------|------------------------------------|-------------|-----|-------|---------|
| | | | Marks | | | |
| | | | CA | SEE | Total | |
| I | DSC-A | Theory-I: Algebra | 15 | 35 | 50 | 4 |
| | | Theory-II: Calculus | 15 | 35 | 50 | |
| II | DSC-B | Theory-I: Geometry | 15 | 35 | 50 | 4 |
| | | Theory-II: Differential Equations | 15 | 35 | 50 | |
| | DSC-A & DSC-B | Practical-I: Mathematics Practical | 30 | 70 | 100 | 4 |

CA: Continuous Assessment SEE: Semester End Examination

Note: -

The above structure (Table-1 and Table-2) is for Sem-I and Sem-II of the undergraduate B.Sc.-I *
/B.S.Ecs.-I /B.C.A.-I programmes under science faculty.

* B.Sc.-I Select any four DSC from Chemistry /Physics /Mathematics /Statistics /Electronics /Botany
/Zoology /Geography /Psychology.

DSC: Discipline Specific Core Course AECC: Ability Enhancement Compulsory Course

Passing in each course is compulsory including Democracy. course.

SGPA/CGPA and Total Marks will be calculated excluding AECC and Democracy.
courses.

Compulsory Course:

| | | |
|-----------|-------------|------------------------------------|
| DEMOCRACY | 200023 2 | DEMOCRACY ELECTIONS AND GOVERNANCE |
| PHY EDU | 200023 3 | PHYSICAL EDUCATION |

1) Preamble

Mathematics is an indispensable part for science and technology. It provides the basic language for understanding the world and lends precision to scientific thought. The B.Sc. I Mathematics course at Sangameshwar College (Autonomous), Solapur is designed to provide a foundation for pursuing higher education and research in Mathematics. The necessary basic concepts of entrance exams like PG admission tests, CU-CET, JAM,

CAT, MAT, G-MAT, GATE and NET/SET/PET etc. were included in the syllabus. As per UGC guidelines syllabus for B.Sc. I Mathematics and question paper pattern has been formed by the BOS(UG) in Mathematics. The students of B.Sc. I offering Mathematics has to complete one theory course in each semester and one practical(annual) entitled Numerical Techniques in Laboratory (NTL)[DSC-I(A&B)] course.

2) Aim

The Mathematics curriculum aims to help all students to develop a positive attitude towards Mathematics and to use its practical applications in real life. Also encourage and enable students to improve the knowledge, problem solving skills and use mathematical language effectively and accurately to pursue further studies in Mathematics.

3) Objectives

- i) To develop the understanding of the fundamental concepts in Mathematics.
- ii) To promote the students for thinking.
- iii) To identify the applications of Mathematics in other disciplines and society.
- iv) To understand, formulate and use quantitative models arising in other branches of knowledge.
- v) Demonstrate basic manipulative skills in algebra, calculus, geometry and differential equations.
- vi) To spread education to acquire skill, technique and knowledge.
- vii) To upgrade confidence by developing a feel for applications, related examples and its use in social and technical study.

Details Of Approved Syllabus of B. Sc. Part-I (MATHEMATICS)

B.Sc. I (Mathematics) (Honours) semester-wise Choice Based Credit System [CBCS] pattern to be implemented from June 2020. This syllabus of Mathematics carries 300 marks. In semester –I Internal examination (college examination) of 15 marks and external examination(semester end examination) of 35 marks [Total 35+15 =50] for Theory papers –I & II each, and also in semester – II for Theory papers –III and IV each and at the end of second semester practical examination in Mathematics entitled **Numerical Techniques in Laboratory** [NTL-I][DSC-I A&B] will be conducted.

The distribution of marks is as follows.

Semester –I(DSC-I A)

(1) Paper-I : Algebra

(Marks 35+15=50)

(2) Paper-II: Calculus

(Marks 35+15=50)

Semester –II(DSC-I B)

(3) Paper -III: Geometry

(Marks 35+15 = 50)

(4) Paper-IV: Differential Equations (Marks 35+15 = 50)

(5) Numerical Technique Laboratory [NTL - I] [DSC- I A + I B] (Marks 70+30 =100)

Internal examination of 15 marks and semester end examination of 35 marks of all the above four theory papers.

