UNIVERSITY OF JAMMU

(NAAC ACCREDITED 'A ++' GRADE' UNIVERSITY)
Baba Sahib Ambedkar Road, Jammu-180006 (J&K)

Academic Section
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NOTIFICATION

(26/Jan./Adp/139)

It is hereby notified for the information of all concerned that the Vice-Chancellor, in anticipation of the approval of the Competent Bodies, is pleased to authorize the adoption of Syllabi and Courses of Studies of **Five Year Integrated Master Degree Programme in Mathematical Science** of **Semester I** as per NEP-2020 **(as given in the Annexure)** for the examinations to be held in the years mentioned below:

Semester	**For the examinations to be held in the year**
Semester-I	December 2025, 2026 and 2027

The Syllabi of the courses is available on the University website: www.jammuuniversity.ac.in.

Sd/-
DEAN ACADEMIC AFFAIRS

No. F. Acd/II/26/13560-585
Dated: 15/01/26
Copy for information and necessary action to:

1. Dean, Faculty of Mathematical Science
2. Convener, Board of Studies in **Mathematics, Computer Science & IT and Statistics**
3. Sr. P.A.to the Controller of Examinations
4. All members of the Board of Studies
5. Director, CITES&M, University of Jammu for directing the concerned to upload the notification on University Website.
6. Director, Computer Centre , University of Jammu

9/1/26
Joint Registrar (Academic)

8/1/26 8/1/26 08/1/26

COURSE STRUCTURE

Five- Year Integrated Post-Graduate Programme in Mathematical Sciences

[DATE]
[COMPANY NAME]
[Company address]

Integrated Programme in Mathematical Sciences (3Yr/4Yr/5Yr)

Credit Details Year-wise

Year	Credits		
	Three Year	Four Year	Five Year
First	48	48	48
Second	48	48	48
Third	48	48	48
Fourth	-	48	48
	-	-	48
Total	144	192	240

	Credit Hours			
Courses	Three Year		Fourth Year	Fifth Year
Major (MJ)	1 Yr	20	28	38
	2 Yr	24		
	3 Yr	30		
	Total	74		
Minor (MI)	24		12	8
Multi-Disciplinary Courses (MDC)	09			
Ability Enhancement Courses (AEC)	09			
Value Added Courses/Indian Knowledge System Courses (VAC/IKS)	08			
Skill Enhancement Courses (SEC)	16		02	02
Summer Internship	04		02	
SWAYAM			04	
Total Credit	144		144+48=192	192+48=240

Course Structure

Sem/ Yr	Course Code	Category	Paper	Credit	L+P
I/1	UIMJCST101	Major-1	Working with Python	6	4+2
	UIMJMAT102	Major-2	Foundations of Mathematical Thinking	6	4+2
	UIMISTT103	Minor	Statistical Thinking and Data Interpretation	4	3+1
	UIMDFMT104	MDC	Psychology for Well-being	3	3
	UIAEFMT105	AEC	Communication Skills (English)	3	3
	UIVAFMT106-[redacted]	VAC	Understanding India	2	2
		Total		**24**	**24**
II/ 1	UIMJCST201	Major-1	Scripting a Website	4	3+1
	UIMJSTT202	Major-2	Probability Foundations for Data Analytics	4	3+1
	UIMIMAT203	Minor	Exploring Calculus	4	3+1
	UIMDFMT204	MDC	Financial Accounting	3	3
	UIAEFMT205	AEC	Personality Development Through Theatre & Drama	3	3
	UISEFMT206	SEC	Website Development	4	2+2
	UIVAFMT207--	VAC	Introduction to Culture	2	2
		Total		**24**	**24**
		Sub Total			**48**
III/ 2	UIMJSTT301	Major-1	Statistical Inference in Machine Learning Paradigm	6	4+2
	UIMJMAT302	Major-2	Linear Algebra for Data and AI	6	4+2
	UIMICST303	Minor	Understanding Object Oriented Programming using Core Java	4	3+1
	UIMDFMT204	MDC	Operations Research for Management	3	3
	UIAEFMT205	AEC	Indian Languages (Hindi/Dogri/Urdu)	3	3
	UISEFMT206				
	UIVAFMT207--	Summer Internship		2	2
		Total		**24**	**24**
		Sub Total			**72**
		Majoring in Computer Applications			
IV /2		Major-1	Algorithmic Problem Solving and Data Structures	4	3+1
		Major-2	MatLab	4	3+1
		Major -3	Applied Machine Learning with Python	4	3+1
		Minor	***Modern Databases and Data-Driven Applications***	4	3+1
		VAC	Environment Science & Education	4	3+1

		SEC	Data Analytics through Excel	4	2+2
		Total		**24**	**24**
		Sub Total			**96**
		Majoring in Statistics			
IV /2		Major-1	From Hypothesis to Insight: Applied DoE and Surveys	4	3+1
		Major-2	Sampling Design & Social Data Analysis	4	3+1
		Major -3	Data Communication, Visualizations and Publishing	4	3+1
		Minor	***Research Methodology and Technical Report Writing through LaTeX***	4	3+1
		VAC	Environment Science and Education	4	3+1
		SEC	Data Analytics through Excel	4	2+2
		Total		**24**	**24**
		Sub Total			**96**
		Majoring in Mathematics			
IV /2		Major-1	Real Analysis	4	3+1
		Major-2	Linear programming and optimization	4	3+1
		Major -3	Three-Dimensional Geometry	4	3+1
		Minor	***Number Theory***	4	3+1
		VAC	Environment Science & Education	4	3+1
		SEC	Data Analytics Through Excel	4	2+2
		Total		**24**	**24**
		Sub Total			**96**

List of Optional Subjects for VAC: Yoga for Stress Management, Understanding India, Health and Wellness, Introduction to Culture, Community Engagement, Sports and Recreation.

