Semester II

Year	I	**Course Code:** 21BSC1C1MAT1L	**Credits**	04
Sem.	II	**Course Title:** Algebra - II and Calculus –II	**Hours**	56

Course Pre-requisites, if any	NA	
Formative Assessment Marks: 40	Summative Assessment Marks: 60	Duration of ESA:.02 hrs.

Course Outcomes	This course will enable the students to • Recognize the mathematical objects called Groups. • Link the fundamental concepts of groups and symmetries of geometrical objects. • Explain the significance of the notions of Cosets, normal subgroups and factor groups. • Understand the concept of differentiation and fundamental theorems in differentiation and various rules. • Find the extreme values of functions of two variables.

Unit No.	**Course Content**	**Hours**
Unit I	**Real Number System:** Recapitulation of number system. Countable and uncountable sets, standard theorems. Real line, bounded sets, suprimum and infimum of a set, completeness properties of R, Archimedean property of R. Intervals, neighborhood of a point, open sets, closed sets, limit points and Bolzano-Weierstrass theorem (Without proof).	14
Unit II	**Groups:** Definition of a group with examples and properties, congruence, problems. Subgroups, center of groups, order of an element of a group and its related theorems, cyclic groups, Coset decomposition, Factor groups, Lagrange's theorem and its consequences. Fermat's theorem, Euler's ϕ	14
Unit III	**Partial Derivatives**: Functions of two or more variables-explicit and implicit functions, partial derivatives. Homogeneous functions- Euler's theorem, total derivatives, differentiation of implicit and composite functions, Jacobians and standard properties and illustrative examples. Taylor's and Maclaurin's series for functions of two variables, Maxima-Minima of functions of two variables	14
Unit IV	**Integral Calculus**: Recapitulation of definite integrals and its properties. Line integral: Definition of line integral and basic properties, examples on evaluation of line integrals. Double integral: Definition of Double integrals and its conversion to iterated integrals. Evaluation of double integrals by changing the order of integration and change of variables. Computation of plane surface areas, volume	14

	underneath a surface of revolution using double integral. Triple integral: Definition of triple integrals and evaluation-change of variables, volume as triple integral. Differentiation under the integral sign by Leibnitz rule.	
Recommended Leaning Resources		
Print Resources	**References** 1. Topics in Algebra, I N Herstein, Wiley Eastern Ltd., New Delhi. 2. Higher algebra, Bernard & Child, Arihant, ISBN: 9350943199/ 9789350943199. 3. Modern Algebra, Sharma and Vasista, Krishna Prakashan Mandir, Meerut, U.P. 4. Differential Calculus, Shanti Narayan, S. Chand & Company, New Delhi. 5. Integral Calculus, Shanti Narayan and P K Mittal, S. Chand and Co. Pvt. Ltd., 6. Schaum's Outline Series, Frank Ayres and Elliott Mendelson, 5th ed. USA: Mc. Graw Hill., 2008. 7. Mathematical Analysis, S C Malik, Wiley Eastern. 8. A Course in Abstract Algebra, Vijay K Khanna and S K Bhambri, Vikas Publications. 9. Text Book of B.Sc. Mathematics, G K Ranganath, S Chand & Company.	

<table>
<tr><td>Year</td><td>I</td><td colspan="2">Course Code: 21BSC1C1MAT1P</td><td>Credits</td><td>02</td></tr>
<tr><td>Sem.</td><td>II</td><td colspan="2">Course Title: Practical's on Algebra - II and Calculus – II</td><td>Hours</td><td>56</td></tr>
<tr><td colspan="2">Course Pre-requisites, if any:</td><td colspan="4">Knowledge of Programming</td></tr>
<tr><td colspan="2">Formative Assessment Marks: 25</td><td colspan="2">Summative Assessment Marks: 25</td><td colspan="2">Duration of ESA: 03 hrs.</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">This course will enable the students to
• Learn Free and Open Source Software (FOSS) tools for computer programming
• Solve problem on algebra and calculus by using FOSS software's.
• Acquire knowledge of applications of algebra and calculus through FOSS Practical/Lab Work to be performed in Computer Lab
Suggested Software's: Maxima/Scilab/Maple/MatLab/Mathematica/Phython/R.</td></tr>
<tr><td></td><td colspan="5">Lab Practical's:

