Semester-I

S. No.	Course Code	Title of Courses	Type of Course	Credits
1	BMAT101	Discrete Mathematics	**Major**	4
2	BMAT102	Programming in C	**Minor**	4
3	BMAT103	Mathematics-I for Life Science	IDC	3
4	BMAT104	Scientific Writing by LaTeX	SEC	3
5	BMAT105	Quantitative Aptitude	AEC	2
6	BMAT106	Indian Knowledge System (IKS)	**VAC**	4
			Total	**20**

BMAT101: Discrete Mathematics

Course Title:	**Discrete Mathematics**	
Course Code:	BMAT101	
Teaching Scheme	**Examination Scheme**	**Credits Allotted**
Theory: 3 hours/week	Internal Assessment: 100 Marks	Theory: 3
Tutorial: 1 hour/week	ESE: 100 Marks	Tutorial: 1
	Total:	4

Course Prerequisite: The student should have knowledge of

1.	
2.	

Course Objectives: To prepare the students with

1.	mathematical reasoning and problem solving.
2.	permutation, combinations and pigeon-hole principle.
3.	graphical algorithms to solve problems.
4.	different types of graphs and their properties.

Course Outcomes: The students will be able to

1.	express a logic sentence in terms of predicates, quantifier and logical connectives.
2.	three graphical algorithms to solve problems.
3.	determining the shortest route from one city to another city using graphs

Course Content:

Unit	Content	Hours
I	Set, function and logic, Types of functions, Relations, Equivalence relations, Partial Orderings, Principle of mathematical induction, Propositions and predicates, Logic and Proofs: Proposition, Quantifiers, Rules of Inference, Proof Methods and Strategy,	15
II	Combinatorics: Principles of counting, Arrangements, Permutation and Combinations, Partitions and allocations, Pigeon-hole principle. Graphs and Planar Graphs: Graph, Multi Graph, Bipartite Graph, Weighted Graphs, Directed graphs. Paths and circuits. Matrix representation of graphs.	15
III	Eulerian Paths and Circuits, Walks, Paths, Cycles, Hamiltonian cycles and travelling salesman problems, Trees, Distances and Shortest Paths, Minimum spanning trees.	15
IV	Group Theory: Definition and examples of various types of groups, Subgroups, Subgroup Tests, Cyclic group, Classification of subgroups of Cyclic groups, Permutation group, Isomorphism, Properties of Isomorphisms, Cosets and Lagrange's Theorem	15

Internal Assessment:

CIA-I	Unit -I
CIA-II	Written Exams/ Quizzes /Assignment /Presentations/Viva-Voce
ESE	Unit-I,II,III,IV

CIA: Continuous Internal Assessment, **ESE:** End Semester Examination

Text Books:

1. C.L. Liu, *Elements of Discrete Mathematics*, 2nd Ed., McGraw Hill, International Edition.
2. J.P. Tremblay and R. P. Manohar, *Discrete Mathematical Structures with Applications to Computer Science*, McGraw-Hill, 1989.
3. S. Wiitala, *Discrete Mathematics: A Unified Approach*, McGraw-Hill Book Co.
4. N. Deo, *Graph Theory with Applications to Computer Science*, Prentice-Hall of India.

Reference Books:

1. J. H. Van Lint and R. M. Wilson, *A course in combinatorics*, 2nd Ed. Cambridge Univ. Press.

E-resources:

BMAT102: Programming in C

Course Title:	**Programming in C**	
Course Code:	**BMAT102**	
Teaching Scheme	**Examination Scheme**	**Credits Allotted**
Theory: 3 hours/week	Internal Assessment: 100 Marks	Theory: 3
Practical: 1 hour/week	ESE: 100 Marks	Practical: 1
	Total:	4

Course Prerequisite: The student should have knowledge of

1	basics of set and functions

Course Objectives:

1	To introduce the basic concepts of computer programming languages.
2	To develop the logics for create programs.
3	To introduce basic programming constructs

Course Outcomes: The students will be able to

1	the concepts of computer programming languages
2	the codes the programmes in C language
3	the developing of the applications

Course Content:

