



MAHARAJA RANJIT SINGH PUNJAB TECHNICAL UNIVERSITY BATHINDA-151001 (PUNJAB), INDIA

(A State University Estb. by Govt. of Punjab vide Punjab Act No. 5 of 2015 and Approved u/s 2(f) & 12 (B) of UGC; Member AIU)

Department: DEPARTMENT OF MATHEMATICS
MRSPTU MAIN CAMPUS ,BATHINDA

Program: B.SC(HONS)(2018)

COs, POs, PSOs Mapping

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| Subject: Calculus-I | Subject Code: BMAT1-101 | Semester: <u>1st</u> |
| Credit: <u>5</u> | L T P <u>4 1 0</u> | Duration: <u>55Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|------------|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Apply the knowledge of basic concepts of calculus in order to study theoretical development of different mathematical techniques and their applications. | 2 | 1 | | 3 | 2 | 1 | 2 | | | 2 | 1 | 1 | 2 | 2 | |
| CO2 | Develop the skills to sketch the curves in a plane using its mathematical properties in the different coordinate systems of reference. | 1 | 3 | | 2 | | 1 | | | | | | | 1 | 1 | |
| CO3 | Apply derivatives for the computation of directional derivative and Optimization. | 2 | 1 | | 1 | 1 | 1 | 2 | | | 1 | 1 | 1 | 2 | 2 | |
| CO4 | Extend the knowledge of Partial derivatives of higher order for further exploration of the subject for going into higher education | 2 | 1 | | 1 | | | 2 | | | | | | 2 | 2 | |

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| Subject: Algebra-I | Subject Code: BMAT1-102 | Semester: <u>1st</u> |
| Credit: <u>5</u> | L T P <u>4 1 0</u> | Duration: <u>55Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|------------|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Understand the basic concepts of linear transformations, the Rank-Nullity Theorem, matrix of a linear transformation, algebra of transformations and the change of basis. | 3 | | | 2 | | | 1 | | | | 1 | | 1 | 2 | |
| CO2 | Analyze& solve problems related to Matrices, Quotient space, Homomorphism & Isomorphism of vector space and Null space etc. | 1 | | | 2 | 2 | | | 2 | | | 1 | | 2 | 1 | |
| CO3 | Recognize consistent and inconsistent systems of linear equations by the row echelon form of the augmented matrix, using rank. | 1 | | | 2 | 2 | | | | | | 1 | | 1 | 2 | |
| CO4 | Find eigenvalues and corresponding eigenvectors for a square matrix | 1 | | | 2 | 2 | | | 2 | | | | | 1 | 2 | |

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| Subject: Analysis-I | Subject Code: BMAT1-103 | Semester: <u>1st</u> |
| Credit: <u>5</u> | L T P <u>4 1 0</u> | Duration: <u>55Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|------------|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Understand many properties of the real line \mathbb{R} , including completeness and Archimedean properties | | | | 3 | | | | 2 | | | 3 | | 3 | 3 | |
| CO2 | Apply the ratio, root, and alternating series and limit comparison tests for convergence and absolute convergence of an infinite series of real numbers. | | | | | 1 | 1 | | 3 | | | 3 | | 3 | 2 | |
| CO3 | Understand the concept of continuous functions, uniform continuity and discontinuity | | | | 1 | | | | 2 | | | 2 | | 3 | 3 | |
| CO4 | Apply mean value theorem, Taylor's theorem | | | | | 3 | 1 | | | | | 1 | | 3 | 3 | |

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| Subject: Fortran Programming | Subject Code: BCAP1-101 | Semester: <u>1st</u> |
| Credit: <u>4</u> | L T P <u>4 0 0</u> | Duration: <u>45Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|------------|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Operating Systems, Linux, Windows and other Operating Systems, Open Source Foundation and GNU | | 1 | | | 1 | 1 | 1 | | 1 | 2 | 1 | 1 | 1 | 2 | 3 |
| CO2 | Programming and Problem Solving, Basic FORTRAN, Control Constructs. | 1 | 2 | 1 | | 2 | | 1 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 3 |
| CO3 | Skills for writing computational programs. | 1 | 2 | 1 | 1 | | 2 | | | 1 | 3 | 3 | 3 | 1 | 2 | 3 |
| CO4 | Different numerical techniques utilized in programming. | | 1 | 1 | 1 | 1 | 2 | | 1 | 2 | 3 | 3 | 3 | 1 | 2 | 3 |

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| Subject: Fortran Programming lab | Subject Code: BCAP1-102 | Semester: <u>1st</u> |
| Credit: <u>1</u> | L T P <u>0 0 2</u> | Duration: <u>30Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|------------|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Use operating Systems, Linux, Windows and other Operating Systems, Open-Source Foundation and GNU | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 2 | 1 | 2 | 3 |
| CO2 | Use Programming and Problem Solving, Basic FORTRAN, Control Constructs. | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 3 |
| CO3 | Design and code mid-level problems. | 1 | 2 | 1 | 1 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 3 |
| CO4 | Understand basic programming concepts Isomorphism of vector space and Null space etc. | 2 | 2 | 1 | 1 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 3 |

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| Subject: English | Subject Code: BHUM1-101 | Semester: <u>1st</u> |
| Credit: <u>4</u> | L T P <u>4 0 0</u> | Duration: <u>55Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | To know about the various dimensions of communication skills and to understand its importance | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 2 | 2 | | |
| CO2 | To comprehend the role of communication at different levels (verbal, non-verbal, official, and non-official). | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | |
| CO3 | To know about the intricacies of written communication for office use. | 1 | 2 | 1 | 1 | 1 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | | | 3 |
| CO4 | To make pupil prepare for presenting him/herself in interviews, GD etc. | 1 | 2 | 1 | 1 | 1 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 |

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| Subject: Calculus-II | Subject Code: BMAT1-204 | Semester: <u>2nd</u> |
| Credit: <u>5</u> | L T P <u>4 1 0</u> | Duration: <u>55Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Apply the knowledge of advanced concepts of calculus in order to study theoretical development of different mathematical techniques and their applications. | 2 | 1 | | 3 | 2 | 1 | 2 | | | 2 | 1 | 1 | 2 | 2 | |
| CO2 | Use the idea of reduction formulae enables to solve an integral problem by reducing it to a problem of solving an easier integral problem | 1 | | | 1 | | 1 | 1 | | | | 2 | | 2 | 1 | |
| CO3 | Develop the knowledge of computing arc length, area and volume by using integration. | 1 | 2 | | 1 | 2 | 1 | 1 | | | | 1 | | 1 | 2 | |
| CO4 | Extend the knowledge of multiple integrals, scalar surface integrals, vector surface integrals and theorems of Green, Gauss and Stokes for exploring its | 1 | 2 | | 1 | | 2 | | | | | 1 | | 2 | 2 | |

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| use in physical sciences | | | | | | | | | | | | | | | | |
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| Subject: Algebra-II | Subject Code: BMAT1-205 | Semester: <u>2nd</u> |
| Credit: <u>5</u> | L T P <u>4 1 0</u> | Duration: <u>55Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|------------|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Understand the concept of group, Ring and their properties. | 1 | | | 2 | | | 1 | | | | 2 | | 2 | 3 | |
| CO2 | Analyze& demonstrate different types of algebraic structures such as subgroups Normal subgroups and Quotient groups to understand and use the fundamental results in Algebra. | 1 | | | 2 | 2 | | 2 | | | | 2 | | 2 | 1 | |
| CO3 | Apply the concepts of isomorphism and homomorphism for groups and rings to solve different types of problems. | 1 | | | 2 | | 2 | 2 | | | | 1 | | 2 | 3 | |
| CO4 | Access the idea of inner product space and determine its orthogonally on vector space, including gram – Schmidt orthogonalisation to obtain orthonormal basis | 1 | | | 2 | | | 2 | | | | 2 | | | 1 | |

