Solapur University, Solapur.
Semester Pattern (CGPA Pattern)
Syllabus
(w.e.f. June 2015)
B.Sc.II-MATHEMATICS

- There will be **Two** theory Paper in **each semester.**
- **Three Theory periods** per week for **each section of theory paper**.
- **Three periods** per week for a **Problem Solving Session[PSS – IIA & IIB**].

Theory Papers:

Semester – III

Paper – III Differential Calculus

Paper – IV Real Analysis

Semester – IV

Paper –V Differential Equation

Paper –VI Abstract Algebra-I

Problem Solving Session – II [

PSS – IIA Differential Calculus and Differential Equation

PSS – IIB Real Analysis and Abstract Algebra-I

(Three Hours in a week with whole Class as a Batch)

Four Theory Papers (Paper-III, IV)

Each paper (Annual 70 + Internal 30 = 100) [100 x 2] Marks 400

Problem Solving Sessions (PSS – IIA and IIB)

Each carrying[Annual 70 + Internal 30 = 100] Marks 200

Total : Marks 600

Semester -III
Paper – III Differential Calculus

Unit-1. Curvature :

Definition of Curvature ,Length of arc as a function, Radius of curvature, Cartesian Equation, Parametric Equations, Polar Equations, Pedal Equations. **(15)**

Unit-2. Jacobians:

Definition of a Jacobian, Jacobian of a function of function, Jacobian of implicit function, Condition of dependent functions (statement only). **(15)**

Unit- 3. Maxima and Minima :

Definiton of Maximum value and minimum value of a function of one, two variables, Necessary condition for extreme values(Statements only), sufficient condition for extreme values (Statements only), Use of second order derivatives. Maxima and Minima of a function of two variables, Lagrange's Method of undetermined multipliers of two variables. **(15)**

Recommended Book(Scope of Syllabus):

Differential Calculus by *Shanti Narayan and P.K.Mittal S.Chand Publication Revised Edition 2005.*

Unit 1 :14.1,14.2,14.3.

Unit 2 :12.1,12.2,12.3,12.4

Unit 3 : 9.1,9.2,9.3,9.4, 9.6.(Examples restricted upto two variables only)

Reference Books

1. Differential Calculus (B. Sc. Part-II: Semester-III Paper – III) Prof. Alandkar S. J., Prof. Dhanshetti N. I., Prof. Dhone A. S., Prof. Mahimkar R. D. by Nirali Prakashan, Pune.
2. Gorakh Prasad, Differential Calculus, Pothishala Pvt. Ltd., Allahabad
3. N. Piskunov, Differential and Integral Calculus, Peace Publishers, Moscow
4. P. N. Wartikar and J. N. Wartikar, A Text Book of Applied Mathematics, Vol. I, Poona Vidyarthi Griha Prakashan, Poona 30.
5. Tom M. Apostol, Calculus Vol I and II, Wiley Publication.

Paper -IV : Real Analysis

Unit -1 : Real Numbers **[15]**

1. Introduction
2. Field Structure and Order Structure
3. Bounded and Unbounded Sets: Supremum, Infimum
4. Completeness in the Set of Real Numbers
5. Absolute Value of a Real Number

Unit –2 : Real Sequences **[15]**

1. Sequences
2. Limit Points of a Sequence
3. Limit Inferior and Superior
4. Convergent Sequnces
5. Nonconvergent Sequences(Definitions)
6. Cauchy's General Principle of Convergence
7. Algebra of Sequences
8. Some Important Theorems
9. Monotonic Sequences

Unit–3: Infinite Series **[15]**

1. Introduction
2. Positive Term Series
3. Comparison Tests for Positive Term Series
4. Cauchy's Root Test
5. D'Alembert's Ratio Test
6. Raabe's Test (without proof and Examples)
7. Logarithmic Test (without proof and Examples)
8. Integral Test (without proof and Examples)
9. Gauss's Test (without proof and Examples)

Recommended Book (Scope of Syllabus):

Mathematical Analysis by S. C. Malik and Savita Arora(Third Revised Edition- 2008) New Age International Publishers.