Unit	Content	Hours
I	Basic concepts of programming languages: Programming domains, language evaluation criterion and language categories, Describing Syntax and Semantics, formal methods of describing syntax, recursive descent parsing, Dynamic semantics (operational semantics, denotational semantics, axiomatic semantics).	11 Hours Theory and 7 Hours Lab
II	Names, Variables, Binding, Type checking, Scope and lifetime data types, array types, record types, union types, set types and pointer types, arithmetic expressions, type conversions, relational and Boolean expressions, assignment statements, mixed mode assignment.	11 Hours Theory and 8 Hours Lab
III	Statement level control structures, compound statements, selection statements, iterative statements, unconditional branching, Character set, variables and constants, keywords, Instructions, assignment statements, arithmetic expression, comment statements, simple input and output.	11 Hours Theory and 7 Hours Lab
IV	Relational operators, logical operators, control structures, decision control structure, loop control structure, case control structure, functions, subroutines, scope and lifetime of identifiers, parameter passing mechanism, arrays and strings.	12 Hours Theory and 8 Hours Lab

Internal Assessment:

CIA-I	Unit-I
CIA-II	Written Exams/ Quizzes/ Assignment/ Presentations/ Viva-Voce/ based on Unit II and III
ESE	Unit-I, II, III, IV

CIA: Continuous Internal Assessment, **ESE:** End Semester Examination

Text Books:

1. Sebesta R. W., 1999, Concepts of Programming Language, Addison Wesley, Pearson Education. 2. Deitel P., Deitel H., 2010, How to Program C (6th Ed.), Addison Wesley, Pearson Education. 3. Toledo R. A. M. and Cushman P. K., 2003, Introduction to Computer Science, Mc Graw Hill International Edition. 4. Appleby D., Kopple J. J V., 1997, Programming Languages (2nd Ed.), Tata McGraw Hill, India. 5. King K. N., 2008, C Programming a Modern Approach (2nd Ed.), W. W. Norton & Company.
Reference Books:
1. Kanetkar Y., 2018, *Let Us C (16th Ed.)*, B.P.B Publications.
E-resources:

BMAT103: Mathematics-I for Life Science

Course Title:	**Mathematics-I for Life Science**	
Course Code:	**BMAT103**	
Teaching Scheme	**Examination Scheme**	**Credits Allotted**
Theory: 3 hours/week	Internal Assessment: 100 Marks	Theory: 3
Tutorial: 0 hour/week	ESE: 100 Marks	Tutorial: 0
	Total:	3

Course Prerequisite: The student should have knowledge of

1	

Course Objectives: To prepare the students with

1	knowledge of set theory calculus such as functions, limit, continuity, differentiability, integration and differential equations.

Course Outcomes: The students will be able to

1	reasonable knowledge of set theory calculus such as functions, limit, continuity, differentiability, integration and differential equations.

Course Content:

Unit	Content	Hours
I	Sets and relations, functions and their graphical representations, trigonometric functions, exponential and logarithmic functions, permutations and combinations, principle of mathematical induction, binomial theorem, arithmetic and geometric progression, complex numbers and algebra of complex numbers.	10 Hours
II	Limit, continuity, differentiability, derivative of functions in parametric forms, increasing and decreasing functions, maxima and minima, Rolle's theorem, Lagranges mean value theorem	12 Hours
III	Integration as inverse process of differentiation, methods of integration, integral of some standard functions	12 Hours
IV	definite integrals, fundamental theorem of calculus, some properties of definite integrals, simple applications of integrals such as finding area under a curve.	11 Hours

Internal Assessment:

CIA-I	Unit -I
CIA-II	Written Exams/ Quizzes /Assignment /Presentations/ Viva-Voce
ESE	Unit-I,II,III,IV

CIA: Continuous Internal Assessment, **ESE:** End Semester Examination

Text Books:

1. Mathematics text book for class XI, NCERT.
2. Mathematics text book for class XII, Part I, NCERT.
3. Mathematics text book for class XII, Part II, NCERT.