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| Subject: Analysis-II | Subject Code: BMAT1-205 | Semester: <u>2nd</u> |
| Credit: <u>5</u> | L T P <u>4 1 0</u> | Duration: <u>55Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|------------|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Compare countable and uncountable sets | 2 | | 1 | 2 | | | | | | | 3 | | 3 | 2 | |
| CO2 | Apply various tests uniform convergence | | | 1 | 2 | 2 | | | | | | 1 | | 3 | 2 | |
| CO3 | Understand the interchange of limit ,derivative, integrals | | | | 3 | | 1 | | | | | 1 | | 3 | 2 | 1 |
| CO4 | Understand the concept of metric spaces | | | 1 | 3 | | | | | | | 2 | | 3 | 2 | |

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| Subject: Fundamentals of Computer and C Programming | Subject Code: BCAP1-203 | Semester: <u>2nd</u> |
| Credit: <u>4</u> | L T P <u>4 0 0</u> | Duration: <u>45Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Implement programs using C. | 1 | 2 | 3 | | | | | | | | | | 2 | 1 | 3 |
| CO2 | Implement fundamental data structures in C. | 3 | 1 | | | | | | | | 2 | | | 2 | 1 | 3 |
| CO3 | Understand the fundamentals of hardware, software, and programming. | | | | | | | | | | | | 3 | 2 | 1 | 3 |
| CO4 | Understand the logic building used in Programming. | | | | | 2 | | 1 | | | | | | 2 | 1 | 3 |

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| Subject: Fundamentals of Computer and C Programming Lab | Subject Code: BCAP1-204 | Semester: <u>2nd</u> |
| Credit: <u>1</u> | L T P <u>0 0 2</u> | Duration: <u>30Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Implement programs using C | 1 | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 2 | 1 | 2 | 3 |
| CO2 | Implement fundamental data structures in C. Isomorphism of vector space and Null space etc. | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 3 |
| CO3 | Write the programming solutions for solving various real-life problems. augmented matrix, using rank. | 1 | 2 | 1 | 1 | 1 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 3 |
| CO4 | Implement Programs with pointers and arrays, perform pointer arithmetic, and use the pre-processor. | 1 | 2 | 1 | 1 | 1 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 3 |

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| Subject: Environmental Science | Subject Code: BHUM1-202 | Semester: <u>2nd</u> |
| Credit: <u>4</u> | L T P <u>4 0 0</u> | Duration: <u>45Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Understand the value of non-renewable Resources such as petroleum and natural gas. | 1 | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 2 | | 3 | |
| CO2 | Learn that how the bodies of living organisms decomposes after death. | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | | 2 | |
| CO3 | Find out the causes of distinct sorts of pollution and their solutions | 1 | 2 | 1 | 1 | 1 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | | 3 | |
| CO4 | Grasp knowledge that how the rain water can be stored and used while climate changes like draught. | 1 | 2 | 1 | 1 | 1 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | | 2 | |

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| Subject: Differential equations-I | Subject Code: BMAT1-307 | Semester: <u>3rd</u> |
| Credit: <u>5</u> | L T P <u>4 1 0</u> | Duration: <u>55Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Understand the concept of ordinary differential equation, formation and order and degree of differential equation etc. | 2 | | | 2 | 1 | 2 | 2 | 3 | | | 1 | | 2 | 3 | 1 |
| CO2 | Apply various methods to Solve first order non-linear differential equation and linear differential equations of higher order | 1 | | | 3 | 1 | 2 | 2 | 3 | | | 2 | | 3 | 2 | |
| CO3 | Apply various power series methods to find series solution of differential equations. | 2 | | | 3 | 1 | 2 | 1 | 1 | | | 1 | | 1 | 2 | |
| CO4 | Apply differential equations to significant applied and theoretical problems. | 2 | | | 3 | 1 | 2 | 2 | 2 | | | 1 | | 1 | 2 | |

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| Subject: Mathematical statistics | Subject Code: BMAT1-308 | Semester: <u>3rd</u> |
| Credit: <u>5</u> | L T P <u>4 1 0</u> | Duration: <u>55Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Understand and use the concept of probability theory and statistics to solve industrial problems | 2 | 1 | | 2 | 3 | | 1 | | | 2 | 1 | 1 | 2 | | |
| CO2 | Define and examine the random sampling and graphical methods with technology | 1 | 3 | | 2 | 1 | 1 | 1 | | | | | | 2 | | 2 |
| CO3 | Recognize and compute the sampling distributions, sampling distributions of means and variances (S ²) and the tand F-distributions | 2 | 1 | | 1 | 1 | 1 | 2 | | | 1 | 1 | 1 | 2 | | 1 |
| CO4 | Recognize the relationship between the confidence interval estimation and tests of hypothesis | 2 | 1 | 3 | 1 | 1 | | 2 | | | | 1 | | 1 | | 1 |

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| Subject: Geometry | Subject Code: BMAT1-309 | Semester: <u>3rd</u> |
| Credit: <u>5</u> | L T P <u>4 1 0</u> | Duration: <u>55Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Understand the relationship between different coordinate systems, transformation of axes and intersection of three planes. | 1 | 3 | | 1 | | 1 | | | | | | | 1 | 1 | |
| CO2 | Apply the knowledge to obtain the equation of cone, enveloping cone, tangent plane, reciprocal cone of given cone and prove their results. | 1 | 2 | | 1 | | 1 | | | | | | | 1 | 1 | |
| CO3 | Develop the equation of cylinder, right circular cylinder, enveloping cylinder. | 1 | 2 | | 1 | | 1 | | | | | | | 1 | 1 | |
| CO4 | Introduce the family of spheres passing through a circle, tangent planes and normal lines to a sphere and radical planes. | 1 | 2 | | 1 | | 1 | | | | | | | 2 | 1 | |

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| Subject: Number Theory | Subject Code: BMAT1-310 | Semester: <u>3rd</u> |
| Credit: <u>5</u> | L T P <u>4 1 0</u> | Duration: <u>55Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Find quotients and remainders from integer division, Division algorithm, Apply Euclid's algorithm for the greatest common divisor, Linear Diophantine equations, Prime numbers | 1 | 3 | | 1 | | 1 | 2 | | | | | | 1 | | |
| CO2 | Learn about congruence, residue classes and least residues add and subtract integers, modulo n, multiply integers and calculate powers, modulo n, Simultaneous linear congruence's | 1 | 2 | | 1 | | 1 | 2 | | | | | | 1 | | |
| CO3 | Familiarize with Arithmetic modulo p and related theorems, Solving congruence modulo prime powers. | 1 | 2 | | 1 | | 1 | 2 | | | | | | 1 | | |
| CO4 | Learn about Euler's Phi function, Euler's theorem and properties of the Phi Function | 1 | 2 | | 1 | | 1 | 3 | | | | | | 1 | | |

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| Subject: Object Oriented Programming | Subject Code: BCAP1-305 | Semester: <u>3rd</u> |
| Credit: <u>3</u> | L T P <u>3 0 0</u> | Duration: <u>45Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Implement programs using C++. | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 2 | 1 | 2 | 3 |
| CO2 | Implement fundamental data structures in C++. | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 3 |
| CO3 | Learn various concepts of object-oriented approach towards problem solving. | 1 | 2 | 1 | 1 | 1 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 3 |
| CO4 | Create computer-based solutions to various real-world problems using Object oriented programming. | 1 | 2 | 1 | 1 | 1 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 3 |

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| Subject: Object Oriented Programming lab | Subject Code: BCAP1-306 | Semester: <u>3rd</u> |
| Credit: <u>1</u> | L T P <u>0 0 2</u> | Duration: <u>30Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Implement programs using C++. | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 2 | 1 | 2 | 3 |
| CO2 | Implement fundamental data structures in C++. | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 3 |
| CO3 | Learn programming from real world examples. | 1 | 2 | 1 | 1 | 1 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 3 |
| CO4 | Create simple programs using classes and objects | 1 | 2 | 1 | 1 | 1 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 3 |

