

# JAI HIND COLLEGE

Basantsing Institute of Science & J. T. Lalvani College of Commerce  
and Sheila Gopal Raheja College of Management.

*Empowered Autonomous*

"A" Road, Churchgate, Mumbai - 400 020, India

**Affiliated to  
University of Mumbai**

**Bachelor of Science**

**Program: B.Sc. in Mathematics**

**Choice Based Credit System (CBCS) under NEP-2020  
with effect from the academic year 2023-2024**

LOCF Document

**PRINCIPAL**  
JAI HIND COLLEGE  
CHURCHGATE, MUMBAI-400 020.



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## Preamble

The study of Mathematics is indispensable as it develops the ability to think deductively, analyze mathematical situations, and extend ideas to new concepts. Mathematics has become a valuable tool in many areas, such as, Economics, Computer Science, Data Analytics, Engineering, Physical Sciences.

Mathematics is a vast subject with immense diversity. Hence it is difficult for every student to learn each branch of Mathematics. Keeping this in mind the syllabi has been framed in such a way that it may help the learners to understand the main objectives of studying the course and to equip and empower them to get jobs in education, technological and engineering fields as well as in Business and Healthcare sectors.

## Credit Framework

### Types of Courses

Sr. No.	Type of Course	Learner category
1.	Major	Mathematics Major
2.	Minor	Mathematics Minor
3.	OE	Arts/Commerce Stream
4.	VSC	Mathematics Major
5.	SEC	Mathematics Major - Science Stream Non-Major - Commerce Stream

### Number of Courses and credits

Types of Courses	Number offered of each	Credits of each
Major	2	4
Minor	2	4
OE	2	2
VSC	2	2
SEC	6	2





### Semester wise Courses

Semester	Course Code	Course Title	Type of Course	No. of credits
I	JUSMAT-DSC101/ JUSMAT-MIN 101	Calculus I	Major/Minor	3
I	JUSMAT-DSCPR 101/ JUSMAT-MINPR101	Calculus Practical I	Major/Minor	1
II	JUSMAT-DSC201/ JUSMAT-MIN 201	Calculus II	Major/Minor	3
II	JUSMAT-DSCPR201/ JUSMAT-MINPR201	Calculus Practical II	Major/Minor	1
I	JUSMAT-SEC101/	Foundation in Mathematics I	SEC	2
II	JUSMAT-SEC201	Foundation in Mathematics I	SEC	2
I	JUCMAT-SEC101	Business Mathematics I	SEC	2
II	JUCMAT-SEC201	Business Mathematics II	SEC	2
I	JUCMAT-SEC102	Business Statistics I	SEC	2
II	JUCMAT-SEC102	Business Statistics II	SEC	2
I	JUSMAT-OE101	Functional Mathematics	OE	2
II	JUSMAT-OE201	Functional Mathematics	OE	2
I	JUSMAT-OE102/	Statistical Techniques	OE	2
II	JUSMAT-OE202	Statistical Techniques	OE	2
I	JUSMAT-VSC101/	Python Programming I	VSC	2
II	JUSMAT-VSC201	Python Programming I	VSC	2



## **Learning outcome-based approach**

Mathematics is the study of quantity, structure, patterns, space, and change. The aim of the syllabus is

- To cover key areas such as Calculus, Algebra, Analysis, Differential Equations
- To familiarize students with suitable tools to handle issues and problems in Mathematics and related areas.
- To develop a range of skills enabling them to undertake further studies in Mathematics and its allied areas.

## **Graduate Attributes in Mathematics**

- Ability to communicate various concepts of Mathematics effectively using examples and their geometric visualization.
- Capability to solve problems in various areas using the knowledge acquired during the course.
- To enquire about the advances in various branches of Mathematics.
- To inculcate the habit of self-learning, critical thinking, and logical reasoning.
- Ability to identify unethical behavior such as fabrication and falsification of data and adopting unbiased and truthful actions in all aspects.

## **Programme objective**

- The programme helps the students in building a sound foundation for higher studies in Mathematics.
- The skills and the knowledge gained can be utilized in modelling and solving real life problems.
- It will also help students to enhance their ability for government jobs, jobs in banking, insurance, and investment sectors, jobs as data analyst, jobs in various public and private sectors.

## **Teaching learning process**

- Introduction of new topics by giving learning objective.
- Concept building by discussion on the theory and problem solving
- Concept strengthening with mock class tests.
- Laying foundation and giving motivation for any new concept to be introduced
- Encouraging students to ask questions and to think.