Reference Books:

1. Shanti Narayan, Differential calculus.

E-resources:

BMAT104: Scientific Writing by LaTeX

Course Title:	**Scientific Writing by LaTeX**	
Course Code:	**BMAT104**	
Teaching Scheme	**Examination Scheme**	**Credits Allotted**
Theory: 1 hours/week	Internal Assessment: 100 Marks	Theory: 1
Practical: 2 hour/week	ESE: 100 Marks	Practical: 1
	Total:	2

Course Prerequisite: The student should have knowledge of

1.	Basic computer skills to downloads the required files and programmes needed for the course

Course Objectives:

1.	Installation of scientific typing tools and writing environment to create documents
2.	To introduce typing tools e.g., LaTeX, Open office
3.	To introduce different commands and mathematical symbols
4.	To discuss the use of template to create impressive documents for Master and PhD thesis
5.	To make students learn how to write equations, plot graphs, and prepare presentations.

Course Outcomes: The students will be able to

1.	learn how to create a scientific document
2.	write equations, letters and do different types of mathematical calculations
3.	include Tables, Figures and Plots in a document
4.	create professional presentations
5.	cite a paper and build Bibliography

Course Content:

Unit	Content	Hours
I	Installing LaTeX and Class files, creating first LaTeX document, creating documents in overleaf, Basic document spacing, Basic typesetting	10 Hours (3 Hours Theory and 07 Hours Practical)
II	mathematical Symbols and Commands, writing of simple article, letters and applications, Mathematical symbols and commands, arrays, formulas and equations, Spacing, Borders and Colors	12 Hours (4 Hours Theory and 08 Hours Practical)
III	Figure environments, Subfigures, Tables, LaTeX presentations using Beamer, Creating different templates, Preparation of template of thesis and books	12 Hours (4 Hours Theory and 08 Hours Practical)
IV	Poster and CV templates, Pictures and Graphics, Bibliography, writing of research articles and reports etc.	11 Hours (3 Hours Theory and 08 Hours Practical)

Internal Assessment:

CIA-I	Unit -I
CIA-II	Written Exams/ Quizzes /Assignment /Presentations/ Viva-Voce
ESE	Unit-I, II, III and IV

CIA: Continuous Internal Assessment, **ESE:** End Semester Examination

Textbooks:

1. Lamport, L.W., 1994, *LaTeX: A document Preparation Systems,* Addison-Wesley Publishing Company.
2. Kopka, H., Daly, P.W., 2004, *Guide to LaTeX*, Fourth Edition, Addison Wesley.

Reference Books:

1. Shirore C., A *Beginner guide to LaTeX,* Lullu.com

E-resources:

2. https://www.udemy.com/course/become-a-good-latex-user-to-create-professional-documents/
3. https://www.overleaf.com/learn

BMAT105: Quantitative Aptitude

Course Title:	**Quantitative Aptitude**	
Course Code:	**BMAT105**	
Teaching Scheme	**Examination Scheme**	**Credits Allotted**
Theory: 2 hours/week	Internal Assessment: 100 Marks	Theory: 2
Tutorial: 0 hour/week	ESE: 100 Marks	Tutorial: 0
	Total:	2

Course Prerequisite: The student should have knowledge of

1	

Course Objectives:

1	Improving mathematical and analytical abilities
2	Improving problem-solving skills
3	Helping students prepare for competitive exams
4	Developing skills to meet competitive exams for better job opportunities

Course Outcomes: The students will be able to

1	understand basic concepts and arithmetic techniques.
2	solve problems easily using shortcut methods and time management.
3	use their logical thinking and analytical abilities to solve aptitude questions from competitive tests.

Course Content:

Unit	**Content**	**Hours**
I	Numbers, H.C.F and L.C.M of Numbers, Square Root and Cube Root, Logarithms, Simplification.	8 Hours
II	Percentage, Average, Ratio and Proportion.	8 Hours
III	Interest: Simple and Compound, Profit and Loss.	8 Hours
IV	Time and Work, Time and Distance.	6 Hours

Internal Assessment:

CIA-I	Unit -I
CIA-II	Written Exams/ Quizzes /Assignment /Presentations/ Viva-Voce
ESE	Unit-I,II,III,IV

CIA: Continuous Internal Assessment, **ESE:** End Semester Examination

Text Books:

1. Quantitative Aptitude by Dinesh Khattar
2. Quantitative Aptitude by R.S. Aggarwal

Reference Books:

E-resources:

