

(i) MATHEMATICS –CBCS COURSE T.D.C (HONOURS)

Semester	Course code	COURSE OUTCOME
1 <sup>ST</sup> sem HONOURS	(a) MAT-HC-1016 (Calculus)	<ol style="list-style-type: none"><li>1. Students will be able to solve limit, functions, derivatives, integrals and infinite series problems of vector functions.</li><li>2. They will be able to apply the scientific method of analysis.</li><li>3. They will be able to understand reduction formula to solve integrals.</li></ol>
	(b) MAT-HC-1026 (Algebra)	<ol style="list-style-type: none"><li>1. They will have developed analytical skills for practical applications in business, science, health care and other non-technical fields.</li><li>2. They will have learned solve linear equations and matrix equations.</li><li>3. They will be able to apply the properties of determinates in their calculations.</li></ol>
1 <sup>ST</sup> SEM HONORS GENERIC/ REGULAR	MAT-HG-1016 MAT-RC-1016 (Calculus)	<ol style="list-style-type: none"><li>1. Students will be able to solve limit, functions, derivatives, integrals and infinite series problems.</li><li>2. They will be able to learn the scientific method of analysis.</li></ol>

		3. They will be able to understand changes over tiny intervals of time.
2 <sup>ND</sup> SEM HONOURS	(a) MAT-HC-2016 (Real Analysis)	<ol style="list-style-type: none"> <li>1. Students will be able to learn about concepts such as sequences and their limits, continuity, differentiation, integration and sequences of functions.</li> <li>2. They will be able to learn to describe the real line as a complete ordered field.</li> <li>3. They will have knowledge about commonly used tests for convergence of infinite series.</li> </ol>
	(b) MAT-HC-2026 (Differential equations)	<ol style="list-style-type: none"> <li>1. They will be able to learn to calculate the movement or flow of electricity, motion of an object and explain thermodynamics concept.</li> <li>2. They will be able to construct and find solutions of mathematical models in the form of differential equations.</li> <li>3. They will be able to learn how to determine the growth of population.</li> </ol>

		4. They will have knowledge about various methods of solving differential equations and make qualitative analysis of the behaviours of solutions along with existence and uniqueness problems.
2 <sup>ND</sup> SEM HONOURS GEN/REGULAR	MAT-HG-2016 MAT-RC-2016 (Calculus)	<ol style="list-style-type: none"> <li>1. Students will be able to solve limit, functions, derivatives, integrals and infinite series problems.</li> <li>2. They will be able to learn the scientific method of analysis.</li> <li>3. They will be able to understand changes over tiny intervals of time.</li> </ol>
3 <sup>RD</sup> SEM HONOURS	(a) MAT-HC-3016 (a) (Theory of real functions)	<ol style="list-style-type: none"> <li>1. They will be able to learn to describe the fundamental properties of real numbers.</li> <li>2. They can know to map a subset of set of real numbers to the set of real numbers.</li> </ol>
	(b) MAT-HC-3026 (Group Theory)	<ol style="list-style-type: none"> <li>1. They will be able to learn about algebraic objects called groups which are used to model and hence study the symmetries of a certain object.</li> <li>2. They will be able to understand</li> </ol>

		terms such as homomorphism and isomorphism and the concept of conjugacy.
	(c) MAT-HC-3036 (Analytical geometry)	<ol style="list-style-type: none"> <li>1. Students will be able to learn the correspondence between geometric curves and algebraic equations.</li> <li>2. Develops knowledge about geometrical shapes like sphere, cone, cylinder.</li> <li>3. They will be able to learn to use analytical geometry in physics, engineering, aviation rocket and space science.</li> </ol>
<b>(i) SEC-1(HON/REG)</b>		
3 <sup>RD</sup> SEM HONORS GEN/REG	MAT-SE-3014	<ol style="list-style-type: none"> <li>1. Students will understand the basic foundations of mathematics.</li> <li>2. They will be able to compute various mathematical problems using software like mathematical, mat lab etc.</li> <li>3. They will have enhanced problem solving skills.</li> <li>4. They will be able to code a mathematical problem into a software programme using the computer.</li> </ol>