SYLLABUS: SEMESTER-1

Five-Year Integrated Post-Graduate Programme in Mathematical Sciences

[DATE]

[COMPANY NAME]

[Company address]

Syllabus for Five Year Integrated Post-Graduate Programme in Mathematical Sciences as per National Education Policy (NEP) 2020 for Semester-I examinations to be held in Dec-2025,2026 and 2027

Course Code: UIMJCST101
Credits: 4+2
Duration of Examination :3 hours

Title: Working with Python
Total Marks: 100
Mid-Semester:30
End Semester :50
Cont. Assessments :20

Mode: Lectures/Practical Lab/Fieldwork

Course Outcomes:

1. Understand the fundamentals of Python programming, basic syntax, control structures, and function definitions.
2. Learn to use Python's built-in data structures and string manipulation techniques effectively.
3. Work with file input/output, handle exceptions, and utilize modules in Python.
4. Grasp the object-oriented paradigm in Python including classes, inheritance, and polymorphism.
5. Explore external libraries for API access, data handling, and visualization for building small-scale real-world applications.

Unit I: Introduction to Python Programming

Introduction to Python, history, applications, installation, IDEs, Python interpreter, writing and running scripts, variables, data types (int, float, str, bool), type conversion, operators: arithmetic, comparison, logical, assignment, input and output functions, format strings, control structures: if, if-else, if-elif-else, loops: while and for, range() function, loop control (break, continue, pass), introduction to functions, def, calling functions, parameters, return values, scope, docstrings

Skill Focus: Writing basic Python programs and using control flow effectively
Assignments/Hands-on: Simple calculator, number guessing game, even/odd checker.

Unit II: Data Structures and String Handling

Lists: creation, indexing, slicing, basic operations, list methods: append(), insert(), pop(), remove(), sort(), etc., tuples: immutability, packing and unpacking, dictionaries: key-value pairs, methods, looping, sets: unique elements, set operations: union(), intersection() etc., nested structures: lists of lists, dicts in lists, introduction to strings, string indexing and slicing, string methods: upper(), find(), replace(), split() etc., string formatting: f-strings, format(), % operator, practical exercises using data structures and strings

Skill Focus: Effective use of Python's core data types for data representation and manipulation.
Assignments/Hands-on: Student marks record using dictionary, string analyzer, address book

Unit III: File Handling and Modules

Introduction to files, need for persistent storage, text vs. binary files, opening and closing files, file modes (r, w, a, b), reading from files (read, readline, readlines), writing to files (write, writelines), file iteration, file pointers (tell, seek), working with binary files, error handling in

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Course Code: UIMJCST101
Credits: 4+2
Duration of Examination :3 hours

Title: Working with Python
Total Marks: 100
Mid-Semester:30
End Semester :50
Cont. Assessments :20

file operations (try-except-finally), using context manager (with), working with CSV files using csv module, log file analysis project, word frequency counter, practical exercises,

Skill Focus: Reading/writing data files and modularizing code using packages and exception handling

Assignments/Hands-on: File-based grade calculator, log analyzer, text statistics

Unit IV: Object-Oriented Programming in Python

Installing packages, working with CSV files using built-in modules, introduction to regular expressions, regex meta-characters and patterns, re module functions (match, search, findall, sub, split), extracting emails and phone numbers using regex, log file analysis with regex, text cleaning and validation, student record validation project, unit revision and assessment, introduction to data visualization using matplotlib, plotting charts: line, bar, pie, histogram, building a small project combining data and visualization,

Skill Focus: Integrating external libraries and APIs for practical Python applications

Assignments/Hands-on: Weather app using API, COVID tracker, data plotting dashboard

Evaluation Scheme:

	Syllabus to be covered in the examination	**Time allotted for the examination**	**%Weightage (Marks)**
Mid-Semester Test	50 %	2 hours	30
End-Semester Test	100 %	3 hours	50
Continuous Assessment/Seminar/ Quiz etc.	100%		20
Total			100

The student shall be continuously evaluated during the conduct of each course based on his/her performance as follows :

- The Mid-Semester Examination will carry a weightage of 30 marks and will be based on Unit-1 and Unit-2. The question paper will be divided into three sections viz., A, B, and C. Section A will consist of 10 compulsory multiple-choice questions, each question carrying 1 mark. Section B will consist of two descriptive questions from each unit, out of which the candidate has to attempt one question from each unit, each question will carry 7.5 marks. Section C will be based on a case study worth 5 marks.
- The End-Semester Examination will carry a weightage of 50 marks. The question paper will be divided into three sections viz., A, B, and C. Section A will consist of 10

Course Code: UIMJCST101 **Title: Working with Python**
Credits: 4+2 **Total Marks:** 100
Duration of Examination :3 hours Mid-Semester:30
End Semester :50
Cont. Assessments :20

compulsory multiple-choice questions based on Unit-3 and Unit-4, each question carrying 1. Section B will consist of One compulsory descriptive question based on Unit-1 and Unit 2, and two descriptive questions from Unit 3 and Unit-4, out of which the candidate has to attempt one question from each unit, each question will carry 10 marks. Section C will be based on a case study worth 10 marks.

- The remaining 20% weightage will be based on Continuous Practical Assessment / Assignment/Tutorial/ Group Discussion/ Presentation/ Field Work/ Quiz/Project/ Survey as may be specified in the course.

Books Recommended

1. Balagurusamy, E. (2022). Programming with Python. McGraw Hill India.
2. Barry, P. (2016). Head first Python: A brain-friendly guide (2nd ed.). O'Reilly Media.
3. Downey, A. (2015). Think Python: How to think like a computer scientist (2nd ed.). O'Reilly Media.
4. Mohan, P. (2021). Python for beginners. TMH India.
5. Nageswara Rao, R. (2018). Core Python programming. Dreamtech Press.
6. Saha, D. (2019). Beginning Python. APH Publishing Corporation.
7. Sethi, R. (2019). Programming in Python. BPB Publications.
8. Taneja, A. (2020). Python programming: A modern approach. Pearson India.
9. Thareja, R. (2021). Python programming. Oxford University Press India.
10. Zed, S. A. (2014). Learn Python the hard way (3rd ed.). Addison-Wesley.