Real Analysis

Unit–1 : (**Real Numbers**) Art: 1 to 5

Unit –2 : (**Real Sequences**) Art: 1 to 9

Unit–3 : (**Infinite Series**) Art: 1 to 9

Reference books:

1. Real Analysis (B. Sc. Part-II: Semester-III Paper – IV) Prof. Alandkar S. J., Prof.
2. Dhanshetti N. I., Prof. Dhone A. S., Prof. Mahimkar R. D. by Nirali Prakashan, Pune.
3. A first course in mathematical analysis by D. Somasundaram & B.Choudhary Narosa Publishing House.
4. Real Analysis by R.R. Goldberg.
5. Principles of Mathematical analysis by Rudin W. McGraw-Hill, New York.
6. A Course of Mathematical Analysis by Shanti Narayan S.Chand & Company New Delhi.

Semester – IV

Paper – V : Differential Equations

Unit 1:- Differential Equations of the first order and of degree higher than the first :
Equations that can be resolved into factors of the first degree, Equations solvable for x,Equations solvable for y, Clairaut's equation, Equations reducible to clairaut's form. **(10)**

Unit 2 : Linear Equations of the second order (Part –I) :
General form of the second order linear equation, Complete solution when one integral belonging to complementary function is known ,Rules of getting an integral belonging to complementary function , Removal of the First order Derivative. **(12)**

Unit 3 : Linear Equations of the second order & Homogeneous linear equations(Part –II) :
Transformation of the linear equation of second order by Changing the independent variable, Homogeneous linear equations, Working rule for finding the solution, Equations reducible to Homogeneous form. **(13)**

Unit 4. Simultaneous Equations & Total Differential Equations:
Nature of the solution of simultaneous equations, Rules of solving the Equation, Total Differential Equation, Necessary and sufficient condition for the integrability of total differential equation (proof of Necessity only), Condition for exactness, Criterion for exactness , Method of Solving the Equation. **(10)**

Recommended Book :

Differential Equation :
Ordinary and Partial Differential Equations :by *M.D.Raisinghania,S.Chand Co.Ltd.Ramanagar,New Delhi-110055(Edition2002)*

Unit 1 (Part I) :6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.7, 6.9, 6.10, 6.11, 6.12.
Unit 2 (Part I) :5.1, 5.2, 5.3, 5.6, 5.7.
Unit 3 (Part II) :4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9, 4.10, 4.11.
Unit 4 (Part II) :5.1,5.2, 5.4,5.5,5.6,5.7.
Unit 5 (Part II) :6.2,6.3,6.4,6.5,6.6,6.7.

Reference Book:

1. Differential Equations (B. Sc. Part-II: Semester-IV Paper – V) Prof. Alandkar S. J., Prof. Dhanshetti N. I., Prof. Dhone A. S., Prof. Mahimkar R. D. by Nirali Prakashan, Pune.

Paper– VI : Abstract Algebra-I

Unit-1: Introduction to Groups **[10]**

Definition and Example of Groups, Permutations, Subgroups, Groups and Symmetry.

Unit -2: Equivalence, Congruence, Divisibilty **[12]**

Equivalence relation and partitions, Congruence and Division Algorithm, Integer Modulo n, Greatest Common Divisors, The Euclidean Algorithm, Factorization, Euler's Phi Function.

Unit-3: Groups **[13]**

Elementary Properties of Groups, Generators, Direct products, Cosets, Lagrange's Theorem, Isomorphism, More on Isomorphism, Cayley's Theorem.

Unit-4: Group Homomorphism **[10]**

Homomorphism of Groups, Kernels, Quotient Groups, The Fundamental theorem of Homomorphism.