Part A:
1. Program for verification of binary operations.
2. Computation of identity and inverse elements of a group.
3. Program to construct Cayley's table and test abelian for given finite set.
4. Program to find all possible cosets of the given finite group.
5. Program to find generators and corresponding possible subgroups of a cyclic group.
6. Programs to verification of Lagrange's theorem with suitable examples.

Part B:
7. Program to verify the Euler's ϕ function for a given finite group.
8. Program to verify the Euler's theorem and its extension
9. Programs to construct series using Maclaurin's expansion for functions of two variables.
10. Program to evaluate the line integrals with constant and variable limits.
11. Program to evaluate the Double integrals with constant and variable limits
12. Program to evaluate the Triple integrals with constant and variable limits.</td></tr>
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Evaluation Scheme for Lab Examination

Assessment Criteria		Marks
Program – 1 from Part A	Writing Program	03
	Execution of Program	07
Program -2 from Part B	Writing Program	03
	Execution of Program	07
Viva-Voce		05
Total		**25**

OPEN-ELECTIVE SYLLABUS :

A: For students of Science stream who have not chosen Mathematics as one of Core Subjects

Year	I	**Course Code:** 21BSC1O1MAT1	**Credits**	03
Sem.	II	**Course Title:** Mathematics – II	**Hours**	42

Course Pre-requisites, if any	NA	
Formative Assessment Marks: 40	Summative Assessment Marks: 60	Duration of ESA:.02 hrs.

Course Outcomes	This course will enable the students to • Recognize the mathematical objects called Groups. • Link the fundamental concepts of groups and symmetries of geometrical objects. • Explain the significance of the notions of Cosets, normal subgroups and factor groups. • Understand the concept of differentiation and fundamental theorems in differentiation and various rules. • Find the extreme values of functions of two variables. • To understand the concepts of multiple integrals and their applications.

Unit No.	**Course Content**	**Hours**
Unit I	**Groups**: Definition of a group with examples and properties, congruence, problems. Subgroups, center of groups, order of an element of a group and its related theorems, cyclic groups, Coset decomposition, Factor groups, Lagrange's theorem and its consequences. Fermat's theorem and Euler's ϕ function.	14
Unit II	**Partial Derivatives**: Functions of two or more variables-explicit and implicit functions, partial derivatives. Homogeneous functions- Euler's theorem, total derivatives, differentiation of implicit and composite functions, Jacobians and standard properties and illustrative examples. Taylor's and Maclaurin's series for functions of two variables, Maxima-Minima of functions of two variables.	14
Unit III	**Integral Calculus**: Recapitulation of definite integrals and its properties. Line integral: Definition of line integral and basic properties, examples on evaluation of line integrals. Double integral: Definition of Double integrals and its conversion to iterated integrals. Evaluation of double integrals by changing the order of integration and change of variables. Computation of plane surface areas, volume underneath a surface of revolution using	14

	double integral. Triple integral: Definition of triple integrals and evaluation-change of variables, volume as triple integral. Differentiation under the integral sign by Leibnitz rule.	
Recommended Leaning Resources		
Print Resources	**References:** 1. Topics in Algebra, I N Herstein, 2nd Edition, Wiley Eastern Ltd., New Delhi. 2. Higher algebra, Bernard & Child, Arihant Pub. 3. Modern Algebra, Sharma and Vasishta, Krishna Prakashan Mandir, Meerut, U.P. 4. A Course in Abstract Algebra, Vijay K Khanna and S K Bhambri, Vikas Publications. 5. Differential Calculus, Shanti Narayan, S. Chand & Company, New Delhi. 6. Integral Calculus, Shanti Narayan and P K Mittal, S. Chand and Co. Pvt. Ltd., 7. Schaum's Outline Series, Frank Ayres and Elliott Mendelson, 5th ed. USA: McGraw Hill., 2008. 8. Mathematical Analysis, S C Malik, Wiley Eastern. 9. Text Book of B.Sc. Mathematics, G K Ranganath, S Chand & Company.	