Syllabus for Five Year Integrated Post-Graduate Programme in Mathematical Sciences as per National Education Policy (NEP) 2020 for Semester-I examinations to be held in Dec-2025,2026 and 2027

Course Code: UIMJMAT102
Credits: 4+2
Duration of Examination :3 hours

Title: Foundations of Mathematical Thinking
Total Marks: 100
Mid-Semester:30
End Semester :50
Cont. Assessments :20

Mode: Lectures/Practical Lab/Fieldwork

Course Objectives: By the end of the course, students will be able to:

1. Develop logical and quantitative reasoning through real-world and abstract contexts.
2. Understand and apply foundational mathematical concepts in areas such as logic, number theory, finance, and modeling.
3. Use MATLAB as a tool to explore mathematical ideas and visualize problem-solving processes.
4. Engage in creative and collaborative problem-solving activities.
5. Reflect on the role and relevance of mathematics in various fields and everyday life.

Unit 1: Logic and Reasoning

Propositions and logical connectives, Truth tables and logical equivalence, Quantifiers and predicates, Rules of inference and argument structures, Introduction to mathematical proof (direct, contrapositive, contradiction).

Experiential Learning Activities: Logic Game Lab: Use puzzles, digital logic circuits, and apps (e.g., Truth table creator, Logic.ly) to explore truth values.

MATLAB Activities: Overview of MATLAB environment. MATLAB syntax and operations.

Unit 2: Set Theory and Structures

Sets, subsets, power sets, and operations on sets. Venn diagrams and cardinality. Cartesian products and relations. Introduction to functions and mappings. Mathematical structures: groups, graphs (basic ideas).

Experiential Learning Activities: Set Theory Lab: Use manipulatives (colored tiles, cards) to physically model set operations. Data Sorting Exercise: Apply set theory to categorize and sort real-world data sets (music playlists, survey responses). Interactive Mapping Project: Create and present a mapping between real-world domains and ranges.

Lab Activities: Use graphing tools (Desmos or GeoGebra) to explore different set theoretic operations.

Unit 3: Patterns, Numbers, and Abstraction

Patterns and sequences (arithmetic, geometric, recursive). Mathematical induction and recursion. Number systems and representations. Number bases (binary and hexadecimal). Prime numbers and modular arithmetic.

Experiential Learning Activities: Pattern Exploration Studio: Use art, nature, and architecture to identify and analyze mathematical patterns. Coding Lab: Implement recursive

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Course Code: UIMJMAT102
Credits: 4+2
Duration of Examination :3 hours

Title: Foundations of Mathematical Thinking
Total Marks: 100
Mid-Semester:30
End Semester :50
Cont. Assessments :20

patterns and sequences using Python. Compose a visual art project inspired by fractals or Fibonacci patterns.

MATLAB Activities: Write functions for prime testing and GCD computation. Explore number base conversions and visualizations. Create modular arithmetic calculators and visual modulo clocks.

Unit 4: Thinking Mathematically in the Real World

Problem-solving strategies (Polya's principles). Mathematical modelling. Probability and decision-making. Data interpretation and critical numeracy. Reflection on the nature of mathematics.

Experiential Learning Activities: Math in the Real-World Project: Students identify a real-life issue and develop a mathematical model or solution. Use probability games (dice, spinners, simulations) to understand randomness and fairness.

Evaluation Scheme

	Syllabus to be covered in the examination	Time allotted for the examination	%Weightage (Marks)
Mid-Semester Test	50 %	2 hours	30
End-Semester Test	100 %	3 hours	50
Continuous Assessment/Seminar/ Quiz etc.	100%		20
Total			100

The student shall be continuously evaluated during the conduct of each course based on his/her performance as follows :

- The Mid-Semester Examination will carry a weightage of 30 marks and will be based on Unit-1 and Unit-2. The question paper will be divided into three sections viz., A, B, and C. Section A will consist of 10 compulsory multiple-choice questions, each question carrying 1 mark. Section B will consist of two descriptive questions from each unit, out of which the candidate has to attempt one question from each unit, each question will carry 7.5 marks. Section C will be based on a case study worth 5 marks.

The End-Semester Examination will carry a weightage of 50 marks. The question paper will be divided into three sections viz., A, B, and C. Section A will consist of 10 compulsory multiple-choice questions based on Unit-3 and Unit-4, each question carrying

Syllabus for Five Year Integrated Post-Graduate Programme in Mathematical Sciences as per National Education Policy (NEP) 2020 for Semester-I examinations to be held in Dec-2025,2026 and 2027

Course Code: UIMJMAT102 **Title: Foundations of Mathematical Thinking**
Credits: 4+2 **Total Marks:** 100
Duration of Examination :3 hours Mid-Semester:30
End Semester :50
Cont. Assessments :20

1. Section B will consist of One compulsory descriptive question based on Unit-I and Unit 2, and two descriptive questions from Unit 3 and Unit-4, out of which the candidate has to attempt one question from each unit, each question will carry 10 marks. Section C will be based on a case study worth 10 marks.

- The remaining 20% weightage will be based on Continuous Practical Assessment / Assignment/Tutorial/ Group Discussion/ Presentation/ Field Work/ Quiz/Project/ Survey as may be specified in the course.

Books Recommended

1. Blitzer, R. (2018). *Thinking mathematically* (7th ed.). Pearson.
2. Devlin, K. (2012). *Introduction to mathematical thinking*. Stanford University Press.
3. Kulkarni, V. (2025). *An introduction to discrete mathematics*. Elsevier.
4. Milanic, M., & Co-authors. (2023). *Discrete mathematics with logic* (1st ed.). Elsevier.
5. O'Regan, G. (2021). *Guide to discrete mathematics: An accessible introduction to the history, theory, logic and applications*. Springer Cham.
6. Velleman, D. J. (2019). *How to prove it: A structured approach* (3rd ed.). Cambridge University Press.