Internal practical examination of 30 marks at the end of semester two and annual practical examination of 70 marks.

Duration of Annual Examination:

(i) For Paper –I /II (Two hours) in semester -I

(ii) For Paper –III/IV (Twohours) in semester -II

(ii) For NTL –I [DSC- I A+ I B] (Three hours for a batch of 20 students) annually.

Note:-

(1) Total teaching periods for Paper –I, II, III &IV (each) are five(5) per week for each semester.

(2) Total teaching periods for [DSC- I A+I B] are four (4) per week for whole class as one batch.

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B.Sc I Mathematics (CBCS Pattern)

Discipline Specific Core Course (DSC-A)

Semester -I

DSC-A Theory-I MATHEMATICS-I(2031106)

Title: Algebra

Credit: 2

Marks: 50

Lectures: 30 Hours

Learning Objectives:

To learn about:

- To find Rank of a matrix, Normal or Canonical form of a matrix, Echelon form, characteristics equation of a matrix, Cayley-Hamilton theorem, its use in finding the inverse of a matrix. System of Non -Homogeneous Linear equations and Homogeneous Linear equations
- To evaluate Modulus and Argument of a complex numbers, De-Moiver's theorem and its applications, Roots of Complex numbers. -- Learn to evaluate Circular functions and their inverses and Hyperbolic functions of a complex variable with their Inverses. –
- The definition of a group, Basic properties and examples.

Unit-I Rank of a matrix and Simultaneous Linear Equations

Rank of a matrix, Normal or Canonical form of a matrix, Echelon form, characteristics equation of a matrix, Cayley-Hamilton theorem, its use in finding the inverse of a matrix. System of Non-Homogeneous Linear equations and Homogeneous Linear equations. 10hrs

Unit-II Complex Numbers

Definition of Complex Number, Complex Conjugate, Representation of complex numbers in Cartesian and polar co-ordinates, Argand diagram. Modulus and Argument of a Complex numbers, De-Moivre's theorem and its applications, Roots of Complex numbers. 7hrs

Unit-III Transcendental Functions

Circular functions and their inverses and Hyperbolic functions of a complex variable with their Inverses and properties. 7hrs

Unit-IV Introduction to Group and its Properties

Definition of a group, Basic properties and examples. 6hrs

Course Outcomes:

Upon successful completion of the course, students will be able:

- To find rank of the matrix, inverse of matrix by using Cayley-Hamilton theorem.
- To obtain the solution system of linear equations,
- To find Modulus and Argument of a complex numbers, De-Moivre's theorem and its applications, Roots of Complex number.
- To Find out Circular functions and their inverses and Hyperbolic functions of a complex variable with their Inverses.
- To Understood Definition of a group, Basic properties and examples.

Recommended Books:

1. Topics in Algebra By Om P.Chug, k. Prakash, A.D.Gupta, Anmol Publication Pvt. Ltd New Delhi.
2. A text book of matrices, byshanty Narayan(S. Chand and company Ltd), New Delhi 11055.
3. A First course in Abstract Algebra, Fraleigh J.B., NarosaPub.House, New Delhi 7th Edition.
4. Matrix and Linear Algebra by K.B. Datta, DHI Publication.
5. Algebra B.Sc. I(Sem-I)Mathematics Paper-I by Prof.S.J.Alandkar, Prof.N.I.Dhanshetti,
6. Prof.DhoneA.S, Prof.Mahimkar R.D., NiraliPrakashan.
7. Algebra B.Sc. I(Sem-I)Mathematics Paper-I by Dr.B.P.Jadhav, Prof.A.M.Mahajan,

Prof.GadeS.P.,Prof.Kokare B.D. Phadake Prakashan.