- Devoting time for discussions and short thinking exercises to maintain the interest for the subject.

### Assessment method

- Class tests
- Problem solving exercises
- Open book tests
- Group Discussion
- Assignments

Course	Theory Marks	Practical Marks	Total Marks
Major/Minor	75(50 SEE+25 CA)	25	100
VSC	-	50(25 SEE+25 CA)	50
SEC	-	50(25 SEE+25 CA)	50
OE	50(25 SEE+25 CA)	-	50





## Discipline Specific Core Courses-Major/Minor

<b>Course Code:</b> JUSM AT-DSC101/ JUSMAT- MIN 101	<b>Course Title:</b> CALCULUS I	<b>Credits: 3</b> <b>Lectures/Week:</b> 3
<b>Course Description</b>	<ol style="list-style-type: none"> <li>1. The primary objective of this course is to introduce real numbers and subsets of reals such as set of rational numbers, set of irrational numbers, study properties of real numbers such as Density of rational numbers and irrational number, Hausdorff property, Fundamental theorems in real analysis like Archimedean property, Bolzano-Weierstrass theorem with applications will be introduced.</li> <li>2. To study sequence of real numbers and the notion of convergent sequences, Cauchy sequences and their important applications.</li> </ol>	
<b>Learning objectives</b>	<ol style="list-style-type: none"> <li>1. To learn lub axiom of <math>R</math> and its consequences</li> <li>2. To understand convergence of sequences in <math>R</math></li> </ol>	
<b>Course Outcomes</b>	<ol style="list-style-type: none"> <li>1. Apply lub axiom to obtain interesting results like Archimedean Principle, Density Theorem.</li> <li>2. Analyze convergent and Cauchy sequences.</li> </ol>	
	<b>THEORY</b>	<b>45 Lectures</b>
<b>Unit-I</b>	<b>Real Number System</b>	<b>15 lectures</b>
1.	Real number system $R$ and order properties of $R$ , Elementary consequences of these properties including AM-GM inequality. Absolute value function (modulus) on $R$ , Examples and basic properties.	
2.	Triangle inequality, Intervals and neighborhoods. Bounded sets of real numbers, Supremum (l.u.b) and Infimum (g.l.b), l.u.b and g.l.b property and its applications.	
3.	Archimedean property and its applications like Density theorem, nested interval theorem, existence of square root of 2.	
<b>Unit – II</b>	<b>Sequences in <math>R</math></b>	<b>15 lectures</b>
1.	Definition of a sequence and examples, Convergence and divergence of sequences, Convergent sequence is bounded,	



	Uniqueness of limit if it exists. Examples on convergence of a sequence using $\epsilon$ - $n_0$ definition. Sandwich theorem, Algebra of convergent sequences, Examples.	
2.	Bounded sequences, Monotone sequences and their convergence. Standard examples such as $a^n, \frac{a^n}{n!}, \left(1 + \frac{1}{n}\right)^n, 1 + \frac{1}{1!} + \frac{1}{2!} + \dots + \frac{1}{n!}, a^{\frac{1}{n}} (a > 0), n^{\frac{1}{n}}$ .	
3.	Cauchy sequences and their convergence, subsequences and their convergence, Bolzano-Weierstrass theorem.	
<b>Unit – III</b>	<b>Series in Real Numbers</b>	<b>15 lectures</b>
1.	Introduction to infinite series and Geometric series, Harmonic $p$ -series, alternating series.	
2.	Test of Convergence: $n$ th term test, Comparison test, Root test, Ratio test, Cauchy's condensation test.	
3.	Test for Conditional convergence, Partial summation formula, Leibnitz's test, Integral test.	
	<b>Evaluation Scheme</b> <b>Theory (75 Marks)</b> <b>Internal Assessment:(25 Marks)</b> CA I: MCQ (10 marks) CA II: Written assignment (10 marks) Attendance and Class Participation: (5 marks) <b>SEE:(50 Marks)</b> Q1. Unit I: 2 out of 4(10 marks) Q2. Unit II: 2 out of 4 (10 marks) Q3. Unit III: 2 out of 4 (10 marks) Q4. Mixed: 4 out of 6 (20 marks)	
<b>References:</b>	1. R.G. Bartle and D.R. Sherbert, Introduction to real analysis, John Wiley and Sons, third edition, 2010 2. Ajit Kumar and S. Kumaresan, A basic course in real analysis, CRC press 2014. 3. K.G. Binmore, Mathematical Analysis, Cambridge university press, 1984.	