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| Subject: Differential equations-II | Subject Code: BMAT1-410 | Semester: <u>4th</u> |
| Credit: <u>5</u> | L T P <u>4 1 0</u> | Duration: <u>55Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Understand the concept of partial differential equation of first order (linear and nonlinear). | 2 | | | 2 | 1 | 2 | 2 | 3 | | | 1 | | 2 | 2 | |
| CO2 | Solve partial differential equations (linear and nonlinear) using various methods and apply these methods in solving some physical problems. | 1 | | | 3 | 1 | 2 | 2 | 3 | | | 2 | | 1 | 2 | |
| CO3 | Understand the formation and solution of some significant PDEs like wave equation, heat equation and diffusion equation | 2 | | | 3 | 1 | 2 | 1 | 1 | | | 1 | | 2 | 1 | |
| CO4 | Undertake any advanced course on ordinary as well as partial differential equations | 2 | | | 3 | 1 | 2 | 2 | 2 | | | 1 | | 2 | 1 | |

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| Subject: Linear Algebra | Subject Code: BMAT1-411 | Semester: <u>4th</u> |
| Credit: <u>5</u> | L T P <u>4 1 0</u> | Duration: <u>55Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|------------|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Apply the knowledge of Algebra which enables to build mathematical thinking and skill. | 1 | 2 | | | | | | | | | 1 | | 2 | | |
| CO2 | Analyze& solve problems related to Rank and Nullity of linear transformation etc. | 2 | | 1 | 3 | | | | | | | | | 2 | | |
| CO3 | Find eigenvalues and corresponding eigenvectors for a square matrix. | 2 | | | 1 | | | 2 | 1 | | | | | 1 | | |
| CO4 | Identify the problems in mathematics and find their suitable solution. | 1 | | 1 | 2 | | | 3 | | | | | | 2 | | |

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| Subject: Mechanics-I | Subject Code: BMAT1-412 | Semester: <u>4th</u> |
| Credit: <u>5</u> | L T P <u>4 1 0</u> | Duration: <u>55Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|------------|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Use Lagrange's equation for deriving equation of motions | | | 2 | 2 | 3 | | | | | 2 | | | 1 | 3 | |
| CO2 | Apply the knowledge in Dynamics at higher levels. | | | 1 | 2 | 3 | 3 | 2 | | | 2 | | | 3 | | |
| CO3 | Learn that a particle moving under a central force describes a plane curve and know the Kepler's laws of the planetary motions, which were deduced by him long before the mathematical theory given by Newton. | | | 2 | 1 | 2 | 3 | | | | | | | 2 | 3 | |
| CO4 | Study mechanical systems under generalized coordinate systems, Virtual work, Energy and momentum, to study mechanics developed by Lagrange, Hamilton, Jacobi and small oscillation | | | | 3 | | 2 | 3 | 3 | | 3 | 2 | | 2 | 3 | |

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| Subject: Numerical Methods | Subject Code: BMAT1-413 | Semester: <u>4th</u> |
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| Credit: 5 | L T P 4 1 0 | Duration: 55Hrs. |
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| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|------------|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Learn various types of numerical methods to find the roots of nonlinear equations and solution of a system of linear equations. | 3 | 3 | | 2 | 3 | 1 | 2 | 2 | | | 2 | | 2 | 1 | 2 |
| CO2 | Find values for a tabulated function using Interpolation techniques. | 1 | 2 | | 3 | 2 | 1 | 2 | | | | 2 | | 1 | 2 | 1 |
| CO3 | Apply these numerical methods to solve ordinary differential equation. | 2 | | | 3 | 2 | 1 | 1 | 2 | | | 1 | | 3 | 1 | 2 |
| CO4 | Introduce the basic concepts of Numerical Mathematics to solve the problems arising in science and engineering etc. | 1 | 1 | | 3 | 3 | 1 | 2 | 1 | | | 2 | | 1 | 3 | 2 |

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|-----------------------------|--------------------------------|----------------------------------|
| Subject: Latex and R | Subject Code: BCAP1-407 | Semester: 4 th |
| Credit: 3 | L T P 3 0 0 | Duration: 45Hrs. |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|------------|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Use Latex, Basic tools for Formatting text. | | 2 | 2 | | | | | | 1 | | | | 2 | 2 | 2 |
| CO2 | Producing Mathematical Formulae using Latex. | | | 1 | | | 3 | 2 | | | 2 | | | 2 | 1 | 2 |
| CO3 | Able to formulate arrays and matrices | | 2 | | 1 | | 2 | | | | 2 | | | 2 | 2 | 3 |
| CO4 | Consequently students can write research papers and prepare presentations. | | | | 3 | | 2 | | | | | 2 | | 2 | 1 | 2 |

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|---------------------------------|--------------------------------|--|
| Subject: Latex and R lab | Subject Code: BCAP1-408 | Semester: <u>4th</u> |
| Credit: <u>1</u> | L T P <u>0 0 2</u> | Duration: <u>30Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Use Latex, Basic tools for Formatting text | | 2 | 2 | | | | | | 1 | | | | 2 | | 3 |
| CO2 | Producing Mathematical Formulae using Latex | | | 1 | | 3 | 2 | | | 2 | | | | 1 | 2 | 3 |
| CO3 | Arrays and Matrices | 2 | | | 1 | | 2 | | | | 2 | | | 1 | | 3 |
| CO4 | Consequently students can write research papers and prepare presentations. | | | | 3 | | 2 | | 3 | | | 2 | | 2 | 2 | 3 |

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|------------------------------|--------------------------------|--|
| Subject: Mechanics-II | Subject Code: BMAT1-514 | Semester: <u>5th</u> |
| Credit: <u>5</u> | L T P <u>4 1 0</u> | Duration: <u>55Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Thorough understanding of dynamics is essential to understanding any modern development of Physical sciences. | | | 2 | 2 | 3 | | | | | 2 | | | 1 | 3 | |
| CO2 | Learn that a particle moving under a central force describes a plane curve and know the Kepler's laws of the planetary motions, which were deduced by him long before the mathematical theory given by Newton. | | | 1 | 2 | 2 | 3 | 2 | | | 2 | | | 2 | 3 | |
| CO3 | Mechanics and its applications are an excellent example of how physics and mathematics work hand in hand to give a complete picture of the real problems. | | | 2 | 1 | 2 | 3 | | | | | | | 3 | 1 | |
| CO4 | Reduction of two-body central force problem to an equivalent one-body problem, Central force motion in a plane. | | | | 3 | | 2 | 3 | 3 | | 3 | 2 | | 2 | 2 | |

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|--------------------------------------|--------------------------------|--|
| Subject: Mathematical Methods | Subject Code: BMAT1-515 | Semester: <u>5th</u> |
| Credit: <u>5</u> | L T P <u>4 1 0</u> | Duration: <u>55Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Fourier series and its applications. | | | 2 | 2 | 3 | | | | | 2 | | | 3 | 3 | |
| CO2 | Fourier transform and its applications to P.D.E | | | 1 | 2 | 2 | 3 | 2 | | | 2 | | | 3 | 2 | |
| CO3 | Laplace transform and its applications to solutions of integrals and Differential Equations. | | | 2 | 1 | 2 | 3 | | | | | | | 2 | 2 | |
| CO4 | Z-transforms and inverse Z-transforms and its importance in context of Difference equations. | | | | 3 | | 2 | 3 | 3 | | 3 | 2 | | 2 | 1 | |

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|---------------------------------------|--------------------------------|--|
| Subject: Differential Geometry | Subject Code: BMAT1-516 | Semester: <u>5th</u> |
| Credit: <u>5</u> | L T P <u>4 1 0</u> | Duration: <u>55Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Students will be at ease to understand the various curves in space | | 2 | | 3 | | 1 | | | | | | | 2 | | |
| CO2 | Students will be able to understand the behavior of the curves in various situations. | | | | 2 | 2 | | | | | | 2 | | | 1 | |
| CO3 | Students will be able to understand the Concept of surface | | | | 2 | | 2 | | | | | 2 | | 2 | | |
| CO4 | Students will be able to understand geodesics | | | | 1 | | | | | | | 2 | | 1 | | |