Syllabus for Five Year Integrated Post-Graduate Programme in Mathematical Sciences as per National Education Policy (NEP) 2020 for Semester-I examinations to be held in Dec-2025,2026 and 2027

Course Code: UIMISTT103 **Title: Statistical Thinking and Data Interpretation**

Credits: 3+1 **Total Marks: 100**

Duration of Examination :3 hours Mid-Semester:30

End Semester :50

Cont. Assessments :20

Mode: Lectures/Practical Lab/Fieldwork

Course Outcomes: To equip students with foundational concepts in descriptive statistics and data representation while nurturing data intuition, mathematical reasoning, and creativity in the context of real-world problems and modern data science with following outcomes:

- Organise and classify data effectively using statistical methods, surveys, and classification techniques while recognising ethical concerns in data collection and reporting.
- Summarise and interpret datasets using measures of central tendency, dispersion, and distribution shapes to draw meaningful comparisons across real-world contexts.
- Create and evaluate data visualisations with traditional and modern tools to communicate insights clearly and avoid misleading representations.
- Analyse relationships and patterns between variables through correlation, regression, and hypothesis testing to support evidence-based decision-making.
- Integrate creativity and critical thinking in storytelling, debates, and projects to apply statistics ethically and meaningfully to societal and personal issues

Unit I: Foundations of Data and Classification

Introduction to Statistics and types of data, **Types of variables**: discrete, continuous, qualitative, quantitative, **Tabulation and classification** of data, Concept of frequency distribution, Designing effective **questionnaires** and data collection techniques.

Experiential Task: Conduct a peer survey using Google Forms on environmental habits or digital consumption and classify results.

Conduct a peer survey using Google Forms on a topic of societal relevance (e.g., sustainable habits, social media usage) and classify results into meaningful categories.

Creative Element: "Statistical Detective" challenge—students analyse misleading data presentations in media and present corrective visuals.

Debate: "Can statistics lie?" Discuss the ethical implications of data manipulation in public policy or advertising.

Unit II: Central Tendency and Dispersion

Measures of central tendency: Mean, Median, Mode, Harmonic Mean and Geometric Mean, Weighted averages and mathematical inequalities (AM $\geq$ GM $\geq$ HM) and their applications, Measures of dispersion: Range, Variance, Standard Deviation, Coefficient of Variation, Quartiles, concept of absolute deviation, Skewness and kurtosis to describe data

Course Code: UIMISTT103 **Title: Statistical Thinking and Data Interpretation**
Credits: 3+1 **Total Marks: 100**
Duration of Examination :3 hours Mid-Semester:30
End Semester :50
Cont. Assessments :20

distribution shapes; introduction to robust statistics (e.g., trimmed means, median absolute deviation), Concept of **error bars** and confidence intervals.

Case Study: Analyse historical climate data (e.g., average monthly temperatures of Indian cities), exploring seasonal patterns.

Experiential Task: Compare measures of central tendency and dispersion across demographic segments (e.g., income, education) using open-access datasets.

"Data Storytelling" Project: Create a narrative around a dataset (e.g., personal fitness tracker data) using measures of central tendency and dispersion to highlight trends.

Unit III: Visualising and Interpreting Data

Introduction to **graphs and data visualisation** tools, Bar graphs, histograms, pie charts, box plots, line graphs, scatter plots, line graphs, and stem-and-leaf plots, boxplots, violin plots, candle charts, **Infographics** and storytelling with data, Introduction to **modern visualisations used in Machine Learning**: heatmaps, pair plots, decision boundaries, t-SNE projections

Storytelling with data: Principles of effective infographics and avoiding visual distortions.

Lab Activity: Use Excel, Google Sheets, Tableau Public, or Python (Seaborn/Matplotlib) to create visualisations for a real-world dataset (e.g., public health or economic data).

"Visualise Your Life" Project: Design an infographic titled "A Week in Data: You!" to depict personal data (e.g., sleep, study hours, screen time) using creative visualisations.

Critical Thinking Component: "Probability Puzzle" Game: Solve real-world probability problems (e.g., Monty Hall, birthday paradox) to enhance probabilistic intuition.

Unit IV: Correlation and Regression

Introduction to hypothesis testing (null vs. alternative hypotheses, p-values, significance levels) and its role in regression analysis, **Correlation**: positive, negative, zero, **Pearson's and Spearman's coefficients, Regression analysis**: simple linear regression, Concept of **multiple and partial correlation**

Real-Life Case Study: Analyse the relationship between education levels and internet usage in rural vs urban India, Case Study: Income vs. education vs. life expectancy

Experiential Task: Collect personal data (e.g., hours studied vs. test scores) and compute a regression line, interpreting slope and intercept.

Syllabus for Five Year Integrated Post-Graduate Programme in Mathematical Sciences as per National Education Policy (NEP) 2020 for Semester-I examinations to be held in Dec-2025,2026 and 2027

Course Code: UIMISTT103 **Title: Statistical Thinking and Data Interpretation**

Credits: 3+1 **Total Marks: 100**

Duration of Examination :3 hours Mid-Semester:30

End Semester :50

Cont. Assessments :20

Creative Element: Design an infographic titled "A Week in Data: You!" to visually depict a week of your life. Math Meets Media: Decode statistical fallacies from newspapers

Critical thinking: Debate: "Should statistical significance dictate policy decisions?" Explore the ethical use of inferential statistics.

Creative and Skill-Based Enhancements

- Data Diaries: Students maintain a weekly journal documenting a personal dataset (e.g., daily step count, expenses) and reflect on patterns using statistical measures.
- Statistical Escape Room: Solve a series of data-driven puzzles requiring application of statistical concepts to "escape" (virtual or in-class activity).
- Critical Thinking Circles: Weekly discussions on real-world data applications, such as ethical dilemmas in data-driven advertising, AI bias, or public health policies.
- Math Meets Media: Analyse statistical fallacies in news articles or social media posts and propose corrected interpretations.