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B.Sc. I Mathematics (CBCS Pattern)
Discipline Specific Core Course (DSC-A)
Semester -I
DSC-A Theory-II MATHEMATICS-II(2031107)
Title: Calculus

Credit:2

Marks: 50
Lectures: 30 Hours

Learning Objectives:

To learn about:

- To evaluate limits of indeterminate forms using L'Hospital Rule
- To find n^{th} order derivatives
- To apply Leibnitz rule to find n^{th} derivative of product of two functions.
- To find partial derivatives
- The homogeneous functions and Euler's theorem, composite rules
- To obtain the series expansions using Taylors and Maclaurins series
- Learn definitions of scalar and vector point functions.
- To find curl, divergence, and gradient and triple products.

Unit-I Indeterminate forms and Series Expansions

Indeterminate forms $\frac{0}{0}, \frac{\infty}{\infty}, 0 \times \infty$ and $\infty - \infty, 1^{\infty}, \infty^0, 0^0$ and L'Hospital's Rule. Taylor's theorem and Maclaurin's Theorem (only statements), Taylor's and Maclaurin's series expansion (statement only), Series Expansions of $e^x, \cos x, \sin x, \sec x, \tan x, \log \log (1 + x), (1 + x)^n (n = -1, \frac{1}{2})$.

6hrs

Unit-II Successive Differentiation

n^{th} Order derivatives of some Standard functions, $(ax + b)^n, \frac{1}{ax+b}, \log \log (ax + b),$

$\sin(ax + b), \cos \cos (ax + b), a^x, e^{ax}, e^{ax} \sin \sin (ax + b), e^{ax} \cos \cos (ax + b)$. Leibnitz theorem and its

Applications.

7hrs

Unit-III Function of two variables

Limits and Continuity of functions of two variables. Partial derivatives of higher orders, Examples using definitions, Composite functions, Composite Rules (Examples), Homogeneous functions, Euler's theorem on Homogeneous function (two variables only), Corollary and its applications.

8hrs

Unit-IV Vector Calculus

Basic review, Scalar and Vector product of three-dimensional vectors, scalar and vector point functions. Vector differentiation, Gradient, divergence, Curl and their properties.

9hrs

Course Outcomes:

Upon successful completion of the course, students will be able to

- Evaluate the limits using L'Hospital rule.
- Find the nth derivatives using properties.
- Apply the Leibnitz rule
- Find higher order partial derivatives using definitions.
- Expand the functions
- Find degree of homogeneity
- Find the p.d.s using Euler's and composite rules and corollaries.
- Understand definitions of vectors and scalars
- Use vector differentiation in other branches.

Recommended Books:

1. Principle of Mathematical Analysis, W. Rudin, Third Edition, McGraw Hill, 1976.
2. Mathematical Analysis and Applications by J.V. Deshpande, Narosa Publishing House.
3. A Course in Calculus and Analysis by Sudhir Ghorpade and Balmohan Limaye, Springer 2006.
4. Mathematical Analysis by S.C. Malik and Savita Arora, New Age International Publisher (second Edition).
4. Calculus B.Sc.-I(sem-II) Mathematics Paper-II by Prof. S.J. Alandkar, Prof. N.I. Dhanshetti, Prof. Dhona A.S., Prof. R.D. Mahimakar, Nirali Prakashan.
5. Calculus B.Sc.I(sem-II) Mathematics paper-II by Prof. Dr. B.P. Jadhav, Prof. A.M. Mahajan, Prof. Dr. S.P. Gade, Prof. B.D. Kokare Phadke Prakashan.
6. Differential Calculus by Shanti Narayan S. Chand.

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B.Sc. I Mathematics (CBCS Pattern)
Discipline Specific Core Course (DSC-B)
Semester -II
DSC-B Theory-I **MATHEMATICS-III(2031206)**
Title: Geometry

Credit:2

Marks: 50
Lectures: 30 Hours

Learning Objectives:

To learn about

- Translations, Rotations, Invariants, Identification of Conic form, general form of Second-degree Equation, Polar Co-ordinates, Conversion formulae.
- Intersection of a sphere and a line Plane of Contact and Polar plane Intersection of two spheres, radical and tangent planes.
- The general second-degree equation of cone, intersection of a cone with line and plane.
- Enveloping cone and right circular cone.
- Enveloping cylinder and right circular cylinder.