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|--|--------------------------------|--|
| Subject: Finite Element Methods | Subject Code: BMAT1-517 | Semester: <u>5th</u> |
| Credit: <u>5</u> | L T P <u>4 1 0</u> | Duration: <u>55Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Demonstrate the steps of finite element methods in finding solution of Dynamic, Heat transfer, Solid Mechanic and Eigen value problems | | | 2 | 2 | 3 | | | | | | | | 2 | 3 | |
| CO2 | Analyse the real time situations and convert it into Finite Methods to find solutions | | | 1 | 2 | | | 2 | | | | | | 2 | | |
| CO3 | Solve the Ordinary differential equations with Finite Element Method | 2 | | | 1 | | 2 | | | | | | | 3 | | |
| CO4 | Solve Elliptic, Hyperbolic and Parabolic P.D.E by Finite Element Method | | | | 3 | | 2 | | 3 | | | 2 | | 3 | 1 | |

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|-------------------------|--------------------------------|--|
| Subject: MATLAB | Subject Code: BCAP1-509 | Semester: <u>5th</u> |
| Credit: <u>3</u> | L T P <u>3 0 0</u> | Duration: <u>45Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Use MatLab for Basic mathematics computations | 1 | 2 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 2 | 1 | | 3 |
| CO2 | Creating M-files, working with script tools and also writing script file | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 2 |
| CO3 | Program scripts and functions using the MatLab development environment, Able to use basic flow controls (if else, for, while). | 1 | 2 | 1 | 1 | 1 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | | 2 |
| CO4 | Use matlab for calculus, numerical integration and other mathematical operations. | 1 | 2 | 1 | 1 | 1 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 1 | | 3 |

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|----------------------------|--------------------------------|--------------------------------|
| Subject: MATLAB Lab | Subject Code: BCAP1-510 | Semester: <u>5th</u> |
| Credit: <u>1</u> | L T P <u>0 0 2</u> | Duration: <u>15Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Understand the main features of the MatLab development environment | 1 | 2 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 2 | 2 | 2 | 3 |
| CO2 | Design simple algorithms to solve problems | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 3 |
| CO3 | Write simple programs in MaTLab to solve scientific and mathematical problems | 1 | 2 | 2 | 1 | 1 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 1 | 1 | 3 |
| CO4 | Understand the main features of the MATLAB/SCILAB program development environment. | 1 | 2 | 1 | 1 | 1 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 2 |

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|-------------------------|--------------------------------|--------------------------------|
| Subject: LPP | Subject Code: BMAT1-618 | Semester: <u>6th</u> |
| Credit: <u>5</u> | L T P <u>4 1 0</u> | Duration: <u>55Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Introduce and formulate linear programming models of real life situations. | 1 | 2 | | | | | | | | | | 1 | 1 | 1 | |
| CO2 | Understand the selection and implementation of graphical solution and variants of simplex method for the solution of LPP. | | 1 | | 1 | 2 | 1 | 1 | | | 1 | 1 | 2 | 2 | 2 | |
| CO3 | Develop the relationships between the primal and dual problems and their solutions. | | | | 1 | 2 | | | | | | 1 | 2 | 1 | | |
| CO4 | Apply the knowledge to solve two-person zero-sum game problems | 1 | 1 | | | 2 | 1 | 1 | | | | 2 | 2 | 1 | 1 | |

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|-----------------------------|--------------------------------|--|
| Subject: Ring Theory | Subject Code: BMAT1-619 | Semester: <u>6th</u> |
| Credit: <u>5</u> | L T P <u>4 1 0</u> | Duration: <u>55Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Know the fundamental concepts in ring theory such as the concepts of ideals, quotient rings, integral domains, and fields. | | 1 | | 3 | | 2 | | | | | | | 3 | 1 | 2 |
| CO2 | Ring theory is powerful in terms of its scope and generality, but it can be simply described as the study of systems in which addition and multiplication are possible. | | | | 2 | 2 | | | | | | 2 | | 2 | 1 | 2 |
| CO3 | Find radicals, bases etc. for special classes of finite dimensional algebras. The student is able to describe the corresponding module if a representation is given, and vice versa. | | | | 2 | | 2 | | | | | 3 | | 2 | 1 | 2 |
| CO4 | Apply various concepts in real life problems | | | | 1 | | | | | | | 2 | | 2 | 1 | 2 |

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|--|--------------------------------|--|
| Subject: Mathematical Modelling | Subject Code: BMAT1-620 | Semester: <u>6th</u> |
| Credit: <u>5</u> | L T P <u>4 1 0</u> | Duration: <u>55Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Demo Understand the concept of several modelling techniques and analyze the resulting systems | 1 | 1 | | | 3 | 1 | 2 | 3 | | | | | 3 | 1 | |
| CO2 | Analyse and construct mathematical models inspired by real life problems. | 1 | 2 | | 2 | 3 | 1 | 2 | 3 | | | | | 3 | 1 | 1 |
| CO3 | The use of mathematics software to observe the implementations of the above mentioned methods efficiently, and to enhance the problem solving skills. | 2 | 3 | | 2 | 2 | 2 | 1 | 2 | 3 | | 2 | | 3 | 2 | 1 |
| CO4 | Solve physical problems using differential equations. nstrate the steps of finite element methods in finding solution of Dynamic, Heat transfer , Solid Mechanic and Eigen | 1 | 2 | | 1 | 2 | 1 | | | | | | | 3 | 2 | |

| | | | | | | | | | | | | | | | | | |
|----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| value problems | | | | | | | | | | | | | | | | | |
|----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|

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|--------------------------------------|--------------------------------|--|
| Subject: Discrete Mathematics | Subject Code: BMAT1-621 | Semester: <u>6th</u> |
| Credit: <u>5</u> | L T P <u>4 1 0</u> | Duration: <u>55Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|------------|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Significant concepts of partial order relations, Recurrence relations, Boolean algebra, Lattices and Graph Theory. | | 1 | | 2 | | 3 | | | | | | | 3 | 2 | 2 |
| CO2 | To understand logical concepts and to show logical equivalences by using truth tables and rules in logics. | | | | 3 | 2 | | | | 2 | | 2 | | 2 | 1 | 2 |
| CO3 | Appreciate the definition and basics of graphs along with types and their examples. | | | | 2 | | 2 | | | | | 3 | | 2 | 1 | 2 |
| CO4 | Understand the definition of a tree and learn its applications to fundamental circuits. Know the applications of graph theory to network flows. Relate the graph theory to the real-world problems. | 1 | | | 1 | | 2 | | | | | 2 | | 2 | 1 | 2 |

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| Subject: Financial Mathematics | Subject Code: BMAT1-622 | Semester: <u>6th</u> |
| Credit: <u>5</u> | L T P <u>4 1 0</u> | Duration: <u>55Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|------------|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Quantitative analysis of financial transactions, understanding of different types of interest rates. | 1 | | 2 | 1 | | 2 | | 1 | | | 2 | | 3 | 1 | |
| CO2 | Accumulated sum of annual annuity and of P-due annuity. | | 1 | 1 | | 2 | | 2 | | | 2 | | | 2 | 1 | |
| CO3 | Understand the concepts related to financial transactions yield. | | | 2 | 2 | | | | | | 1 | | | 2 | 1 | |
| CO4 | Analyze real investments with different yields. | | | | | 2 | 3 | | 2 | | | 2 | | 2 | 1 | |



MAHARAJA RANJIT SINGH PUNJAB TECHNICAL UNIVERSITY BATHINDA-151001 (PUNJAB), INDIA

(A State University Estb. by Govt. of Punjab vide Punjab Act No. 5 of 2015 and Approved u/s 2(f) & 12 (B) of UGC; Member AIU)

Department: DEPARTMENT OF MATHEMATICS
MRSPTU MAIN CAMPUS ,BATHINDA

Program: B.SC(HONS)(2019)