Recommended books (Scope of Syllabus):

Modern Algebra-An Introduction, by John R. Durbin, John Wiley & Sons, Inc. Fifth Edition

Unit – 1 : Chapter-II: Art. 5,6,7,8

Unit – 2 : Chapter-III: Art. 9,10,11,12

Unit – 3 : Chapter-IV : Art. 14,15,16,17,18,19,20

Unit – 4 : Ch- V :21,22,23

Reference Books:

1. Abstract Algebra-I (B. Sc. Part-II: Semester-IV Paper – VI) Prof. Alandkar S. J., Prof. Dhanshetti N. I., Prof. Dhone A. S., Prof. Mahimkar R. D. by Nirali Prakashan, Pune.
2. A First Course In Abstract Algebra J. B. Fraleigh Pearson Education 7^{th} edition.
3. University Algebra N.S. Gopalkrishnan.
4. Algebra M. Artin Prentice Hall of India.
5. Abstract Algebra David S. Dummit & Richard M. Foote Wiley & Sons, Inc.
6. Fundamentals of Abstract Algebra D. S. Malik & N. Mordeson & M. K. Sen Mc. Graw Hill International Edition.
7. A Course in Abstract Algebra by Vijay K. Khanna and S.K. Bhambri, Vikas Publishing House Pvt. Ltd.

Problem Solving Session - II

[PSS – IIA :Differential Calculus and Differential Equation
PSS – IIB: Real Analysis and Abstract Algebra – I]

PSS – IIA: Differential Calculus and Differential Equation

Assignment No.1: Curvature -I

Assignment No.2: Curvature -II

Assignment No.3 : Jacobians-I

Assignment No.4 : Jacobians-II

Assignment No.5 : Maxima and Minima-I

Assignment No.6 : Maxima and Minima-II

Assignment No.7: Differential Equations of the first order and of degree higher than the first(Part-I) .

Assignment No. 8: Differential Equations of the first order and of degree higher than the first(Part-I) .

Assignment No.9: Linear Equations of the second order(Part-I)

Assignment No.10: Linear Equations of the second order (Part-II)

Assignment No.11: Simultaneous Equations & Total Differential Equations(Part-I)

Assignment No.12: Simultaneous Equations & Total Differential Equations(Part-II)

PSS –IIB : Real Analysis and Abstract Algebra – I

Assignment No.1: Real Numbers(Part-I)

Assignment No.2 : Real Numbers (Part-II)

Assignment No.3 : Real Sequences (Part-I)

Assignment No. 4 : Real Sequences (Part-II)

Assignment No. 5: Infinite Series(Part-I)

Assignment No. 6: Infinite Series(Part-II)

Assignment No. 7: Equivalence, Congruence, Divisibilty

Assignment No. 8: Equivalence, Congruence, Divisibilty

Assignment No.9: Groups(Part-I)

Assignment No.10: Groups(Part-II)

Assignment No.11: Group Homomorphism(Part-I)

Assignment No.12: Group Homomorphism(Part-II)

Nature of question paper

For Each Theory Paper

External /Annual Examination [70] + Internal [30] = 100 Marks

1. **Internal : Unit Test [20] + Tutorial [10]** **[30]**
2. **External : One paper of 70 marks in each semester.**

(As per Solapur University Pattern)

Problem Solving Session- II [PSS- IIA and PSS-IIB]

Examination of 3 hours each PSS- IIA and PSS-IIB (for a batch of 20 to 30 students) at the end of the year. And External /Annual Examination [70] + Internal [30] = 100 Marks for each PSS- IIA and PSS-IIB

1. **Internal : Practical [20] + Journal [10]** **[30]**
2. **External : One paper of 70 marks in each semester. Nature is as follows:**

Problem Solving Session - II [PSS – IIA and PSS- IIB]

Attempt any 7 out of 10 (10 marks each). Ten questions contains 5 questions from each section.

Total (200 marks)

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