<b>Course Code:</b> JUSMAT-DSC PR101/ JUSMAT- MIN PR 101	<b>Course Title:</b> CALCULUS I Practical	<b>Credits:</b> 1
<b>Unit I</b>	Practical based on Real numbers system.	
<b>Unit II</b>	Practical based on Sequences of Real numbers.	
<b>Unit III</b>	Practical based on Series of Real numbers.	
	<b>Evaluation Scheme</b> <b>Practical (25 Marks)( (Internal+SEE)/2)</b> <b>Internal(Practical):(25 marks)</b> CA-Open/Close Book Tests(20 marks) VIVA(5 marks) <b>SEE (Practical):(25 marks)</b> Attempt any <b>Five</b> Questions Q1. Unit I (5 marks) Q2. Unit I (5 marks) Q3. Unit II (5 marks) Q4. Unit II (5 marks) Q5. Unit III (5 marks) Q6. Unit III (5 marks)	

**% Application of Bloom's Taxonomy in Evaluation Scheme**

UNIT	KNOWLEDGE	UNDERSTANDING	APPLICATION	TOTAL MARKS
I	06	06	06	18
II	05	05	06	16
III	05	05	06	16
<b>TOTAL MARKS PER OBJECTIVE</b>	<b>16</b>	<b>16</b>	<b>18</b>	<b>50</b>
<b>% WEIGHTAGE</b>	<b>32</b>	<b>32</b>	<b>36</b>	<b>100</b>



<b>Course Code:</b> JUSM AT-DSC201/ JUSMAT-MIN 201	<b>Course Title:</b> CALCULUS II	<b>Credits: 3</b> <b>Lectures/Week:</b> 3
<b>Course Description</b>	<ol style="list-style-type: none"> <li>1. The primary objective of this course is to introduce functions of one variable including a study of limits, continuity, derivatives of different classes of functions.</li> <li>2. To study maxima and minima and optimization problems.</li> </ol>	
<b>Learning objectives</b>	<ol style="list-style-type: none"> <li>1. To discuss continuity concept precisely and develop some fundamental properties of continuous functions.</li> <li>2. To understand the meaning of derivatives in terms of a rate of change and use this concept to solve variety of problems.</li> </ol>	
<b>Course Outcomes</b>	<ol style="list-style-type: none"> <li>1. Determine continuity at a point or intervals and distinguish between the types of discontinuities.</li> <li>2. Determine extrema for a continuous function and use this to solve optimization problems.</li> </ol>	
	<b>THEORY</b>	<b>45 Lectures</b>
<b>Unit I</b>	<b>Limits and continuity</b>	<b>15L</b>
<b>1</b>	$\epsilon - \delta$ definition of limit of a (realvalued) function, Right hand and Left hand limits, Uniqueness of limit when it exists, Algebra of limit of a function, Sandwich theorem, Sequential continuity.	
<b>2</b>	Examples of discontinuous functions and continuity of constant function, identity function, trigonometric functions, polynomial functions etc.	
<b>3</b>	Intermediate value theorem and its applications, A continuous function on a closed and bounded interval is bounded and attains its bounds and its consequences.	



<b>Unit II</b>	<b>Differentiation</b>	<b>15L</b>
<b>1</b>	Differentiation of real-valued function, examples of differentiable and non-differentiable functions, differentiability implies continuity, Algebra of differentiable functions	
<b>2</b>	Chain-Rule, Higher order derivatives, Leibnitzrule, L'Hospital's rule	
<b>3</b>	Rolle's theorem, Lagrange's and Cauchy's mean value theorem, their applications, and examples.	
<b>Unit III</b>	<b>Applications of Differentiation</b>	<b>15L</b>
<b>1</b>	Taylor's theorem and its applications.	
<b>2</b>	Definition of local maximum and local minimum, necessary condition, stationary points, first and second derivative test, examples	
	<b>Evaluation Scheme</b> <b>Theory (75 Marks)</b> <b>Internal Assessment:(25 Marks)</b> CA I: MCQ (10 marks) CA II: Written assignment (10 marks) Attendance and Class Participation: (5 marks) <b>SEE:(50 Marks)</b> Q1. Unit I: 2 out of 4(10 marks) Q2. Unit II: 2 out of 4 (10 marks) Q3. Unit III: 2 out of 4 (10 marks) Q4. Mixed: 4 out of 6 (20 marks)	
<b>References:</b>	1. R.G. Bartle and D.R. Sherbert, Introduction to real analysis, John Wiley and Sons, third edition, 2010 2. Ajit Kumar and S. Kumaresan, A basic course in real analysis, CRC press 2014. 3. K.G. Binmore, Mathematical Analysis, Cambridge university press, 1984.	