Evaluation Scheme

	Syllabus to be covered in the examination	**Time allotted for the examination**	**%Weightage (Marks)**
Mid-Semester Test	50 %	2 hours	30
End-Semester Test	100 %	3 hours	50
Continuous Assessment/Seminar/ Quiz etc.	100%		20
Total			100

The student shall be continuously evaluated during the conduct of each course based on his/her performance as follows:

The Mid-Semester Examination will carry a weightage of 30 marks and will be based on Unit-1 and Unit-2. The question paper will be divided into three sections viz., A, B, and C. Section A will consist of 10 compulsory multiple-choice questions, each question carrying 1 mark. Section B will consist of two descriptive questions from each unit, out of which

Syllabus for Five Year Integrated Post-Graduate Programme in Mathematical Sciences as per National Education Policy (NEP) 2020 for Semester-I examinations to be held in Dec-2025,2026 and 2027

Course Code: UIMISTT103 **Title: Statistical Thinking and Data Interpretation**
Credits: 3+1 **Total Marks: 100**
Duration of Examination :3 hours Mid-Semester:30
End Semester :50
Cont. Assessments :20

- the candidate has to attempt one question from each unit, each question will carry 7.5 marks. Section C will be based on a case study worth 5 marks.
- The End-Semester Examination will carry a weightage of 50 marks. The question paper will be divided into three sections viz., A, B, and C. Section A will consist of 10 compulsory multiple-choice questions based on Unit-3 and Unit-4, each question carrying 1. Section B will consist of One compulsory descriptive question based on Unit-1 and Unit 2, and two descriptive questions from Unit 3 and Unit-4, out of which the candidate has to attempt one question from each unit, each question will carry 10 marks. Section C will be based on a case study worth 10 marks.
- The remaining 20% weightage will be based on Continuous Practical Assessment / Assignment/Tutorial/ Group Discussion/ Presentation/ Field Work/ Quiz/Project/ Survey as may be specified in the course.

Books Recommended

1. Bruce, P., Bruce, A., & Gedeck, P. (2020). *Practical statistics for data scientists* (2nd ed.). O'Reilly Media.
2. Diez, D. M., Barr, C. D., & Çetinkaya-Rundel, M. (2019). *OpenIntro statistics* (4th ed.). OpenIntro.
3. Field, A., Miles, J., & Field, Z. (2012). *Discovering statistics using R*. SAGE Publications.
4. Freedman, D., Pisani, R., & Purves, R. (2007). *Statistics* (4th ed.). W. W. Norton & Company.
5. Gupta, S. C., & Kapoor, V. K. (2020). *Fundamentals of mathematical statistics* (12th ed.). Sultan Chand & Sons.
6. Mendenhall, W., Beaver, R. J., & Beaver, B. M. (2012). *Introduction to probability and statistics* (14th ed.). Cengage Learning.
7. Newbold, P., Carlson, W. L., & Thorne, B. (2013). *Statistics for business and economics* (8th ed.). Pearson.
8. Spiegelhalter, D. (2019). *The art of statistics: How to learn from data*. Pelican Books.
9. Wheelan, C. (2013). *Naked statistics: Stripping the dread from the data*. W. W. Norton & Company.

Syllabus for Five Year Integrated Post-Graduate Programme in Mathematical Sciences as per National Education Policy (NEP) 2020 for Semester-I examinations to be held in Dec-2025,2026 and 2027

Course Code: UIMDFMT104
Credits: 3
Duration of Examination :3 hours

Title: Psychology for Well Being
Total Marks: 75
Mid-Semester:20
End Semester :40
Cont. Assessments :15

Mode: Lectures/Practical Lab/Fieldwork

Course Outcomes:

This course, will help students not only gain theoretical knowledge but also develop practical, analytical, and creative skills to apply psychology in real-world contexts especially within data-rich environments with following learning outcomes:

CO1: Understand and articulate key psychological theories of happiness

- Explain foundational concepts such as hedonic and eudaimonic well-being, positive psychology, and emotional intelligence.
- Compare historical, cultural, and biological perspectives on happiness.

CO2: Apply empirical methods to measure and analyze happiness

- Design and interpret psychological surveys and scales using statistical tools.
- Use data analytics and visualization techniques to explore patterns in well-being metrics.

CO3: Evaluate cognitive and emotional factors influencing happiness

- Identify and analyze the role of gratitude, optimism, mindfulness, and resilience.
- Recognize cognitive biases and emotional regulation strategies that impact well-being.

CO4: Integrate psychological insights with technology and data science

- Develop data-driven interventions or applications that promote happiness.
- Assess the ethical implications of using AI and digital platforms to influence emotional states.

CO5: Design and implement creative solutions for enhancing happiness

- Collaborate across disciplines to create happiness-enhancing tools, campaigns, or models.
- Present and defend a well-researched happiness intervention in a public or academic setting.

CO6: Reflect on personal and societal dimensions of happiness

- Maintain a reflective journal to track emotional growth and insights.
- Critically evaluate the role of relationships, purpose, and habits in long-term well-being

Unit 1: Foundations of Happiness

Definitions and dimensions of happiness: Hedonic vs. Eudaimonic well-being, Historical and cultural perspectives on happiness, Key psychological theories: Maslow's Hierarchy, Self-Determination Theory, Broad and Build Theory, Ryff's Psychological Well-being, Biological and neurological bases of happiness.

Creative Activity:

Syllabus for Five Year Integrated Post-Graduate Programme in Mathematical Sciences as per National Education Policy (NEP) 2020 for Semester-I examinations to be held in Dec-2025,2026 and 2027

Course Code: UIMDFMT104
Credits: 3
Duration of Examination: 3 hours

Title: Psychology for Well Being
Total Marks: 75
Mid-Semester:20
End Semester :40
Cont. Assessments :15

Happiness Timeline: Students create a visual timeline of personal or historical happiness milestones, integrating psychological theories
Reflective Journal Entry: "What does happiness mean to me?" with peer feedback

Unit 2: Measuring Happiness

Psychological scales and surveys: PANAS, PERMA, Satisfaction with Life Scale, Quantitative vs. qualitative methods in happiness research, Data visualization and interpretation of happiness metrics, Biases in self-reporting and survey design.