COs, POs, PSOs Mapping

| | | |
|----------------------------|---------------------------------|--|
| Subject: Calculus-I | Subject Code: BMATS1-101 | Semester: <u>1st</u> |
| Credit: 4 | L T P <u>3 1 0</u> | Duration: <u>60Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|------------|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Apply the knowledge of basic concepts of calculus in order to study theoretical development of different mathematical techniques and their applications. | 2 | 1 | | 3 | 2 | 1 | 2 | | | 2 | 1 | 1 | 2 | 2 | |
| CO2 | Develop the skills to sketch the curves in a plane using its mathematical properties in the different coordinate systems of reference. | 1 | 3 | | 2 | | 1 | | | | | | | 1 | 1 | |
| CO3 | Apply derivatives for the computation of directional derivative and Optimization. | 2 | 1 | | 1 | 1 | 1 | 2 | | | 1 | 1 | 1 | 2 | 2 | |
| CO4 | Extend the knowledge of Partial derivatives of higher order for further exploration of the subject for going into higher education | 2 | 1 | | 1 | | | 2 | | | | | | 2 | 2 | |

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|---------------------------|---------------------------------|--|
| Subject: Algebra-I | Subject Code: BMATS1-102 | Semester: <u>1st</u> |
| Credit: 4 | L T P <u>3 1 0</u> | Duration: <u>60Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Understand the basic concepts of linear transformations, the Rank-Nullity Theorem, matrix of a linear transformation, algebra of transformations and the change of basis. | 3 | | | 2 | | | 1 | | | | 1 | | 1 | 2 | |
| CO2 | Analyze& solve problems related to Matrices, Quotient space, Homomorphism & Isomorphism of vector space and Null space etc. | 1 | | | 2 | 2 | | | 2 | | | 1 | | 2 | 1 | |
| CO3 | Recognize consistent and inconsistent systems of linear equations by the row echelon form of the augmented matrix, using rank. | 1 | | | 2 | 2 | | | | | | 1 | | 1 | 2 | |
| CO4 | Find eigenvalues and corresponding eigenvectors for a square matrix | 1 | | | 2 | 2 | | | 2 | | | | | 1 | 2 | |

| | | |
|----------------------------|---------------------------------|--|
| Subject: Analysis-I | Subject Code: BMATS1-103 | Semester: <u>1st</u> |
| Credit: <u>4</u> | L T P <u>3 1 0</u> | Duration: <u>60Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Understand many properties of the real line \mathbb{R} , including completeness and Archimedean properties | | | | 3 | | | | 2 | | | 3 | | 3 | 3 | |
| CO2 | Apply the ratio, root, and alternating series and limit comparison tests for convergence and absolute convergence of an infinite series of real numbers. | | | | | 1 | 1 | | 3 | | | 3 | | 3 | 2 | |
| CO3 | Understand the concept of continuous functions, uniform continuity and discontinuity | | | | 1 | | | | 2 | | | 2 | | 3 | 3 | |

| | | | | | | | | | | | | | | | | |
|------------|--|--|--|--|--|---|---|--|--|--|--|---|--|---|---|--|
| CO4 | Apply mean value theorem, Taylor's theorem | | | | | 3 | 1 | | | | | 1 | | 3 | 3 | |
|------------|--|--|--|--|--|---|---|--|--|--|--|---|--|---|---|--|

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|-------------------------------------|---------------------------------|--|
| Subject: Fortran Programming | Subject Code: BMATS1-104 | Semester: <u>1st</u> |
| Credit: <u>4</u> | L T P <u>3 1 0</u> | Duration: <u>60Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|------------|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Operating Systems, Linux, Windows and other Operating Systems, Open Source Foundation and GNU | | 1 | | | 1 | 1 | 1 | | 1 | 2 | 1 | 1 | 1 | 2 | 3 |
| CO2 | Programming and Problem Solving, Basic FORTRAN, Control Constructs. | 1 | 2 | 1 | | 2 | | 1 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 3 |
| CO3 | Skills for writing computational programs. | 1 | 2 | 1 | 1 | | 2 | | | 1 | 3 | 3 | 3 | 1 | 2 | 3 |
| CO4 | Different numerical techniques utilized in programming. | | 1 | 1 | 1 | 1 | 2 | | 1 | 2 | 3 | 3 | 3 | 1 | 2 | 3 |

| | | |
|---|---------------------------------|--|
| Subject: Fortran Programming lab | Subject Code: BMATS1-105 | Semester: <u>1st</u> |
| Credit: <u>1</u> | L T P <u>0 0 2</u> | Duration: <u>30Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|------------|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Use operating Systems, Linux, Windows and other Operating Systems, Open-Source Foundation and GNU | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 2 | 1 | 2 | 3 |
| CO2 | Use Programming and Problem Solving, Basic FORTRAN, Control Constructs. | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 3 |
| CO3 | Design and code mid-level problems. | 1 | 2 | 1 | 1 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 3 |

| | | | | | | | | | | | | | | | | | |
|------------|--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO4 | Understand basic programming concepts Isomorphism of vector space and Null space etc. | 2 | 2 | 1 | 1 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 3 |
|------------|--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| | | |
|-------------------------|---------------------------------|--|
| Subject: English | Subject Code: BHSMC0-001 | Semester: <u>1st</u> |
| Credit: <u>4</u> | L T P <u>3 1 0</u> | Duration: <u>60Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|------------|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | To know about the various dimensions of communication skills and to understand its importance | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 2 | 2 | | |
| CO2 | To comprehend the role of communication at different levels (verbal, non-verbal, official, and non-official). | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | |
| CO3 | To know about the intricacies of written communication for office use. | 1 | 2 | 1 | 1 | 1 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | | | 3 |
| CO4 | To make pupil prepare for presenting him/herself in interviews, GD etc. | 1 | 2 | 1 | 1 | 1 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 |

| | | |
|-----------------------------|---------------------------------|--|
| Subject: Calculus-II | Subject Code: BMATS1-201 | Semester: <u>2nd</u> |
| Credit: <u>4</u> | L T P <u>3 1 0</u> | Duration: <u>60Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|------------|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Apply the knowledge of advanced concepts of calculus in order to study theoretical development of different mathematical techniques and their applications. | 2 | 1 | | 3 | 2 | 1 | 2 | | | 2 | 1 | 1 | 2 | 2 | |
| CO2 | Use the idea of reduction formulae enables to solve an integral problem by reducing it to a problem of solving an easier integral problem | 1 | | | 1 | | 1 | 1 | | | | 2 | | 2 | 1 | |

| | | | | | | | | | | | | | | | | |
|------------|---|---|---|--|---|---|---|---|--|--|--|---|--|---|---|--|
| CO3 | Develop the knowledge of computing arc length, area and volume by using integration. | 1 | 2 | | 1 | 2 | 1 | 1 | | | | 1 | | 1 | 2 | |
| CO4 | Extend the knowledge of multiple integrals, scalar surface integrals, vector surface integrals and theorems of Green, Gauss and Stokes for exploring its use in physical sciences | 1 | 2 | | 1 | | 2 | | | | | 1 | | 2 | 2 | |

| | | |
|----------------------------|---------------------------------|--|
| Subject: Algebra-II | Subject Code: BMATS1-202 | Semester: <u>2nd</u> |
| Credit: <u>4</u> | L T P <u>3 1 0</u> | Duration: <u>60Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|------------|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Understand the concept of group, Ring and their properties. | 1 | | | 2 | | | 1 | | | | 2 | | 2 | 3 | |
| CO2 | Analyze& demonstrate different types of algebraic structures such as subgroups Normal subgroups and Quotient groups to understand and use the fundamental results in Algebra. | 1 | | | 2 | 2 | | 2 | | | | 2 | | 2 | 1 | |
| CO3 | Apply the concepts of isomorphism and homomorphism for groups and rings to solve different types of problems. | 1 | | | 2 | | 2 | 2 | | | | 1 | | 2 | 3 | |
| CO4 | Access the idea of inner product space and determine its orthogonally on vector space, including gram – Schmidt orthogonalisation to obtain orthonormal basis | 1 | | | 2 | | | 2 | | | | 2 | | | 1 | |

| | | |
|-----------------------------|---------------------------------|--|
| Subject: Analysis-II | Subject Code: BMATS1-203 | Semester: <u>2nd</u> |
| Credit: <u>4</u> | L T P <u>3 1 0</u> | Duration: <u>60Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|------------|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Compare countable and uncountable sets | 2 | | 1 | 2 | | | | | | | 3 | | 3 | 2 | |
| CO2 | Apply various tests uniform convergence | | | 1 | 2 | 2 | | | | | | 1 | | 3 | 2 | |