<b>Course Code:</b> JUSMAT-DSC PR 201/ JUSMAT- MIN PR201	<b>Course Title:</b> CALCULUS II Practical	<b>Credits:</b> 1
<b>Unit I</b>	Practical based on Limits and continuity.	
<b>Unit II</b>	Practical based on Differentiation.	
<b>Unit III</b>	Practical based on Applications of Differentiation	
	<b>Evaluation Scheme</b> Practical (25 Marks) (Internal+SEE)/2 Internal(Practical):(25 marks) CA-Open/Close Book Tests(20 marks) VIVA(5 marks) SEE (Practical):(25 marks)	

**% Application of Bloom's Taxonomy in Evaluation Scheme**

UNIT	KNOWLEDGE	UNDERSTANDING	APPLICATION	TOTAL MARKS
I	06	06	06	18
II	05	05	06	16
III	05	05	06	16
<b>TOTAL MARKS PER OBJECTIVE</b>	<b>16</b>	<b>16</b>	<b>18</b>	<b>50</b>
<b>% WEIGHTAGE</b>	<b>32</b>	<b>32</b>	<b>36</b>	<b>100</b>



## Skill Enhancement Elective Courses

<b>Course Code:</b> JUSMAT- SEC101/JUSM AT-SEC201	<b>Course Title:</b> Foundation in Mathematics I	<b>Credits:</b> 2
<b>Course Description</b>	<ol style="list-style-type: none"> <li>1. The primary objective of this course is to think, read and write abstractly and mathematically.</li> <li>2. How to prove Mathematical statements using variety of methods.</li> </ol>	
<b>Learning objectives</b>	<ol style="list-style-type: none"> <li>1. To learn the fundamental set theory, foundation in functions.</li> <li>2. To understand the Fundamental theorem of Arithmetic, modular arithmetic, and learn how to find GCD and LCM.</li> </ol>	
<b>Course Outcomes</b>	<ol style="list-style-type: none"> <li>1. Identify the functions which are injective, surjective, or bijective.</li> <li>2. Apply the modular arithmetic to solve problems.</li> <li>3. Use Fundamental theorem of Arithmetic to find GCD and LCM.</li> </ol>	
	<b>Practical</b>	
<b>Unit-I</b>	<b>Sets and Functions</b>	
1.	Negation of a statement, use of quantifiers, sets, union and intersection of sets, complement of a set, De Morgan's law, Cartesian product of sets.	
2.	Definition of a function; domain, co-domain and range of a function, composite functions, examples, Graph of a function, Injective, surjective, bijective functions; composite of injective, surjective, bijective functions when defined.	
3.	Invertible functions, bijective functions are invertible and conversely. Examples of functions including constant, identity, relation, equivalence relation.	
<b>Unit-II</b>	<b>Integers and divisibility</b>	
1.	Well-ordering property, First and second principle of mathematical induction as a consequence of well-ordering property.	
2.	Divisibility in integers, division algorithm, existence and uniqueness of greatest common divisor (gcd) and least common multiple (lcm) and their basic properties.	



3.	Euclidean algorithm, Primes, Euclid's lemma, Fundamental theorem of arithmetic.	
<b>Unit-III</b>	<b>Theory of congruence</b>	
1.	Congruences, definition and elementary properties, Congruence is an equivalence relation on $Z$ , residue classes and partition of $Z$ , addition modulo $n$ , multiplication modulo $n$ , examples	
2.	Linear congruences..	
3.	Euler's $\phi$ function, Euler's theorem, Fermat's little theorem, Wilson's theorem, and their applications.	
	<b>Evaluation Scheme</b> <b>Internal Assessment:(25 marks)</b> CA I: MCQ (10 marks) CA II: Written assignment (10 marks) OR Project/ Case Study / Presentation (20 marks) VIVA (5 marks) <b>SEE (Practical):(25 marks)</b>	
<b>References:</b>	1. David M. Burton, Elementary number theory, seventh edition, Tata McGraw-Hill edition, 2011. 2. S. Kumaresan, Ajit Kumar and Bhaba Kumar Sarma, A foundation course in Mathematics, first edition, Narosa publication house, 2018 3. Thomas Koshy, Elementary number theory with applications, Academic press, 2007.	