Creative Activity:

Build Your Own Happiness Survey: Design and deploy a short happiness questionnaire using Google Forms
Mini Data Project: Analyze class-wide happiness data (e.g., clustering or sentiment analysis)

Unit 3: Eastern Models of Happiness: Insights from the Upanishads, Bhagavad Gita, and Yoga

Eastern Psychology: Advaita and Samkhya Philosophy, Happiness in Vedic thought Vedas and Upanishads, Ananda in Upanishads Bhagavad Gita teachings on inner peace, detachment, and duty. Concepts of Dharma, Karma, and Moksha as foundations of lasting happiness. The origin of Yoga, 8 limbs of yoga, Integral Yoga, Yogic cognition and role in Psychology, Role of meditation, breath control (pranayama), and ethics (yamas & niyamas) in cultivating happiness.

Creative Activity:

Creative Expression Project – "Ananda in Art"- Create an artistic expression (poem, short story, painting, or digital art) that represents the idea of happiness (*Ananda*) as described in Indian philosophy.
Personal Happiness Diary - Keep a 7-day self-diary applying one principle daily (e.g., detachment, compassion, mindfulness). Rate your own happiness each day on a 1–10 scale. Use descriptive statistics & simple graphs (bar chart/line graph) to analyze fluctuations in happiness scores across practices.
Mindfulness Coding Challenge: Build a simple app or script that sends daily mindfulness prompts or tracks mood.

Unit 4: Cognitive and Emotional Drivers of Happiness and Designing a Happy Life

Role of gratitude, optimism, and resilience, Cognitive distortions and happiness traps, Emotional intelligence and regulation, Mindfulness and flow states

Syllabus for Five Year Integrated Post-Graduate Programme in Mathematical Sciences as per National Education Policy (NEP) 2020 for Semester-I examinations to be held in Dec-2025,2026 and 2027

Course Code: UIMDFMT104 **Title: Psychology for Well Being**
Credits: 3 **Total Marks: 75**
Duration of Examination: 3 hours Mid-Semester:20
End Semester :40
Cont. Assessments :15

Happiness in relationships, work, and purpose, Behavioural interventions and habit formation
Technology and happiness: digital well-being, AI in mental health, Ethical considerations in happiness engineer.

Creative Activity:

• Happiness Blueprint: Students design a personal or community-based happiness intervention using behavioural science and data analytics
• Gratitude Mapping: Create a digital or physical gratitude map using data visualization tools.
• Mindfulness Coding Challenge: Build a simple app or script that sends daily mindfulness prompts or tracks mood.
• Final Presentation: Pitch a happiness-enhancing product, app, or policy using psychological insights and data.

Evaluation Scheme

	Syllabus to be covered in the examination	Time allotted for the examination	%Weightage (Marks)
Mid-Semester Test	50 %	1.5 hours	20
End-Semester Test	100 %	3 hours	40
Continuous Assessment/Seminar/ Quiz etc.	100%		15
Total			75

The student shall be continuously evaluated during the conduct of each course based on his/her performance as follows:

- The Mid-Semester Examination will carry a weightage of 20 marks and will be based on Unit-1 and Unit-2. The question paper will be divided into three sections viz., A, B, and C. Section A will consist of 05 compulsory multiple-choice questions, each question carrying 1 mark. Section B will consist of two descriptive questions from each unit, out of which the candidate has to attempt one question from each unit, each question will carry 5 marks. Section C will be based on a case study worth 5 marks.

The End-Semester Examination will carry a weightage of 40 marks. The question paper will be divided into three sections viz., A, B, and C. Section A will consist of 05

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Cont. Assessments :15

- compulsory multiple-choice questions based on Unit-3 and Unit-4, each question carrying 1. Section B will consist of One compulsory descriptive question based on Unit-1 and Unit 2, and two descriptive questions from Unit 3 and Unit-4, out of which the candidate has to attempt one question from each unit, each question will carry 10 marks. Section C will be based on a case study worth 05 marks.
- The remaining 15 marks weightage will be based on Continuous Practical Assessment / Assignment/Tutorial/ Group Discussion/ Presentation/ Field Work/ Quiz/Project/ Survey as may be specified in the course.

Final Course Project: "The Happiness Hackathon"

Students will work in interdisciplinary teams to:

1. Identify a real-world happiness challenge (e.g., workplace burnout, social media stress)
2. Apply psychological theory and data analytics to propose a solution
3. Build a prototype, model, or campaign
4. Present findings in a public showcase or digital portfolio

Books Recommended

1. "Data Science for Psychology", Florian W. Steger (Editor)
2. "Doing Psychology Experiments", David W. Martin
3. "Emotional Intelligence: Why It Can Matter More Than IQ".: Daniel Goleman
4. "Flourish: A Visionary New Understanding of Happiness and Well-being", Martin Seligman
5. "Positive Psychology: The Science of Happiness and Human Strengths", Ilona Boniwell
6. "Python for Data Analysis", Wes McKinney
7. "Stumbling on Happiness", Daniel Gilbert
8. 10.Journal of Positive Psychology – Latest research articles on well-being and happiness
9. 4. "Thinking, Fast and Slow", Daniel Kahneman
10. Focus: Cognitive biases, decision-making, and their impact on happiness and perception.
11. Focus: Comprehensive introduction to positive psychology, well-being models, and applications in education and work
12. Focus: Emotional regulation, empathy, and social intelligence as drivers of well-being.
13. Focus: Evidence-based strategies for increasing happiness; includes practical exercises and psychological foundations
14. Focus: Experimental design, statistical analysis, and ethical considerations in psychological research.

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15. Focus: Integrating data science methods into psychological research; ideal for students with ML and analytics background.
16. Focus: PERMA model, psychological interventions, and the role of purpose and engagement in happiness.
17. Focus: Practical guide to using Python for data wrangling and visualization—useful for happiness survey analysis.
18. Focus: Psychological illusions and forecasting errors in the pursuit of happiness.