Unit-I Change of Axis

Translations, Rotations, Invariants, Identification of Conic from general form of Second-degree Equation, Polar Co-ordinates, Conversion formulae. 6hrs

Unit-II The Sphere

1. Definition
2. The Circle
3. Intersection of a sphere and a line
4. Plane of Contact and Polar plane
5. Intersection of two spheres
6. Radical plane
7. Coaxial spheres
8. Conjugate of Coaxial sphere

9hrs

Unit-III The Cone

- 1 Definition
2. General second-degree equations

3. Intersection of a Cone with plane
4. Intersection of a Cone and a line
5. Enveloping Cone
6. Right circular Cone
7. The cone $ax^2 + by^2 + cz^2 = 0$ 9hrs

Unit-IV The Cylinder

1. Definition
2. Enveloping Cylinder
3. Right Circular Cylinder 6hrs

Course Outcomes:

Upon successful completion of the course, students will be able:

- To find out Translations, Rotations, Invariants, and Identification of Conic from general form of Second-degree Equation, Polar Co-ordinates, and Conversion formulae.
- To find out Intersection of a sphere and a line, Plane of Contact and Polar plane.
- To find Intersection of two spheres, intersection of a cone with plane and line.
- To find equation of enveloping cone and cylinder.

Reference Books:

1. Analysis Solid Geometry Shanti Narayan, Dr.P.K.Mittal Publication: S.Chand
2. Analytical solid Geometry by shanti Narayan, S.Chand and Company Ltd, New-delhi-110055.
3. The elements of co-ordinate Geometry Loney S.L., Macmillan and Co.Ltd London (Book Acc.No.54414).

Recommended Books:

- 1 Geometry B.Sc. I (Sem-II) Mathematics-Paper-III by Prof.S.J.Alandkar, Prof.N.I.Dhanshetti, Prof.R.D.Mahimkar, NiraliPrakashan (Edition-July2014), ISBN 978-93-5164-162-9.

- 2 Analytical Geometry of Three Dimensions by P.K.Jain Second Edition 1994 Khalil Ahmad Wiley Eastern Limited.
- 3 Algebra and Geometry B.Sc.I Paper-I by Prof.R.B.kulkarni, Prof.J.D.Yadav, Prof. S.J.Alandkar, Prof.N.I.Dhanshetti (SUMS Publication).
- 4 Algebra and Geometry B.Sc.I Paper-I by L.G.Kulkarni, Dr.M.K.Kubde, Dr.B.P.Jadhav, Dr.Mrs.P.D.Patwardhan Phadke Prakashan Second Edition July-2005.
- 5 Geometry B.Sc.I(Sem-II) Paper-III by Dr.B.P. Jadhav, Prof.A.M.Mahajan, Dr.S.P.Gade, Prof.B.D.Kakare, Phadke Prakashan First Edition-2016.

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B.Sc I Mathematics (CBCS Pattern)
 Discipline Specific Core Course (DSC-B)
Semester -II
DSC-B Theory-I MATHEMATICS-IV(2031207)
Title: Differential Equations

Credit:2

Marks: 50
Lectures: 30 Hours

Learning Objectives:

To Learn about to:

- To solve the first order ordinary differential equations
- To specify the forms variable separable, homogeneous equation, non-homogeneous, Exact /non exact equations
- To find IF's and their rules
- To use Linear equations and its reducible form.
- To define linear differential equations, its solutions
- To find CF using auxiliary equation in different cases real/imaginary roots and repeated/non repeated cases
- The short methods of finding PI
- the applications of ODEs to various fields

Unit-I Differential equations of first Order and first degree

Definitions, variable separable form (Statement only), Homogenous differential Equations (statement only), Non-Homogeneous Equations (Theory with examples). Exact differential equations, Necessary and Sufficient condition for exactness, Integrating factor, Linear differential equation (statement only), Bernoulli's equation $\frac{dy}{dx} + Py = Qy^n$.

12hrs

Unit-II 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 roots.