<p>3<sup>RD</sup> SEM HONORS GEN/REG</p>	<p>MAT-HG-3016 MAT-RC-3016 (Differential calculus)</p>	<ol style="list-style-type: none"> <li>1. Students will be able to solve linear and exact differential equations.</li> <li>2. They will be able to find orthogonal and oblique trajectories in Cartesian co-ordinates.</li> </ol>
<p>4<sup>th</sup> sem Honours</p>	<p>MAT-HC-4016 Multivariate Calculus</p>	<p>Students will develop knowledge If limit and continuity partial and differentiation of higher orders.</p> <ul style="list-style-type: none"> <li>• They will learn about gradient and its normal properties. Also about tangent planes and normal lines.</li> <li>• They will be able to solve problems on maxima and minima of functions of two or more variables and how solve by method by method and languages multipliers.</li> <li>• They will also learn about vectors and divergence and curl and vectors .</li> <li>• They will be able to solve problems on double and triple integral and hence find volume in cylindrical</li> </ul>

		<p>and spherical co-ordinates.</p> <ul style="list-style-type: none"> <li>• They will also be able to solve problems on line integrals and its applications to find mass and work area and surface integrals.</li> </ul>
	<p>MAT-HC-4026 Numerical Methods</p>	<p>The students will learn to drive numerical methods different mathematical operations such as interpolation numerical differentiation in integration by the Simpson's Rule Euler's method and analyze and evaluate the accuracy of common numerical methods.</p> <ul style="list-style-type: none"> <li>• They will also be able to use CAS like mathematical for different numerical programs on the computers.</li> </ul>
IV	<p>MAT-HC-4036 Ring Theory</p>	<p>Students will be able to write definitions of various objects in theory, give examples they will gain knowledge of ideals, quotient rings, integral domain and field. Also learn about polynomials rings, fundamental properties of finite fields.</p>

<p><b>SEC-2(HON/REG)</b></p>	<p>MAT-SE-4014 R Programming</p>	<p>After completing R-Programming attendants should be able to</p> <ul style="list-style-type: none"> <li>• understand the basics in the terms of construct, control statements.</li> <li>• Understand the use of R for big data analysis and apply R for text processing.</li> </ul>
	<p>MAT-HG-4016/MAT-RC-4016 Real Analysis.</p>	<p>Students will be able to understand properties of the real line <math>\mathbb{R}</math> and define sequences from <math>\mathbb{R}</math> to <math>\mathbb{R}</math>.</p> <ul style="list-style-type: none"> <li>• Distinguish bounded convergent divergent, Cauchy and monotonic sequences and calculate their limits.</li> <li>• Apply various tests link ratio, root, comparison test for convergence and absolute convergence of an infinite series.</li> </ul>
<p>5<sup>TH</sup> SEM HONORS</p>	<p>MAT-HC-5016 Riemann Integration and Metric spaces</p>	<p>The students will be able to</p> <ul style="list-style-type: none"> <li>• learn some properties of Riemann integral functions and the application of fundamental theorem of integration</li> </ul>

		<ul style="list-style-type: none"> <li>• learn about metric spaces and its application.</li> <li>• Learn about continuous, sequential uniform mappings. Also about Homomorphism and connectedness.</li> </ul>
	MAT-HC-5026 LINEAR ALGEBRA	<p>The students will be able to understand</p> <ul style="list-style-type: none"> <li>• concept of vector spaces, sub spaces, bases, dimension's.</li> <li>• matrices and linear transformation relation compute eigenvalues and eigenvectors of linear transformations.</li> <li>• Learn properties of inner product spaces and their orthogonality.</li> </ul>
<b>SEC-3 REGULAR</b>		
	MAT-SE-5014 Combinatorics and graph theory	<p>The students will have knowledge of</p> <ul style="list-style-type: none"> <li>• Concepts in combinatorial graph theory and how graphs serves as models for many standard problems.</li> </ul>