BMAT106: Indian Knowledge System (IKS)
(To be finalized)

Semester-II

S. No.	Course Code	Title of Courses	Type of Course	Credits
1	BMAT201	Differential Calculus	**Major**	4
2	BMAT202	Introduction to Space Dynamics	**Minor**	4
3	BMAT203	Mathematics-II for Life Science	IDC	3
4	BMAT204	Introduction to SciLab	SEC	3
5	BMAT205	Mathematical and Logical Reasoning	AEC	2
6	BMAT206	Universal Human Values (UHV)	**VAC**	4
			Total	**20**

BMAT201: Differential Calculus

Course Title:	**Differential Calculus**	
Course Code:	**BMAT201**	
Teaching Scheme	**Examination Scheme**	**Credits Allotted**
Theory: 3 hours/week	Internal Assessment: 100 Marks	Theory: 3
Tutorial: 1 hour/week	ESE: 100 Marks	Tutorial: 1
	Total:	4

Course Prerequisite: The student should have knowledge of

1.	
2.	

Course Objectives: To prepare the students with

1.	the basic concepts of limit, continuity, differentiability.
2.	the basic concepts of mathematical theorems and applications.
3.	the basic concepts of curvature and different forms.

Course Outcomes: The students will be able to

1.	find derivative and limits of various functions and use them for further study
2.	draw graph of various functions in Cartesian and Polar coordinates
3.	use the concepts of calculus in higher learning.

Course Content:

Unit	Content	Hours
I	Limit of a function, Algebra of Limit, Continuous functions, Classifications of discontinuities, Differentiability of a function, Algebra of derivatives, Increasing and decreasing functions, Extreme values of functions.	15
II	Tangent and normal, Rolle's theorem, Mean value theorems and their geometrical interpretations, Taylor's and Maclaurin's series expansions, Taylor's theorem with Lagrange form of remainder.	15
III	Indeterminate forms, L' Hospital Rule, Successive differentiation and Leibnitz theorem, Asymptotes, Convexity, concavity and point of inflexion.	15
IV	Curvature of plane curves, radius of curvature in Cartesian, parametric and polar forms, center of curvature. Evolutes and involutes, envelopes. Tracing of standard Cartesian and polar curves.	15

Internal Assessment:

CIA-I	Unit-I
CIA-II	Written Exams/ Quizzes /Assignment /Presentations/ Viva-Voce based on Unit-II and III
ESE	Unit-I,II,III,IV

CIA: Continuous Internal Assessment, **ESE:** End Semester Examination

Text Books:

1. G. B. Thomas and R. L. Finney, “Calculus and Analytic Geometry”, 9 th Edition, Pearson Education India, 2010 2. E. Kreyszig, “Advanced Engineering Mathematics”, 10 th Edition, John & Wiley Sons, U.K., 2016. 3. R. K. Jain, & S. R. K. Iyenger,“Advanced Engineering Mathematics”, 4 th Edition, Narosa Publishing House, New Delhi, India, 2014.
Reference Books:
1. Gorakh Prasad, “Integral Calculus”, Pothishala Private Limited, 2015
E-resources:

BMAT202: Introduction to Space Dynamics

Course Name	**Introduction to Space Dynamics**	
Course Code:	**BMAT202**	
Teaching Scheme	**Examination Scheme**	**Credits Allotted**
Theory: 3 hours/week	Internal Assessment: 100 Marks	Theory: 3
Tutorial: 1 hour/week	ESE: 100 Marks	Tutorial: 1
	Total:	4

Course Prerequisite: The student should have knowledge of

1.	Basics of linear algebra, analytical geometry, differential equations, and vector calculus

Course Objectives:

1.	kinematics of particles, understanding of different orbital paths and elaboration of conservation laws.
2.	two body problems and its application in space and visualization of Kepler's laws of planetary motion.
3.	existence of integrals in three-body problem, applications of stable equilibrium points of the restricted problem of three bodies and importance of the Jacobi integral.
4.	rocket dynamics, performance measuring parameters and needs multi-stages rockets.