6hrs

Unit-III Linear Differential equations with constant coefficients Part-II

Meaning of $\{1/(D+a)\} X$, Solution of $f(D)Y=X$, where X is of the form

$$e^{ax}, \sin ax, \cos ax, X^m, e^{ax}V, XV.$$

6hrs

Unit-IV Applications of Differential Equations 6hrs

Growth and Decay, Radioactivity and Carbon dating, Electric Circuit. Simple Mechanical applications.

Course Outcomes:

Upon successful completion of the course, students will be able to:

- Choose the appropriate method
- Use var.sep.form in finding solution to first order ode
- Use homogeneous and non-homo. Methods to solve ode and types to which it belongs.
- Solve the linear and reducible equations
- Choose the proper rule of finding IF
- Find the CF in all cases
- Select the exact useful method to solve the LDEs with constant coefficients
- Identify the applications of Mathematics in other disciplines
- Model the problems of growth and decay, electric ckts and carbon dating etc.

Reference Books:

- 1) Ordinary and Partial Differential equations by Dr.M.D.Raisinghania, S.Chand 18th Edition.
- 2) Differential equations and their applications (Second Edition) by Zafar Ahsan, Prentice-Hall of India, Private Limited; New Delhi-110001.
- 3) Engineering Mathematics (M3) by Dr. Kumbojkar, Nirali Prakashn, Pune.

Recommended Books:

1. Differential Equation B.Sc.I(Sem-II) Mathematics Paper-IV by Prof.S.J.Alandkar, Prof.N.I.Dhanshetti, Prof.DhoneA.S., Prof.R.D.Mahimkar,NiraliPrakashan, Pune.
2. Differential Equation B.Sc.I(Sem-II) Mathematics Paper-IV.ByProf.Dr.B.P.Jadhav, Prof. A.M.Mahajan, Prof.Dr.S.P.Gade,Prof.B.D.Kokare ,PhadkePrakashans.
3. Calculus and Differential equations B.Sc.I Paper-II by G.V.Kumbhajkar,NiraliPrakashan.
4. Algebra and Geometry B.Sc.I Paper-I by Prof.L.G.Kulkarni, Prof.Dr.M.K.Kubade, Prof. Jadhav.
5. Differential equations by G.S, Diwan,D.S.Agashe,Popular Prakashan ,Bombay.
6. Introductory course in Differential Equation by D.A.Murray Orient Longman.
7. Sharma and Gupta,DifferentialEquation,KrishnaPrakashan, Media co. Meerut.

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Numerical Techniques In Laboratory (NTL-I)

MATHEMATICS PRACTICAL-I(2031222)

Credit: 4

Marks: 100

Lectures: 04 Periods Per Week

- PSS-1-Computation of Inverse of a matrix by Cayley-Hamilton Method.
- PSS-2-Numerical Problems on System of Linear Homogeneous Equations.
- PSS-3 Numerical Problems on System of Non-Homogeneous Linear equations.
- PSS-4 Finding n^{th} roots of a complex number.
- PSS-5 Numerical Problems on Groups/Subgroups.
- PSS-6 Finding n^{th} order derivative by Leibnitz Rule.
- PSS-7 Problems on Higher order Partial Derivatives.
- PSS-8 Numerical Problems on gradient/divergence/Curl (part-I).
- PSS-9 Numerical Problems on gradient/divergence/Curl (part-II).
- PSS-10 Numerical Problems based on Composite rules and Euler's theorem.
- PSS-11 Problems on Change of axis.

PSS-12 Examples of intersection of a sphere and a line, Plane of contact and intersection of two spheres.

PSS-13 Numerical examples on Radical plane, Coaxial Sphere.

PSS-14 Problems on intersection of a cone with a plane and line, enveloping cone.

PSS-15 Examples on Cylinder.

PSS-16 First order differential equations Non-Homogeneous equations/Exact differentialequation/Integrating Factor.

PSS-17 Particular integral by short method when $X=e^{ax}$ or x^m .

PSS-18 Particular integral by short method when $X=\sin ax$ and $\cos ax$.

PSS-19 Particular integral by short methods when $X=e^{ax} V$, XV .

PSS-20 Applications of differential equations.

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