		<ul style="list-style-type: none"> <li>• Know graphs trees Euler's graphs</li> <li>• Paths and cycles, social networks exploring and travelling</li> <li>• Eulerian and Hamiltonian graphs</li> <li>• Knights tour problem and gray codes.</li> </ul>
<b>DSE-1 (HONORS/REGULAR)</b>		
	MAT-HE-5016 MAT-RE-5116 NUMBER THEORY	They will <ul style="list-style-type: none"> <li>• Learn about the Linear Diophantine equation, goldbach conjecture, linear congruence's , the Chinese Remainder theorem Wilsons theorem.</li> <li>• Also learn about number theoretic function, multiplicative functions the Mobius inversion formula.</li> <li>• Know about the Euler's phi-function and some of its properties.</li> </ul>
	DSE-2 (HONORS) MAT-HE-5046 Linear Programming	Students should be able to <ul style="list-style-type: none"> <li>• Explain LPP with different type of methods like simplex</li> </ul>

		<p>method, Big-M Method, two phase method.</p> <ul style="list-style-type: none"> <li>• Understand about different matrix forms, hyper planes and convex and polyhedral sets.</li> <li>• Solve basics feasible solutions.</li> <li>• Understand about principles of duality in LPP and the Fundamental theorem of duality. Also understand and solve transportation and assignment problems.</li> </ul>
	<p>MAT-HE-5056 Spherical trigonometry and astronomy</p>	<p>After completion of this course students will be able</p> <ul style="list-style-type: none"> <li>• State sphere, spherical triangles, polar triangles and related definition.</li> <li>• Solve spherical trigonometry related examples.</li> <li>• Understand celestial sphere and its different astronomical phenomena.</li> <li>• Understand planetary motion of the sun and planet. Deduce Kepler's law from Newton's law of gravitation</li> </ul>

		laws of refraction and Cassini's Hypothesis.
	MAT-HE-5066 Programming in C	<p>The students after completion of the course will have.</p> <ul style="list-style-type: none"> <li>• Fundamental understanding of different components of a computer</li> <li>• Learn machine level language structure of a C program and its operations.</li> <li>• Understanding of control statements.</li> <li>• Concept of arrays and subscripted variables and properties.</li> <li>• Knowledge of practical programming like find roots a quadratic equations Fibonacci members , square root, cube roots of a number and many other mathematical functions with th help of a computer.</li> </ul>
<b>6<sup>TH</sup> SEM HONORS</b>		
6 <sup>TH</sup> SEM HONORS	MAT-HC-6016 Complex Analysis	After completion of this course 'student will have

		<ul style="list-style-type: none"> <li>• Understood properties of complex numbers and their differentiation ,problem</li> <li>• Explain Cauchy Riemann equations and limits and continuity</li> <li>• Understanding of analytics functions examples and exponential , logarithmic trigonometric functions and their derivatives.</li> <li>• Understanding of contours and their integrals and examples</li> <li>• Learn about anti-derivative, Cauchy Goursat theorems also Cauchy integral formula, Liouirles’s theorem and fundamental theorem of algebra</li> <li>• Ability to perform lab mark ona computer using Matt lab / mathematica</li> </ul>
	<p style="text-align: center;">MAT-HC-6026 Partial differentiation equations</p>	<p>Students will be able to</p> <ul style="list-style-type: none"> <li>• Apply different methods to solve first order partial differential equations like Cauchy, charpits and jacobis</li> </ul>

		<p>methods</p> <ul style="list-style-type: none"> <li>• Understand canonical forms of ped and reduction to canonical forms</li> <li>• Perform lab work on a computer using matt labs/mathematica/etc to solve various problems on ped</li> </ul>
	<p>DSE-3(HONORS) MAT-HE-6016 Boolean algebra and automata theory</p>	<p>Students will have knowledge about</p> <ul style="list-style-type: none"> <li>• Definitions, examples and basic properties of ordered sets. Also about dual of an ordered set and various properties</li> <li>• Lattices and their types and examples</li> <li>• Boolean algebra and Boolean functions and switching circuits</li> <li>• Understand alphabets, strings and languages like finite automata and regular and their relationship. Also various aspects of automata language</li> </ul>
	<p>MAT-HE-6026 Bio-mathematics</p>	<p>Students will have learn about</p> <ul style="list-style-type: none"> <li>• Basic concepts and definitions of various mathematical models and linear systems</li> </ul>