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|------------|--|--|--|---|---|--|---|--|--|--|--|---|--|---|---|---|
| CO3 | Understand the interchange of limit ,derivative, integrals | | | | 3 | | 1 | | | | | 1 | | 3 | 2 | 1 |
| CO4 | Understand the concept of metric spaces | | | 1 | 3 | | | | | | | 2 | | 3 | 2 | |

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|--|---------------------------------|--|
| Subject: Fundamentals of Computer and C Programming | Subject Code: BMATS1-204 | Semester: <u>2nd</u> |
| Credit: <u>4</u> | L T P <u>3 1 0</u> | Duration: <u>60Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|------------|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Implement programs using C. | 1 | 2 | 3 | | | | | | | | | | 2 | 1 | 3 |
| CO2 | Implement fundamental data structures in C. | 3 | 1 | | | | | | | | 2 | | | 2 | 1 | 3 |
| CO3 | Understand the fundamentals of hardware, software, and programming. | | | | | | | | | | | | 3 | 2 | 1 | 3 |
| CO4 | Understand the logic building used in Programming. | | | | | 2 | | 1 | | | | | | 2 | 1 | 3 |

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|--|---------------------------------|--|
| Subject: Fundamentals of Computer and C Programming Lab | Subject Code: BMATS1-205 | Semester: <u>2nd</u> |
| Credit: <u>1</u> | L T P <u>0 0 2</u> | Duration: <u>30Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|------------|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Implement programs using C | 1 | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 2 | 1 | 2 | 3 |
| CO2 | Implement fundamental data structures in C. Isomorphism of vector space and Null space etc. | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 3 |
| CO3 | Write the programming solutions for solving various real-life problems. augmented matrix, using rank. | 1 | 2 | 1 | 1 | 1 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 3 |
| CO4 | Implement Programs with pointers and arrays, perform pointer arithmetic, and use the pre-processor. | 1 | 2 | 1 | 1 | 1 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 3 |

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|---------------------------------------|---------------------------------|--|
| Subject: Environmental Science | Subject Code: BMNCC0-003 | Semester: <u>2nd</u> |
| Credit: <u>4</u> | L T P <u>3 1 0</u> | Duration: <u>60Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Understand the value of non-renewable Resources such as petroleum and natural gas. | 1 | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 2 | | 3 | |
| CO2 | Learn that how the bodies of living organisms decomposes after death. | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | | 2 | |
| CO3 | Find out the causes of distinct sorts of pollution and their solutions | 1 | 2 | 1 | 1 | 1 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | | 3 | |
| CO4 | Grasp knowledge that how the rain water can be stored and used while climate changes like draught. | 1 | 2 | 1 | 1 | 1 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | | 2 | |

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|--|---------------------------------|--|
| Subject: Differential equations-I | Subject Code: BMATS1-301 | Semester: <u>3rd</u> |
| Credit: <u>4</u> | L T P <u>3 1 0</u> | Duration: <u>60Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Understand the concept of ordinary differential equation, formation and order and degree of differential equation etc. | 2 | | | 2 | 1 | 2 | 2 | 3 | | | 1 | | 2 | 3 | 1 |
| CO2 | Apply various methods to Solve first order non-linear differential equation and linear differential equations of higher order | 1 | | | 3 | 1 | 2 | 2 | 3 | | | 2 | | 3 | 2 | |
| CO3 | Apply various power series methods to find series solution of differential equations. | 2 | | | 3 | 1 | 2 | 1 | 1 | | | 1 | | 1 | 2 | |
| CO4 | Apply differential equations to significant applied and theoretical problems. | 2 | | | 3 | 1 | 2 | 2 | 2 | | | 1 | | 1 | 2 | |

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|---|---------------------------------|--|
| Subject: Mathematical statistics | Subject Code: BMATS1-302 | Semester: <u>3rd</u> |
| Credit: <u>4</u> | L T P <u>3 1 0</u> | Duration: <u>60Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Understand and use the concept of probability theory and statistics to solve industrial problems | 2 | 1 | | 2 | 3 | | 1 | | | 2 | 1 | 1 | 2 | | |
| CO2 | Define and examine the random sampling and graphical methods with technology | 1 | 3 | | 2 | 1 | 1 | 1 | | | | | | 2 | | 2 |
| CO3 | Recognize and compute the sampling distributions, sampling distributions of means and variances (S ²) and the tand F-distributions | 2 | 1 | | 1 | 1 | 1 | 2 | | | 1 | 1 | 1 | 2 | | 1 |
| CO4 | Recognize the relationship between the confidence interval estimation and tests of hypothesis | 2 | 1 | 3 | 1 | 1 | | 2 | | | | 1 | | 1 | | 1 |

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|--------------------------|----------------------------------|--|
| Subject: Geometry | Subject Code: BMATS1--303 | Semester: <u>3rd</u> |
| Credit: <u>4</u> | L T P <u>3 1 0</u> | Duration: <u>60Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Understand the relationship between different coordinate systems, transformation of axes and intersection of three planes. | 1 | 3 | | 1 | | 1 | | | | | | | 1 | 1 | |
| CO2 | Apply the knowledge to obtain the equation of cone, enveloping cone, tangent plane, reciprocal cone of given cone and prove their results. | 1 | 2 | | 1 | | 1 | | | | | | | 1 | 1 | |
| CO3 | Develop the equation of cylinder, right circular cylinder, enveloping cylinder. | 1 | 2 | | 1 | | 1 | | | | | | | 1 | 1 | |
| CO4 | Introduce the family of spheres passing through a circle, tangent planes and normal lines to a sphere and radical planes. | 1 | 2 | | 1 | | 1 | | | | | | | 2 | 1 | |

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|-------------------------------|---------------------------------|--|
| Subject: Number Theory | Subject Code: BMATS1-304 | Semester: <u>3rd</u> |
| Credit: 4 | L T P <u>4 1 0</u> | Duration: <u>60Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Find quotients and remainders from integer division, Division algorithm, Apply Euclid's algorithm for the greatest common divisor, Linear Diophantine equations, Prime numbers | 1 | 3 | | 1 | | 1 | 2 | | | | | | 1 | | |
| CO2 | Learn about congruence, residue classes and least residues add and subtract integers, modulo n, multiply integers and calculate powers, modulo n, Simultaneous linear congruence's | 1 | 2 | | 1 | | 1 | 2 | | | | | | 1 | | |
| CO3 | Familiarize with Arithmetic modulo p and related theorems, Solving congruence modulo prime powers. | 1 | 2 | | 1 | | 1 | 2 | | | | | | 1 | | |
| CO4 | Learn about Euler's Phi function, Euler's theorem and properties of the Phi Function | 1 | 2 | | 1 | | 1 | 3 | | | | | | 1 | | |

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|---|---------------------------------|--|
| Subject: Object Oriented Programming | Subject Code: BMATS1-305 | Semester: <u>3rd</u> |
| Credit: 4 | L T P <u>3 1 0</u> | Duration: <u>60Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Implement programs using C++. | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 2 | 1 | 2 | 3 |
| CO2 | Implement fundamental data structures in C++. | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 3 |
| CO3 | Learn various concepts of object-oriented approach towards problem solving. | 1 | 2 | 1 | 1 | 1 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 3 |
| CO4 | Create computer-based solutions to various real-world problems using Objectoriented programming. | 1 | 2 | 1 | 1 | 1 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 3 |