Course Outcomes: The students will be able to

1.	know about the kinematics of particles, understand about different orbital paths of particles and verify the conservation laws.
2.	solve the two-body problem, verify Kepler's laws of planetary motion and visualize the application of two body problems in space.
3.	verify the existence of integrals in a three-body problem, determine and examine the stability of equilibrium points in the restricted problem of three bodies and know the importance of the Jacobi integral.
4.	know about rocket dynamics, estimate the performance parameters and understand about the needs of optimized multi-stages rockets.

Course Content:

Unit	Content	Hours
I	Some basic definitions, Conservation laws, Newton’s laws of motion, Kinematics of particles, Conic-section, Central force motion, Differential equation of orbit and its solution, Geometry of different kinds of orbits.	15
II	Formulation of problem of two-body and equations of motion, relative equation of motion of two body problem, Solution of two body problem and its application. Kepler’s law of planetary motion, Kepler’s equation and its solution, Uniform rotating frame.	15
III	Introduction of three body problem, ten known integrals, Stationary solutions of three body problem and applications, Restricted problem of three body, Jacobi integral, prohibited regions of motion, collinear and noncollinear equilibrium points, Stability analysis of equilibrium points, Applications of restricted problem of three body in space.	15
IV	Equation of variable mass, introduction of rocket theory, governing equation of a rocket, Single-stage rocket and its performance, Effect of gravity on the dynamics of a rocket, two-stage rocket and its performance, multi-stage rocket, Optimization of multi-stage rocket.	15

Internal Assessment:

CIA-I	Written Exam.

CIA-II	Written Exams/ Quizzes /Assignment /Presentations/ Viva-Voce
ESE	Written Exam. for Unit-I, II, III, & IV

CIA: Continuous Internal Assessment, **ESE:** End Semester Examination

Textbooks:

1. McCuskey S. W., 1963, *Introduction to Celestial Mechanics*, Addison-Wesley Publishing Company.
2. Murray C. D., Dermott S.F., 2000, *Solar System Dynamics*, Cambridge University Press.
3. Rao K.S., 2009, *Classical Mechanics*, PHI Learning, Pvt. Ltd.
4. Goldstein H., Poole C.P. and Safko J.L., 2019, *Classical Mechanics* (Third edition), Pearson India Education Pvt. Ltd.
5. Battin, Richard H., 1999, *An Introduction to The Mathematics and Methods of Astrodynamics*, AIAA Education Series.

Reference Books:

1. Szebehely V., 1967, *Theory of orbits*. The restricted problem of three bodies, New York Acad. Press.
2. Thomson, William T., 1986, *Introduction to Space Dynamics*, Dover Publication, Inc. New York

E-resources:

https://nptel.ac.in/courses/101105029
https://nptel.ac.in/courses/101104078

BMAT203: Mathematics-II for Life Science

Course Title:	**Mathematics-II for Life Science**	
Course Code:	**4.5MAT82**	
Teaching Scheme	**Examination Scheme**	**Credits Allotted**
Theory: 3 hours/week	Internal Assessment: 100 Marks	Theory: 3
Tutorial: 0 hour/week	ESE: 100 Marks	Tutorial: 0
	Total:	3

Course Prerequisite: The student should have knowledge of

1	Mathematics-II for Life Science

Course Objectives:

1	knowledge on matrices, determinant, coordinate geometry of two and three dimension and a feel on probability and statistics.

Course Outcomes: The students will be able to

1	reasonable knowledge on matrices, determinant, coordinate geometry of two and three dimension and a feel on probability and statistics.

Course Content:

Unit	Content	Hours
I	Matrices, different types of matrices, operations of matrices, invertible matrices, transpose of a matrix. Determinants, properties of determinants, minors and cofactors, adjoint and inverse of a matrix, applications of determinants and matrices.	10 Hours
II	Slope of a line, various forms of equation of a line, general equation of a line, distance of a point from a line, conic sections, circle, and parabola.	11 Hours
III	Probability and statistics, range, mean, median, mode, variance and standard deviation, analysis of frequency distributions, conditional probability	12 Hours
IV	multiplication theory on probability, independent events, Baye's theorem, random variables and its probability distribution, Bernoulli trials and binomial distributions.	12 Hours

Internal Assessment:

CIA-I	Unit -I
CIA-II	Written Exams/ Quizzes /Assignment /Presentations/ Viva-Voce
ESE	Unit-I,II,III,IV