		<ul style="list-style-type: none"> <li>• Population growth model, cell division, predator prey model and administrative of drugs and epidemics</li> <li>• Stability and modeling of biological phenomenon</li> <li>• Bifurcation and chaos of a limit cycle</li> <li>• Modeling molecular evolution and genetic</li> </ul>
	MAT-HE-6036 Mathematical modelling	<p>Students will have knowledge of</p> <ul style="list-style-type: none"> <li>• Power series solution of a differential equation about an ordinary point and singular solution about a point . the methods of frobenius, legendre's and bessels</li> <li>• Laplace transform and inverse transform</li> <li>• Monte carlo simulation modeling and some more models</li> <li>• Performing lab work in a computer using MATLAB/mathematica/tc</li> </ul>
	MAT-HE-6046 hydromechanics	<p>Students will have knowledge of</p> <ul style="list-style-type: none"> <li>• Pressure equation and define homogenous and</li> </ul>

		<p>heterogeneous fluids</p> <ul style="list-style-type: none"> <li>• Fundamental principles of motion of real and ideal fluids and their various properties and functions</li> </ul>
	<p>DSE-4(HONORS) MAT-HE-6056 Rigid dynamics</p>	<p>Students will have ability to understand</p> <ul style="list-style-type: none"> <li>• Moments and products of inertia, parallel axes theorem and six constant theorem.</li> <li>• The momental ellipsoid and equimomential system and principal axes.</li> <li>• Concept of D'Alembert's principle, motion of a rigid body and centre of inertia.</li> <li>• Concept of motion about a fixed axis and in two dimension under finite and impulsive forces.</li> <li>• Conservation of momentum and energy and lagrange's equations and initial motions</li> </ul>
	<p>MAT-HE-6066 Group theory 2</p>	<p>Students will be able to understand</p> <ul style="list-style-type: none"> <li>• Isomorphisms, automorphisms, inner automorphisms and groups</li> <li>• External direct products and</li> </ul>

		<p>properties</p> <ul style="list-style-type: none"> <li>• Normal subgroups, factor groups and fundamental theorem of finite abelian groups</li> <li>• Finite simple groups and Cayley's, index and embedding theorems.</li> </ul>
	<p>MAT-HE-6076 Mathematical finance</p>	<p>Students will be able to</p> <ul style="list-style-type: none"> <li>• Understand financial markets and options and futures</li> <li>• Appreciate pricing of options, interest rate swaps and no arbitrage pricing concepts</li> <li>• Study and use hedging parameters, trading strategies and swaps</li> </ul>
	<p>DSE 2 REGULAR MAT-RE-6116 Numerical Analysis</p>	<p>Students will be able to</p> <ul style="list-style-type: none"> <li>• Derive numerical methods for various mathematical operations such as interpolation differentiation, integration.</li> <li>• Solve linear and non-linear equations and differential equations.</li> <li>• Analyse and evaluate common numerical methods.</li> </ul>



	<p>MAT-RE-6126 Programming in-C</p>	<p>After completion of this course students will be able</p> <ul style="list-style-type: none"> <li>• State sphere, spherical triangles, polar triangles and related definition.</li> <li>• Solve spherical trigonometry related examples.</li> <li>• Understand celestial sphere and its different astronomical phenomena.</li> <li>• Understand planetary motion of the sun and planet. Deduce Kepler's law from Newton's law of gravitation laws of refraction and Cassini's Hypothesis.</li> </ul>
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# PSO

On completion of the course the students will be able to

- Communicate mathematics effectively by oral, written, computational and graphic means.
- Create mathematical ideas from basic axioms.
- Gauge the hypothesis, theories techniques and proofs provisionally.
- Utilize mathematics to solve theoretical and applied problems by critical understanding analysis and synthesis.
- Identify applications of mathematics in other disciplines leading to enhancement of career prospects in various fields.