### % Application of Bloom's Taxonomy in Evaluation Scheme

UNIT	KNOWLEDGE	UNDERSTANDING	APPLICATION	TOTAL MARKS
I	06	06	06	18
II	05	05	06	16
III	05	05	06	16
<b>TOTAL MARKS PER OBJECTIVE</b>	<b>16</b>	<b>16</b>	<b>18</b>	<b>50</b>
<b>% WEIGHTAGE</b>	<b>32</b>	<b>32</b>	<b>36</b>	<b>100</b>



<b>Course Code:</b> JUCMAT-- SEC101	<b>Course Title:</b> Business Mathematics I	<b>Credits:</b> 2
<b>Course Description</b>	<ol style="list-style-type: none"> <li>1. It will equip with basic knowledge of Share distribution of various companies and understand the mathematics required to evaluate a company for investment.</li> <li>2. Give basic knowledge on optimization techniques required for maximizing profit and minimizing cost.</li> </ol>	
<b>Learning objectives</b>	<ol style="list-style-type: none"> <li>1. To learn mathematical formulas involved in finding ratios like return, dividend on investments.</li> </ol>	
<b>Course Outcomes</b>	<ol style="list-style-type: none"> <li>1. Students will be able to identify the best company for investment.</li> <li>2. Students will learn mathematical computations of various investment schemes.</li> </ol>	
	<b>Practical</b>	<b>Credit = 2</b>
<b>Unit-I</b>	<b>Shares</b>	
1.	Introduction to Shares, preference shares, face value, dividend on investment.	
2.	Market value, brokerage, return on investment, part investment.	
3.	Splitting of shares, bonus shares.	
<b>Unit-II</b>	<b>Mutual Funds</b>	
1.	N.A.V., Entry Load, Exit Load	
2.	Dividend, Ex-Dividend N.A.V.	
3.	Rate of return, Systematic Investment Plan.	
<b>Unit-III</b>	<b>Linear Programming Problem</b>	
1.	Minimization Problem	
2.	Maximization Problem	
3.	Formulation of L.P.P	

	<b>Evaluation Scheme</b> <b>Practical (50 marks)</b> <b>Internal Assessment:(25 marks)</b> CA I: MCQ (10 marks) CA II: Written assignment (10 marks) OR Project/ Case Study / Presentation (20 marks) VIVA (5 marks) <b>SEE (Practical):(25 marks)</b>	
<b>References:</b>	<ol style="list-style-type: none"> <li>1. Anthony, M. &amp; Biggs, N. Mathematics for Economics and Finance Methods and Modelling, Cambridge University Press 2000 Edition.</li> <li>2. Sancheti, D. C., &amp; Kapoor, V. K. Business Mathematics, S. Chand &amp; Sons Publications, 2020 Edition.</li> <li>3. Shankaram, S. Handbook on Indian Mutual Funds, Vision Books, 2020 Edition.</li> <li>4. Gupta, G. &amp; Kapoor, V. K. Operation Research, S. Chand &amp; Sons 2020 Edition.</li> </ol>	

### % Application of Bloom's Taxonomy in Evaluation Scheme

UNIT	KNOWLEDGE	UNDERSTANDING	APPLICATION	TOTAL MARKS
I	06	06	06	18
II	05	05	06	16
III	05	05	06	16
<b>TOTAL MARKS PER OBJECTIVE</b>	<b>16</b>	<b>16</b>	<b>18</b>	<b>50</b>
<b>% WEIGHTAGE</b>	<b>32</b>	<b>32</b>	<b>36</b>	<b>100</b>





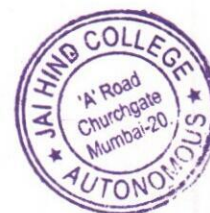
<b>Course Code:</b> JUCMAT- SEC102	<b>Course Title:</b> Business Statistics I	<b>Credits:</b> 2
<b>Course Description</b>	<p>Reflecting the broad nature of the subject and developing statistical tools for continuing further study in various fields of science.</p> <p>Enhancing student's overall development and to equip them with problem solving skills, creative talent and power of communication necessary for various kinds of employment.</p> <p>To introduce statistics to undergraduate students of commerce, so that they can use them in the field of commerce and industry to solve real life problems.</p>	
<b>Learning objectives</b>	1.The objective is to make the student understand the data, find the central tendencies, dispersion of data and data visualization.	
<b>Course Outcomes</b>	<p>1.Student's Knowledge skills and concept will get enhanced and they will get confidence and interest in Statistics.</p> <p>2.They will be able to analyze the data, find the central tendencies and measure the dispersion of data.</p> <p>3.They will be able to represent the data graphically.</p>	
		<b>Credits =2</b>
<b>Unit-I</b>	<b>Measure of central tendencies of data</b>	
1.	Definition of Average, Arithmetic Mean, Median, and Mode for grouped as well as ungrouped data. Using	
2.	Quartiles, Deciles and Percentiles. Using Ogive to locate median and Quartiles.	
3.	Histogram locate mode. Combined and Weighted mean.	
<b>Unit-II</b>	<b>Measure of dispersion of data and graphical representation of data</b>	
1.	<p>Concept and idea of dispersion.</p> <p>Various measures Range, Quartile Deviation, Mean Deviation, Standard Deviation.</p>	