B: For Students of other than Science Stream

Year	I	**Course Code:** 21BSC1O1MAT1	**Credits**	03
Sem.	II	**Course Title:** Business Mathematics – II	**Hours**	42
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 40		Summative Assessment Marks: 60	Duration of ESA:.02 hrs.	
Course Outcomes	This course will enable the students to • Integrate concept in international business concept with functioning of global trade. • Evaluate the legal, social and economic environment of business. • Apply decision-support tools to business decision making. • Will be able to apply knowledge of business concepts and functions in an integrated manner.			
Unit No.	**Course Content**		**Hours**	
Unit I	**Commercial Arithmetic**: Interest: Concept of Present value and Future value, Simple interest, Compound interest, Nominal and Effective rate of interest, Examples and Problems Annuity: Ordinary Annuity, Sinking Fund, Annuity due, Present Value and Future Value of Annuity, Equated Monthly Instalments (EMI) by Interest of Reducing Balance and Flat Interest methods, Examples and Problems.		14	
Unit II	**Measures of central Tendency and Dispersion**: Frequency distribution: Raw data, attributes and variables, Classification of data, frequency distribution, cumulative frequency distribution, Histogram and give curves. Requisites of ideal measures of central tendency, Arithmetic Mean, Median and Mode for ungrouped and grouped data. Combined mean, Merits and demerits of measures of central tendency, Geometric mean: definition, merits and demerits, Harmonic mean: definition, merits and demerits, Choice of A.M., G.M. and H.M. Concept of dispersion, Measures of dispersion: Range, Variance, Standard deviation (SD) for grouped and ungrouped data, combined SD, Measures of relative dispersion: Coefficient of range, coefficient of variation. Examples and problems.		14	
Unit III	**Correlation and regression**: Concept and types of correlation, Scatter diagram,		14	

	Interpretation with respect to magnitude and direction of relationship. Karl Pearson'scoefficient of correlation for ungrouped data. Spearman's rank correlation coefficient. (with tie and without tie) Concept of regression, Lines of regression for ungrouped data, predictions using lines of regression. Regression coefficients and their properties (without proof). Examples and problems.	
Recommended Leaning Resources		
Print Resources	**References:** 1. Practical Business Mathematics, S. A. Bari New Literature Publishing Company New Delhi. 2. Mathematics for Commerce, K. Selvakumar Notion Press Chennai 3. Business Mathematics with Applications, Dinesh Khattar & S. R. Arora S. Chand Publishing New Delhi 4. Business Mathematics and Statistics, N.G. Das &Dr. J.K. Das McGraw Hill New Delhi 5. Fundamentals of Business Mathematics, M. K. Bhowal, Asian Books Pvt. Ltd New Delhi 6. Mathematics for Economics and Finance: Methods and Modelling, Martin Anthony and Norman, Biggs Cambridge University Press Cambridge 7. Financial Mathematics and its Applications, Ahmad Nazri Wahidudin Ventus Publishing APS Denmark 8. Fundamentals of Mathematical Statistics, Gupta S. C. and Kapoor V. K.:, Sultan Chand and Sons, New Delhi. 9. Statistical Methods, Gupta S. P.: Sultan Chand and Sons, New Delhi. 10. Applied Statistics, Mukhopadhya Parimal New Central Book Agency Pvt. Ltd. Calcutta. 11. Fundamentals of Statistics, Goon A. M., Gupta, M. K. and Dasgupta, B. World Press Calcutta. 12. Fundamentals of Applied Statistics, Gupta S. C. and Kapoor V. K.:, Sultan Chand and Sons, New Delhi.	