Syllabus for Five Year Integrated Post-Graduate Programme in Mathematical Sciences as per National Education Policy (NEP) 2020 for Semester-I examinations to be held in Dec-2025,2026 and 2027

Course Code: UIAEFMT105
Credits: 3
Duration of Examination: 3 hours

Title: Communication Skills (English)
Total Marks: 75
Mid-Semester:20
End Semester :40
Cont. Assessments :15

Mode: Lectures/Practical Lab/Fieldwork

Course Outcomes: Upon completion of the Effective Workplace Communication course, students will be able to:

Course Outcomes: Upon completion of the Effective Workplace Communication course, students will be able to:

- Demonstrate effective listening, speaking, and writing skills for clear and professional workplace communication.
- Interpret verbal and non-verbal cues to foster empathy, connection, and understanding in diverse communication contexts.
- Construct well-structured messages and documents tailored to professional, academic, and social settings.
- Apply communication strategies to enhance collaboration, problem-solving, and conflict resolution in workplace scenarios.
- Reflect on ethical and cultural aspects of communication to engage effectively with people from diverse backgrounds.

Unit- I:

Listening: Techniques of Effective Listening, Listening and Comprehension, Probing Questions, Barriers to Listening, Listening Styles
Activities: Role-playing scenarios for active listening practice, Comprehension exercises with multimedia content, Group discussions with probing questions, Identifying and overcoming barriers to effective listening, Personality assessments to understand individual listening styles.

Unit- II :

Speaking: Pronunciation, Enunciation, Vocabulary, Fluency, Common Errors, Body Language, Building Rapport
Activities: Pronunciation drills and tongue twisters, Enunciation exercises for clarity, Vocabulary building games, Fluency practice through impromptu speaking and debates, Role-playing with focus on body language, Group activities for rapport building.

Unit- III

Reading: Techniques of Effective Reading, Evaluating Ideas and Information in the Text, Identify the Arguments Employed in the Text, Interpret the Text
Activities: Guided reading sessions with comprehension questions, Annotation exercises for identifying arguments and main ideas, Text analysis focusing on bias and tone, Critical reading/reviewing activities to analyze perspective.

Unit- IV

Writing: Avoiding Ambiguity, Using Proper Signposting Techniques, Well-knit Logical Sequence, Narrative Sequence, Category Groupings.

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Cont. Assessments :15

Different Modes of Writing: E-mails, Proposal Writing for Higher Studies
Recording the Proceedings of Meetings, Any other Mode of Writing Relevant for Learners
Activities: Ambiguity elimination exercises, Signposting techniques practice, Narrative writing exercises for structure and development, Categorization activities for organizing ideas, Different Modes of Writing: Simulated email writing scenarios, Proposal writing workshops, Mock meeting simulations for minute-taking, Exploratory writing exercises in various styles.

Evaluation Scheme

	Syllabus to be covered in the examination	Time allotted for the examination	%Weightage (Marks)
Mid-Semester Test	50 %	1.5 hours	20
End-Semester Test	100 %	3 hours	40
Continuous Assessment/Seminar/ Quiz etc.	100%		15
Total			75

The student shall be continuously evaluated during the conduct of each course based on his/her performance as follows:

- The Mid-Semester Examination will carry a weightage of 20 marks and will be based on Unit-1 and Unit-2. The question paper will be divided into three sections viz., A, B, and C. Section A will consist of 05 compulsory multiple-choice questions, each question carrying 1 mark. Section B will consist of two descriptive questions from each unit, out of which the candidate has to attempt one question from each unit, each question will carry 5 marks. Section C will be based on a case study worth 5 marks.
- The End-Semester Examination will carry a weightage of 40 marks. The question paper will be divided into three sections viz., A, B, and C. Section A will consist of 05 compulsory multiple-choice questions based on Unit-3 and Unit-4, each question carrying 1. Section B will consist of One compulsory descriptive question based on Unit-1 and Unit 2, and two descriptive questions from Unit 3 and Unit-4, out of which the candidate has to attempt one question from each unit, each question will carry 10 marks. Section C will be based on a case study worth 05 marks.

Syllabus for Five Year Integrated Post-Graduate Programme in Mathematical Sciences as per National Education Policy (NEP) 2020 for Semester-I examinations to be held in Dec-2025,2026 and 2027

Course Code: UIAEFMT105
Credits: 3
Duration of Examination: 3 hours

Title: Communication Skills (English)
Total Marks: 75
Mid-Semester:20
End Semester :40
Cont. Assessments :15

- The remaining 15 marks weightage will be based on Continuous Practical Assessment / Assignment/Tutorial/ Group Discussion/ Presentation/ Field Work/ Quiz/Project/ Survey as may be specified in the course.

Books Recommended

1. Davidson, D. (2010). *Cross-media communications: An introduction to the art of creating integrated media experiences*. Lulu Press.
2. Kester, G. H. (2004). *Conversation pieces: Community and communication in modern art*. University of California Press.
3. Luhmann, N. (2000). *Art as a social system*. Stanford University Press.
4. Moos, M., & McLuhan, M. (2014). *Media research: Technology, art and communication*. Routledge.
5. Williams, R. (2016). *Communications*. Random House.

Syllabus for Five Year Integrated Post-Graduate Programme in Mathematical Sciences as per National Education Policy (NEP) 2020 for Semester-I examinations to be held in Dec-2025,2026 and 2027

Course Code: UIVAFMT106
Credits: 2
Duration of Examination: 3 hours

Title: Understanding India
Total Marks: 50
Mid-Semester:15
End Semester :25
Cont. Assessments :10

Mode: Lectures/Practical Lab/Fieldwork

Course Outcomes: To make student aware of the trajectories of cultural development of India and the making of unity in diversity.

1. To understand the major forms and phases of freedom struggle.
2. To make student aware of the contributors to our struggle for independence.
3. To familiarize students with the process of constitutional developments and its emergence as one of the largest democratic states in the world.
4. To make student aware of the major contributions of India to world civilization in the field of science and technology.