2.	Variance, Combined Variance.	
3.	Graphical representation of data : ogive, histogram, pie diagram, stem and leaf representation of data	
	<b>Evaluation Scheme</b> <b>Practical (50 marks)</b> <b>Internal Assessment:(25 marks)</b> CA I: MCQ (10 marks) CA II: Written assignment (10 marks) VIVA: (5 marks) <b>SEE (Practical):(25 marks)</b>	
<b>References:</b>	Fundamentals of Statistics - D. N. Elhance. Statistical Methods - S.G. Gupta (S. Chand & Co. Statistics for Management - Lovin R. Rubin D.S. (Prentice Hall of India) Statistics - Theory, Method & Applications D.S.Sancheti & V. K. Kapoor. Business Mathematics & Statistics : B Aggarwal, Ane Book Pvt. Limited	

#### Bloom's Taxonomy in Evaluation Scheme

UNIT	KNOWLEDGE	UNDERSTANDING	APPLICATION	TOTAL MARKS
I	08	08	09	25
II	08	08	09	25
<b>TOTAL MARKS PER OBJECTIVE</b>	<b>16</b>	<b>16</b>	<b>18</b>	<b>50</b>
<b>% WEIGHTAGE</b>	<b>32</b>	<b>32</b>	<b>36</b>	<b>100</b>





JUCMAT-SEC201	<b>Course Title:</b> Business Mathematics II	<b>Credits:</b> 2
<b>Course objective</b>	<p>3. To equip the students with the concept of the rate of change of the dependent variable with respect to a change in the independent variable</p> <p>4. To give basic knowledge on optimization techniques required for maximizing profit and minimizing cost.</p>	
<b>Course Outcomes</b>	<p>3. Students will be able to describe the cost function, revenue function, elasticity of demand.</p> <p>4. Students will be able to explain the mathematical computations of various investment schemes.</p>	
<b>Course description</b>	The course deals with mathematical formulas involved in finding derivatives. It details the relationship between simple and compound interest.	
<b>Unit I</b>	<p><b>Derivatives and Their Applications</b></p> <p>1.<b>Derivative of functions:</b> Derivative as rate measure, Derivative of <math>x^n, e^x, \log x</math>.</p> <p>2.<b>Rules of derivatives:</b> Scalar multiplication, sum, difference, product, quotient (Statements only), Simple problems. Second order derivatives and Applications: Marginal Cost, Marginal Revenue, Elasticity of Demand. Maxima and Minima for functions in Economics and Commerce.</p>	
<b>Unit II</b>	<p><b>Interest and Annuity</b></p> <p>1.<b>Interest:</b> Simple Interest, Compound Interest (Nominal &amp; Effective Rate of Interest), Calculations involving up to 4 time periods.</p> <p>2.<b>Annuity:</b> Annuity Immediate and its Present value, Future value. Equated Monthly Installments (EMI) using reducing balance method &amp; amortization of loans.</p>	
	<p><b>Evaluation Scheme</b></p> <p><b>Practical (50 marks)</b></p> <p><b>a) Internal Assessment:(25 marks)</b></p> <p>CA I: MCQ (10 marks)</p> <p>CA II: Written assignment (10 marks)</p> <p>OR</p> <p>Project/ Case Study / Presentation (20 marks)</p> <p>VIVA: (5 marks)</p> <p><b>b) SEE (Practical):(25 marks)</b></p>	