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|---|---------------------------------|--|
| Subject: Object Oriented Programming lab | Subject Code: BMATS1-306 | Semester: <u>3rd</u> |
| Credit: <u>1</u> | L T P <u>0 0 2</u> | Duration: <u>30Hrs.</u> |

| Cos | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|------------|--|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|-------------|
| CO1 | Implement programs using C++. | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 2 | 1 | 2 | 3 |
| CO2 | Implement fundamental data structures in C++. | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 3 |
| CO3 | Learn programming from real world examples. | 1 | 2 | 1 | 1 | 1 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 3 |
| CO4 | Create simple programs using classes and objects | 1 | 2 | 1 | 1 | 1 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 3 |

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|---|---------------------------------|--|
| Subject: Differential equations-II | Subject Code: BMATS1-401 | Semester: <u>4th</u> |
| Credit: <u>4</u> | L T P <u>3 1 0</u> | Duration: <u>60Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|------------|--|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|-------------|
| CO1 | Understand the concept of partial differential equation of first order (linear and nonlinear). | 2 | | | 2 | 1 | 2 | 2 | 3 | | | 1 | | 2 | 2 | |
| CO2 | Solve partial differential equations (linear and nonlinear) using various methods and apply these methods in solving some physical problems. | 1 | | | 3 | 1 | 2 | 2 | 3 | | | 2 | | 1 | 2 | |
| CO3 | Understand the formation and solution of some significant PDEs like wave equation, heat equation and diffusion equation | 2 | | | 3 | 1 | 2 | 1 | 1 | | | 1 | | 2 | 1 | |
| CO4 | Undertake any advanced course on ordinary as well as partial differential equations | 2 | | | 3 | 1 | 2 | 2 | 2 | | | 1 | | 2 | 1 | |

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|--------------------------------|---------------------------------|--|
| Subject: Linear Algebra | Subject Code: BMATS1-402 | Semester: <u>4th</u> |
| Credit: 4 | L T P 3 1 0 | Duration: <u>60Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Apply the knowledge of Algebra which enables to build mathematical thinking and skill. | 1 | 2 | | | | | | | | | 1 | | 2 | | |
| CO2 | Analyze& solve problems related to Rank and Nullity of linear transformation etc. | 2 | | 1 | 3 | | | | | | | | | 2 | | |
| CO3 | Find eigenvalues and corresponding eigenvectors for a square matrix. | 2 | | | 1 | | | 2 | 1 | | | | | 1 | | |
| CO4 | Identify the problems in mathematics and find their suitable solution. | 1 | | 1 | 2 | | | 3 | | | | | | 2 | | |

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|-----------------------------|---------------------------------|--|
| Subject: Mechanics-I | Subject Code: BMATS1-403 | Semester: <u>4th</u> |
| Credit: 4 | L T P 3 1 0 | Duration: <u>60Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Use Lagrange's equation for deriving equation of motions | | | 2 | 2 | 3 | | | | | 2 | | | 1 | 3 | |
| CO2 | Apply the knowledge in Dynamics at higher levels. | | | 1 | 2 | 3 | 3 | 2 | | | 2 | | | 3 | | |
| CO3 | Learn that a particle moving under a central force describes a plane curve and know the Kepler's laws of the planetary motions, which were deduced by him long before the mathematical theory given by Newton. | | | 2 | 1 | 2 | 3 | | | | | | | 2 | 3 | |
| CO4 | Study mechanical systems under generalized coordinate systems, Virtual work, Energy and momentum, to study mechanics developed by Lagrange, Hamilton, Jacobi and small oscillation | | | | 3 | | 2 | 3 | 3 | | 3 | 2 | | 2 | 3 | |

| | | |
|-----------------------------------|---------------------------------|--|
| Subject: Numerical Methods | Subject Code: BMATS1-404 | Semester: <u>4th</u> |
| Credit: 4 | L T P 3 1 0 | Duration: <u>60Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Learn various types of numerical methods to find the roots of nonlinear equations and solution of a system of linear equations. | 3 | 3 | | 2 | 3 | 1 | 2 | 2 | | | 2 | | 2 | 1 | 2 |
| CO2 | Find values for a tabulated function using Interpolation techniques. | 1 | 2 | | 3 | 2 | 1 | 2 | | | | 2 | | 1 | 2 | 1 |
| CO3 | Apply these numerical methods to solve ordinary differential equation. | 2 | | | 3 | 2 | 1 | 1 | 2 | | | 1 | | 3 | 1 | 2 |
| CO4 | Introduce the basic concepts of Numerical Mathematics to solve the problems arising in science and engineering etc. | 1 | 1 | | 3 | 3 | 1 | 2 | 1 | | | 2 | | 1 | 3 | 2 |

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|-----------------------------|---------------------------------|--|
| Subject: Latex and R | Subject Code: BMATS1-405 | Semester: <u>4th</u> |
| Credit: 4 | L T P 3 1 0 | Duration: <u>60Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Use Latex, Basic tools for Formatting text. | | 2 | 2 | | | | | | 1 | | | | 2 | 2 | 2 |
| CO2 | Producing Mathematical Formulae using Latex. | | | 1 | | | 3 | 2 | | | 2 | | | 2 | 1 | 2 |
| CO3 | Able to formulate arrays and matrices | | 2 | | 1 | | 2 | | | | 2 | | | 2 | 2 | 3 |
| CO4 | Consequently students can write research papers and prepare presentations. | | | | 3 | | 2 | | | | | 2 | | 2 | 1 | 2 |

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|---------------------------------|--------------------------------|--|
| Subject: Latex and R lab | Subject Code: BMATS1-40 | Semester: <u>4th</u> |
| Credit: <u>1</u> | L T P <u>0 0 2</u> | Duration: <u>30Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Use Latex, Basic tools for Formatting text | | 2 | 2 | | | | | | 1 | | | | 2 | | 3 |
| CO2 | Producing Mathematical Formulae using Latex | | | 1 | | 3 | 2 | | | 2 | | | | 1 | 2 | 3 |
| CO3 | Arrays and Matrices | 2 | | | 1 | | 2 | | | | 2 | | | 1 | | 3 |
| CO4 | Consequently students can write research papers and prepare presentations. | | | | 3 | | 2 | | 3 | | | 2 | | 2 | 2 | 3 |

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|------------------------------|---------------------------------|--|
| Subject: Mechanics-II | Subject Code: BMATS1-501 | Semester: <u>5th</u> |
| Credit: <u>4</u> | L T P <u>3 1 0</u> | Duration: <u>60Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Thorough understanding of dynamics is essential to understanding any modern development of Physical sciences. | | | 2 | 2 | 3 | | | | | 2 | | | 1 | 3 | |
| CO2 | Learn that a particle moving under a central force describes a plane curve and know the Kepler's laws of the planetary motions, which were deduced by him long before the mathematical theory given by Newton. | | | 1 | 2 | 2 | 3 | 2 | | | 2 | | | 2 | 3 | |
| CO3 | Mechanics and its applications are an excellent example of how physics and mathematics work hand in hand to give a complete picture of the real problems. | | | 2 | 1 | 2 | 3 | | | | | | | 3 | 1 | |
| CO4 | Reduction of two-body central force problem to an equivalent one-body problem, Central force motion in a plane. | | | | 3 | | 2 | 3 | 3 | | 3 | 2 | | 2 | 2 | |

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|--------------------------------------|---------------------------------|--|
| Subject: Mathematical Methods | Subject Code: BMATS1-502 | Semester: <u>5th</u> |
| Credit: 4 | L T P <u>3 1 0</u> | Duration: <u>60Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Fourier series and its applications. | | | 2 | 2 | 3 | | | | | 2 | | | 3 | 3 | |
| CO2 | Fourier transform and its applications to P.D.E | | | 1 | 2 | 2 | 3 | 2 | | | 2 | | | 3 | 2 | |
| CO3 | Laplace transform and its applications to solutions of integrals and Differential Equations. | | | 2 | 1 | 2 | 3 | | | | | | | 2 | 2 | |
| CO4 | Z-transforms and inverse Z-transforms and its importance in context of Difference equations. | | | | 3 | | 2 | 3 | 3 | | 3 | 2 | | 2 | 1 | |