CIA: Continuous Internal Assessment, **ESE:** End Semester Examination

Text Books:

1. Mathematics text book for class XI, NCERT. 2. Mathematics text book for class XII, Part I, NCERT. 3. Mathematics text book for class XII, Part II, NCERT.
Reference Books:
1. Shanti Narayan, Differential calculus.
E-resources:

BMAT204: Introduction to SciLab

Course Title:	**Introduction To SciLab**	
Course Code:	**BMAT204**	
Teaching Scheme	**Examination Scheme**	**Credits Allotted**
Theory: 2 hours/week	Internal Assessment: 100 Marks	Theory: 2
Practical: 2 hour/week	ESE: 100 Marks	Practical: 1
	Total:	3

Course Prerequisite: The student should have knowledge of

1	

Course Objectives:

1	To introduce SciLab as software tool.
2	To learn different types of plots.
3	To learn programming in SciLab.

Course Outcomes: The students will be able to

1	understand various SciLab commands
2	plot different 2D and 3D graphs
3	Develop SciLab programmes

Course Content:

Unit	Content	Hours
I	Introduction to Scilab, installation, SciNotes, files formatting, local and global variables, predefined constants, constants, common mathematical functions, variable assignment operator, data types, floating points, number formats, Boolean data strings.	15
II	Introduction of loops, while loop, infinite loops, for loop, if-else, arrays, vectors, operations, vector element wise operations.	15
III	Matrix multiplication, inverse of matrices, vector random matrix, row and columns addition and deletion, vector matrix manipulations, matrix reshaping, upper and lower triangular matrices.	15
IV	Introduction to 2D plotting, 3D plotting, multiple plots in same graph, multiple plots, formatting, editing of graphs.	15

Internal Assessment:

CIA-I	Unit -I
CIA-II	Written Exams/ Quizzes /Assignment /Presentations/ Viva-Voce
ESE	Unit-I,II,III,IV

CIA: Continuous Internal Assessment, **ESE:** End Semester Examination

Text Books:

1. Mathieu, P., and Roux, P., *Scilab: I. Fundamentals,* Scilab Enterprises, 2016.
2. Affouf, M., *Scilab by Example,* Create Space Independent Pub. Platform, 2012.

Reference Books:

E-resources:

BMAT205: Mathematical and Logical Reasoning

Course Title:	**Mathematical and Logical Reasoning**	
Course Code:	**BMAT205**	
Teaching Scheme	**Examination Scheme**	**Credits Allotted**
Theory: 2 hours/week	Internal Assessment: 100 Marks	Theory: 2
Tutorial: 0 hour/week	ESE: 100 Marks	Tutorial: 0
	Total:	2

Course Prerequisite: The student should have knowledge of

1	

Course Objectives:

1	Improving mathematical and analytical abilities
2	Improving problem-solving skills
3	Helping students prepare for competitive exams
4	Developing skills to meet competitive exams for better job opportunities

Course Outcomes: The students will be able to

1	understand basic concepts and arithmetic techniques.
2	solve problems easily using shortcut methods and time management.
3	use their logical thinking and analytical abilities to solve aptitude questions from competitive tests.

Course Content:

Unit	Content	Hours
I	Analogy, Classification, Coding-Decoding, Blood Relation, Completion of incomplete Figure\Pattern.	8 Hours
II	Puzzle Test: Sitting Arrangement, Ranking Arrangement, Mirror Image, Water Image, Alphabet Test.	8 Hours
III	Number Series, Missing Character, Arithmetic Reasoning.	8 Hours
IV	Direction Test, Calendar, Venn Diagram, Counting Figures, Dice and Cubes.	6 Hours

Internal Assessment:

CIA-I	Unit -I
CIA-II	Written Exams/ Quizzes /Assignment /Presentations/ Viva-Voce
ESE	Unit-I,II,III,IV

CIA: Continuous Internal Assessment, **ESE:** End Semester Examination

Text Books:

1. Quantitative Aptitude by Dinesh Khattar
2. Quantitative Aptitude by R. S. Aggarwal

Reference Books:

E-resources:

BMAT206: Universal Human Values (UHV)
(To be finalized)