<b>References:</b>	<p>5. Anthony, M. &amp; Biggs, N. Mathematics for Economics and Finance Methods and Modelling, Cambridge University Press 2000 Edition.</p> <p>6. Sancheti, D. C., &amp; Kapoor, V. K. Business Mathematics, S. Chand &amp; Sons Publications, 2020 Edition.</p> <p>7. Shankaram, S. Handbook on Indian Mutual Funds, Vision Books, 2020 Edition.</p> <p>8. Gupta, G. &amp; Kapoor, V. K. Operation Research, S. Chand &amp; Sons 2020 Edition.</p>
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### Bloom's Taxonomy in Evaluation Scheme

UNIT	KNOWLEDGE	UNDERSTANDING	APPLICATION	TOTAL MARKS
I	08	08	09	25
II	08	08	09	25
<b>TOTAL MARKS PER OBJECTIVE</b>	16	16	18	50
<b>% WEIGHTAGE</b>	32	32	36	100



## Vocational Skill Enhancement Courses

<b>Course Code:</b> JUSMAT- VSC101/JU SMAT- VSC201	<b>Course Title:</b> Python Programming I	<b>Credits:</b> 2
<b>Course description</b>	Introduction of python programming language.	
<b>Learning objectives</b>	The objective is to introduce various data types in python and impart the use of loops and controls in python to the students.	
<b>Course Outcomes</b>	After taking the course, students will be able to: Develop Python Programs on their own, Apply problem solving skills and implement any real world problems. Write functions and use python in an efficient way.	
	<b>Practical</b>	<b>Credit =2</b>
<b>Unit-I</b>	<b>Introduction to Python</b>	
1.	Reasons for Python as the first programming language. Introduction to the IDLE interpreter (shell) and its documentation.	
2.	Building Blocks of Program: Data, Data Types, Data Binding, Variables, Constants, Declaration, Operations on Data such as assignment, arithmetic, relational, logical operations, dry run, and variables used.	
3.	Develop Code using Python: Features, basic syntax, Writing and executing simple program, Basic Data Types such as numbers, strings, list, tuples, set, dictionary etc Declaring variables, Performing assignments, arithmetic operations, Simple input-output.	
<b>Unit-II</b>	<b>Loops and controls</b>	
1.	Sequence Control: Precedence of operators, Type conversion	
2.	Conditional Statements: if, if-else, nested if –else	
3.	Looping: for, while, nested loops, Control statements: Terminating loops, skipping specific conditions	



	<b>Evaluation Scheme</b> <b>Practical (50 marks)</b> <b>Internal Assessment:(25 marks)</b> CA I: MCQ (10 marks) CA II: performing simple code (10 marks) VIVA : (5 marks) <b>SEE (Practical):(25 marks)</b>	
<b>References:</b>	1. Beginning Python: From Novice to Professional, Magnus Lie Hetland, Apress, 2nd edition. 2. Paul Gries, et al. Practical Programming (2014) :An Introduction to Computer Science Using Python, 2nd Edition , Pragmatic Bookshelf. 3. Kenneth A Lambert (2018) : Fundamentals of Python First programs , Second Edition, Cengage Learning. 4. Beginning Python(2008): From Novice to Professional, Magnus Lie Hetland, Second Edition, Apress.	

### % Application of Bloom's Taxonomy in Evaluation Scheme

UNIT	KNOWLEDGE	UNDERSTANDING	APPLICATION	TOTAL MARKS
I	08	08	09	25
II	08	08	09	25
<b>TOTAL MARKS PER OBJECTIVE</b>	16	16	18	50
<b>% WEIGHTAGE</b>	32	32	36	100





## Open Elective Courses

<b>Course Code:</b> JUSMAT- OE 101/JUSMA T-OE 201/	<b>Course Title:</b> Functional Mathematics	<b>Credits:</b> 2
<b>Course Description</b>	<ol style="list-style-type: none"> <li>1. It will empower the students with mathematical tricks and shortcuts used in almost every competitive exam.</li> <li>2. Develop interest in learning math amongst students with and without prior math knowledge.</li> <li>3. Boost confidence and remove math fear amongst students.</li> </ol>	
<b>Learning objectives</b>	1. Learn mathematical techniques and tricks required for solving application based problems.	
<b>Course Outcomes</b>	1. Students will be able to solve aptitude questions (mathematical) in various competitive exams	
	<b>THEORY</b>	<b>(30) lectures</b>
<b>Unit-I</b>	<b>Fun with Sets</b>	<b>10 lectures</b>
1.	Intuition of a set, types of set, operation on sets.	04
2.	Developing a set under given mathematical conditions	03
3.	Application of set theory in real world problems	03
<b>Unit-II</b>	<b>Linear and Quadratic Equations</b>	<b>10 lectures</b>
1.	Tricks in solving systems of equations. Turning a given situation in systems of equations	03
2.	Finding roots of Quadratic equations, relation of roots with coefficient of equations	04
3.	Solving case studies involving linear and quadratic equations	03