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|---------------------------------------|---------------------------------|--|
| Subject: Differential Geometry | Subject Code: BMATS1-503 | Semester: <u>5th</u> |
| Credit: 4 | L T P <u>3 1 0</u> | Duration: <u>60Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Students will be at ease to understand the various curves in space | | 2 | | 3 | | 1 | | | | | | | 2 | | |
| CO2 | Students will be able to understand the behavior of the curves in various situations. | | | | 2 | 2 | | | | | | 2 | | | 1 | |
| CO3 | Students will be able to understand the Concept of surface | | | | 2 | | 2 | | | | | 2 | | 2 | | |
| CO4 | Students will be able to understand geodesics | | | | 1 | | | | | | | 2 | | 1 | | |

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|--|---------------------------------|--|
| Subject: Finite Element Methods | Subject Code: BMATS1-504 | Semester: <u>5th</u> |
| Credit: <u>4</u> | L T P <u>3 1 0</u> | Duration: <u>60Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Demonstrate the steps of finite element methods in finding solution of Dynamic, Heat transfer, Solid Mechanic and Eigen value problems | | | 2 | 2 | 3 | | | | | | | | 2 | 3 | |
| CO2 | Analyse the real time situations and convert it into Finite Methods to find solutions | | | 1 | 2 | | | 2 | | | | | | 2 | | |
| CO3 | Solve the Ordinary differential equations with Finite Element Method | 2 | | | 1 | | 2 | | | | | | | 3 | | |
| CO4 | Solve Elliptic, Hyperbolic and Parabolic P.D.E by Finite Element Method | | | | 3 | | 2 | | 3 | | | 2 | | 3 | 1 | |

| | | |
|-------------------------|---------------------------------|--|
| Subject: MATLAB | Subject Code: BMATS1-505 | Semester: <u>5th</u> |
| Credit: <u>4</u> | L T P <u>3 1 0</u> | Duration: <u>60Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Use MatLab for Basic mathematics computations | 1 | 2 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 2 | 1 | | 3 |
| CO2 | Creating M-files, working with script tools and also writing script file | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 2 |
| CO3 | Program scripts and functions using the MatLab development environment, Able to use basic flow controls (if else, for, while). | 1 | 2 | 1 | 1 | 1 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | | 2 |
| CO4 | Use matlab for calculus, numerical integration and other mathematical operations. | 1 | 2 | 1 | 1 | 1 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 1 | | 3 |

| | | |
|----------------------------|---------------------------------|--------------------------------|
| Subject: MATLAB Lab | Subject Code: BMATS1-506 | Semester: <u>5th</u> |
| Credit: <u>1</u> | L T P <u>0 0 2</u> | Duration: <u>15Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Understand the main features of the MatLab development environment | 1 | 2 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 2 | 2 | 2 | 3 |
| CO2 | Design simple algorithms to solve problems | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 3 |
| CO3 | Write simple programs in MaTLab to solve scientific and mathematical problems | 1 | 2 | 2 | 1 | 1 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 1 | 1 | 3 |
| CO4 | Understand the main features of the MATLAB/SCILAB program development environment. | 1 | 2 | 1 | 1 | 1 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 2 |

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|-------------------------|---------------------------------|--------------------------------|
| Subject: LPP | Subject Code: BMATS1-601 | Semester: <u>6th</u> |
| Credit: <u>4</u> | L T P <u>3 1 0</u> | Duration: <u>60Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Introduce and formulate linear programming models of real life situations. | 1 | 2 | | | | | | | | | | 1 | 1 | 1 | |
| CO2 | Understand the selection and implementation of graphical solution and variants of simplex method for the solution of LPP. | | 1 | | 1 | 2 | 1 | 1 | | | 1 | 1 | 2 | 2 | 2 | |
| CO3 | Develop the relationships between the primal and dual problems and their solutions. | | | | 1 | 2 | | | | | | 1 | 2 | 1 | | |
| CO4 | Apply the knowledge to solve two-person zero-sum game problems | 1 | 1 | | | 2 | 1 | 1 | | | | 2 | 2 | 1 | 1 | |

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|----------------------------------|---------------------------------|--|
| Subject: Complex Analysis | Subject Code: BMATS1-602 | Semester: <u>6th</u> |
| Credit: <u>4</u> | L T P <u>3 1 0</u> | Duration: <u>60Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Understand calculus of complex functions also concept and consequences of analyticity and Cauchy-Riemann equations . | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 1 | 1 | 1 | 3 | 1 | |
| CO2 | Understanding Geometrical interpretation of Complex functions especially bilinear and conformal transformations. | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 1 | 1 | 1 | 3 | 1 | |
| CO3 | Formulation of analytic functions and their applications. | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 1 | 1 | 1 | 3 | 2 | |
| CO4 | Represent complex functions as Taylor, power and Laurent series, classification of singularities . | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 1 | 1 | 1 | 3 | 3 | |

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| Subject: Mathematical Modelling | Subject Code: BMATS1-603 | Semester: <u>6th</u> |
| Credit: <u>4</u> | L T P <u>3 1 0</u> | Duration: <u>60Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Demo Understand the concept of several modelling techniques and analyze the resulting systems | 1 | 1 | | | 3 | 1 | 2 | 3 | | | | | 3 | 1 | |
| CO2 | Analyse and construct mathematical models inspired by real life problems. | 1 | 2 | | 2 | 3 | 1 | 2 | 3 | | | | | 3 | 1 | 1 |
| CO3 | The use of mathematics software to observe the implementations of the above mentioned methods efficiently, and to enhance the problem solving skills. | 2 | 3 | | 2 | 2 | 2 | 1 | 2 | 3 | | 2 | | 3 | 2 | 1 |
| CO4 | Solve physical problems using differential equations. nstrate the steps of finite element methods in finding solution of Dynamic, Heat transfer , Solid Mechanic and Eigen value problems | 1 | 2 | | 1 | 2 | 1 | | | | | | | 3 | 2 | |

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| Subject: Discrete Mathematics | Subject Code: BMATS1-604 | Semester: <u>6th</u> |
| Credit: <u>4</u> | L T P <u>3 1 0</u> | Duration: <u>60Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Significant concepts of partial order relations, Recurrence relations, Boolean algebra, Lattices and Graph Theory. | | 1 | | 2 | | 3 | | | | | | | 3 | 2 | 2 |
| CO2 | To understand logical concepts and to show logical equivalences by using truth tables and rules in logics. | | | | 3 | 2 | | | | 2 | | 2 | | 2 | 1 | 2 |
| CO3 | Appreciate the definition and basics of graphs along with types and their examples. | | | | 2 | | 2 | | | | | 3 | | 2 | 1 | 2 |
| CO4 | Understand the definition of a tree and learn its applications to fundamental circuits. Know the applications of graph theory to network flows. Relate the graph theory to the real-world problems. | 1 | | | 1 | | 2 | | | | | 2 | | 2 | 1 | 2 |

| | | |
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| Subject: Financial Mathematics | Subject Code: BMATS1-605 | Semester: <u>6th</u> |
| Credit: <u>4</u> | L T P <u>3 1 0</u> | Duration: <u>60Hrs.</u> |

| COs | Statement | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | Quantitative analysis of financial transactions, understanding of different types of interest rates. | 1 | | 2 | 1 | | 2 | | 1 | | | 2 | | 3 | 1 | |
| CO2 | Accumulated sum of annual annuity and of P-due annuity. | | 1 | 1 | | 2 | | 2 | | | 2 | | | 2 | 1 | |
| CO3 | Understand the concepts related to financial transactions yield. | | | 2 | 2 | | | | | | 1 | | | 2 | 1 | |
| CO4 | Analyze real investments with different yields. | | | | | 2 | 3 | | 2 | | | 2 | | 2 | 1 | |

Enter Correction levels 1, 2 or 3 as defined below:

1. Slight (Low) - upto 30%
2. Moderate (Medium) –above 30% and upto 70%
3. Substantial (High) – above 70%

Enter Correction levels 1, 2 or 3 as defined below:

1. Slight (Low) - upto 30%
2. Moderate (Medium) –above 30% and upto 70%
3. Substantial (High) – above 70%