UNIT-I

Bharatavarsha: concept and its evolution; Vedic, Epic and Puranic traditions and the making of Modern India.
State and Imperial formation: Rise of Janapadas, the Mauryas, the Kushanas, the Guptas, Pallava, Cholas and Vijayanagar Empire.
Origin and growth of major religious streams: Vedic, Jainism, Buddhism, Bhakti, Sufism and Sikhism.
Reform Movement and Modern Indian Thought: Brahmo Samaj, Arya Samaj, Ramakrishna Mission and Religious philosophy of Sri Aurobindo.

UNIT-II

India's struggle for Independence: 1857 as the First War of Independence.
Important heroes of Freedom struggle: Birsa Munda, Bhagat Singh, EV Ramaswami Naicker, Subash Chandra Bose and Dr. BR Ambedkar.
Formation of Different Political Organisations: Early moderates, extremists, and revolutionaries; Gandhi's role in mass mobilization (Non-cooperation, Civil Disobedience, Quit India).
Making of Indian constitution: Background and its salient features.

UNIT-III

India's contribution to the world: Charaka, Sushruta and C.V Raman
Mathematics and Astronomy: Aryabhata, Baudhyana, Brahmagupta and Ramanujam.
Statistics and Computers: P.C Mahalanobis, C.R Rao, Vinod Dham and Narinder Singh Kapany, Manjula Bhargava.
Space Mission of India and key personalities: Homi J Bhabha, Satish Dhawan and Dr. APJ Abdul Kalam

Syllabus for Five Year Integrated Post-Graduate Programme in Mathematical Sciences as per National Education Policy (NEP) 2020 for Semester-I examinations to be held in Dec-2025,2026 and 2027

Course Code: UIVAFMT106
Credits: 2
Duration of Examination: 3 hours

Title: Understanding India
Total Marks: 50
Mid-Semester:15
End Semester :25
Cont. Assessments :10

UNIT-IV

Cultural Development: Gandhara and Mathura School of Arts.
Styles of Temple Architecture in India: Nagara, Dravida and Vesara.
Regional Art and Architecture: Martand Sun temple, Krimchi temples, Babore temples, Basohli School of Paintings.
Key personalities of J&K: Abhinavagupta, Lal Ded, Nund Rishi, Baba Jitto, Mian Dido and Zorawar Singh.

Evaluation Scheme

	Syllabus to be covered in the examination	Time allotted for the examination	%Weightage (Marks)
Mid-Semester Test	50 %	1 hour	15
End-Semester Test	100 %	2 hours	25
Continuous Assessment/Seminar/ Quiz etc.	100%		10
Total			50

The student shall be continuously evaluated during the conduct of each course based on his/her performance as follows:

- The Mid-Semester Examination will carry a weightage of 15 marks and will be based on Unit-1 and Unit-2. The question paper will be divided into two sections viz., A and B. Section A will consist of 05 compulsory multiple-choice questions, each question carrying 1 mark. Section B will consist of two descriptive questions from each unit, out of which the candidate has to attempt one question from each unit, each question will carry 5 marks.
- The End-Semester Examination will carry a weightage of 25 marks. The question paper will be divided into three sections viz., A, B, and C. Section A will consist of 05 compulsory multiple-choice questions based on Unit-3 and Unit-4, each question carrying 1. Section B will consist of One compulsory descriptive question based on Unit-1 and Unit 2, and two descriptive questions from Unit 3 and Unit-4, out of which the candidate has to attempt one question from each unit, each question will carry 05 marks. Section C will be based on a case study worth 05 marks.

Syllabus for Five Year Integrated Post-Graduate Programme in Mathematical Sciences as per National Education Policy (NEP) 2020 for Semester-I examinations to be held in Dec-2025,2026 and 2027

Course Code: UIVAFMT106
Credits: 2
Duration of Examination: 3 hours

Title: Understanding India
Total Marks: 50
Mid-Semester:15
End Semester :25
Cont. Assessments :10

- The remaining 10 marks weightage will be based on Continuous Practical Assessment / Assignment/Tutorial/ Group Discussion/ Presentation/ Field Work/ Quiz/Project/ Survey as may be specified in the course.

Books Recommended

1. Banerjee, A. (2005). *Gandhara and Mathura schools of art.* Indian Archaeological Society.
2. Basu, D. (2012). *Introduction to the Constitution of India*. Lexis Nexis.
3. Chandra, B. (1987). *India's struggle for independence*. Penguin.
4. Chandra, S. (2009). *History of medieval India*. Orient BlackSwan.
5. Chattopadhyaya, B. D. (2016). *History of ancient India: Vedic period to the Mauryas*. Orient Longman.
6. Chaube, S. (2009). *The making and working of the Indian Constitution*. National Book Trust.
7. Cohen, S. P. (2002). *India: Emerging power*. Brookings Institution Press.
8. Desai, P. (2001). *Temple architecture styles in India: Nagara, Dravida, and Vesara*. South Asian Press.
9. Gore, M. S. (2002). *Unity in diversity: The Indian experience in nation-building*. Rawat Publications.
10. Kabir, H. (1946). *Our heritage*. National Information and Publications Ltd.
11. Kachroo, S. (2007). *Regional art and architecture of Jammu and Kashmir*. J&K Press.
12. Malik, S. C. (1975). *Understanding Indian civilization: A framework of enquiry*. Indian Institute of Advanced Study.
13. Parekh, B. (1989). *Colonialism, tradition and reforms: An analysis of Gandhi's political discourses*. Sage Publications.
14. Rudolph, L., & Rudolph, S. (2008). *Explaining Indian institutions: A fifty-year perspective, 1956–2006* (Vol. 2). Oxford University Press.
15. Singh, K. (2008). *The cultural contributions of J&K: Abhinavagupta and others*. Kashmir University Press.
16. Thapar, R. (2016). *History of India*. Taylor & Francis.