<b>Unit-III</b>	<b>Time, distance, and speed.</b>	<b>10 lectures</b>
1.	Calculating time or speed or distance if given any two of these.	04
2.	Problems of Trains traveling in same and opposite directions	03
3.	Problems with relative speed.	03
	<b>Evaluation Scheme</b> <b>Total (50 marks)</b> <b>Internal Assessment:(25 marks)</b> CA I: MCQ (10 marks) CA II: Written assignment (10 marks) VIVA (5 marks) <b>SEE (Theory):(25 marks)</b>	
<b>References:</b>	1. Warner, S. Set Theory for Pre-Beginners: An Elementary Introduction to Sets, Relations, Partitions, Functions, Equinumerosity, Logic, Axiomatic Set Theory, Ordinals, and Cardinals Paperback, 2019 Edition. 2. Lipschutz, S. Set theory and related topics, Schaum Outline, 3rd Edition. 3. Neeraja, A. V. & Pragadeeswara, P.C. N., AptitudeB2A Basics to Advanced - Time Speed & Distance : For UPSC, SSC, IBPS, SBI exam, Railways, GATE, GMAT, GRE, MAT, XAT, Campus Placements, etc. 2019 Edition. 4. McMullen, C., Algebra Essentials Practice Workbook with Answers. 2020 Edition.	

### % Application of Bloom's Taxonomy in Evaluation Scheme

UNIT	KNOWLEDGE	UNDERSTANDING	APPLICATION	TOTAL MARKS
I	06	06	06	18
II	05	05	06	16
III	05	05	06	16
<b>TOTAL MARKS PER OBJECTIVE</b>	<b>16</b>	<b>16</b>	<b>18</b>	<b>50</b>
<b>% WEIGHTAGE</b>	<b>32</b>	<b>32</b>	<b>36</b>	<b>100</b>



<b>Course Code:</b> JUSMAT- OE102/JUS MAT-OE 202/	<b>Course Title:</b> Statistical Techniques	<b>Credits:</b> 2
<b>Course description</b>	Reflecting the broad nature of the subject and developing statistical techniques for continuing further study in various fields of science. Enhancing student's overall development and to equip them with problem solving skills. To introduce statistical techniques to undergraduate students of commerce and arts.	
<b>Learning objectives</b>	The objective is to make the student understand permutation, combination, and probability theory.	
<b>Course Outcomes</b>	The student will be able to understand permutation and combination well. The student will be able to solve problems on probability.	
	<b>THEORY</b>	
<b>Unit-I</b>	<b>Permutation, Combination and Introduction to Probability Theory</b>	
1.	Factorial Notation, Permutation as arrangements, Simple examples.	
2.	Combination as selection, simple examples.	
3.	Concept of random experiment and possible outcomes, sample space, events and their types, classical definition of probability.	
<b>Unit-II</b>	<b>Elementary Probability Theory</b>	
1.	Addition theorem, multiplication theorem in probability, simple examples.	
2.	Conditional probability, independence of events, examples, Probability distribution, Expectation and variance of random variable.	
3.	Binomial and Poisson distribution.	
	<b>Evaluation Scheme</b>	





	<b>Total (50 marks)</b> <b>Internal Assessment:(25 marks)</b> CA I: MCQ (10 marks) CA II: Written test (10 marks) VIVA (5 marks) <b>SEE :(25 marks)</b>	
<b>References:</b>	Fundamentals of Statistics - D. N. Elhance. Statistical Methods - S.G. Gupta (S. Chand & Co. Statistics for Management - Lovin R. Rubin D.S. (Prentice Hall of India) Statistics - Theory, Method & Applications D.S.Sancheti & V. K. Kapoor.	

### % Application of Bloom's Taxonomy in Evaluation Scheme

UNIT	KNOWLEDGE	UNDERSTANDING	APPLICATION	TOTAL MARKS
I	08	08	09	25
II	08	08	09	25
<b>TOTAL MARKS PER OBJECTIVE</b>	<b>16</b>	<b>16</b>	<b>18</b>	<b>50</b>
<b>% WEIGHTAGE</b>	<b>32</b>	<b>32</b>	<b>36</b>	<b>100</b>



  
**PRINCIPAL**  
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