



Title	Syllabus Distribution (CBCS)
Session	2022-23 (Even Semester)
Department	B.Sc General in Mathematics
Institution Name	Hiralal Bhakat College, Nalhati, Birbhum, W.B.
Coordinator	Dr. Banshidhar Sahoo, Assistant Professor in Mathematics

Details of Courses of B.Sc. General under CBCS

Sl.	Course	Credit		Marks
1.	Core Course (12 Papers) 4 core papers each in 3 disciplines of choice	Theory+Practical $12 \times (4+2) = 72$	Theory+Tutorial $12 \times (5+1) = 72$	$12 \times 75 = 900$
2.	Elective Course DSE (6 Papers)	$6 \times (4+2) = 36$	$6 \times (5+1) = 36$	$6 \times 75 = 450$
3	Ability Enhancement Core Course (AECC) AECC-1 (ENVS) AECC-2 (English/MIL)	$4 \times 1 = 4$ $2 \times 1 = 2$	$4 \times 1 = 4$ $2 \times 1 = 2$	100 50
4.	SEC (4 Papers)	$4 \times 2 = 8$	$4 \times 2 = 8$	$4 \times 50 = 200$
	Total Credit:	122	122	1700

B.Sc. Mathematics General Course Structure

Semester	Course Course (CC)	Discipline Specific Elective (DSE)	Ability Enhancement Course	
			AECC (2)	SEC (4)
I	CC1A (Mathematics) CC2A (Physics) CC3A (Computer Sc.)		AECC-1	
II	CC1B (Mathematics) CC2B (Physics) CC3B (Computer Sc.)		AECC-2	
III	CC1C (Mathematics) CC2C (Physics) CC3C (Computer Sc.)			SEC-1 (Mathematics) or SEC-1 (Computer Sc.)
IV	CC1D (Mathematics) CC2D (Physics) CC3D (Computer Sc.)			SEC-2 (Mathematics) or SEC-2 (Computer Sc.)
V		DSE1A (Mathematics) DSE2A (Physics) DSE3A (Computer Sc.)		SEC-3 (Mathematics) or SEC-3 (Physics)
VI		DSE1B (Mathematics) DSE2B (Physics) DSE3B (Computer Sc.)		SEC-4 (Mathematics) or SEC-4 (Physics)

Semester-II

Core Course (CC 1B): Differential Equation (Marks : 75)

Syllabus	Number of Lecture	Name of Teacher
First order exact differential equations, Integrating factor. First order higher degree equation. Solvable for x, y, p. Methods for solving higher-differential equations. Basic Theory of differential equations. Wronskian and its Properties.	20 L	Dr. Banshidhar Sahoo
Linear homogeneous equations with constant coefficients. Linear non-homogeneous equations. Methods of variable of parameters. Cauchy-Euler equation. Simultaneous differential equation.	16 L	
Order and degree of partial differential equations. Concept of linear and non-linear partial differential equations. Formation of first order partial differential equations. Linear partial differential equation of first order. Lagrange's method. Charpit's method.	15 L	
Classification of second order partial differential equations into elliptic, parabolic and hyperbolic through illustration only.	9 L	

Reference book:

1. S.L. Ross: Differential Equation, 3rd Ed., John Wiley and Sons, 1984
2. I. Sneddon: Elements of Partial Differential equations, McGraw-Hill, International Edition, 1967.
3. M.D. Raisinghania: Ordinary and Partial Differential Equation, S. Chand (20th Edition).
4. J.G. Chakraborty and P.R.Ghosh: Differential Equation, U.N. Dhur & Sons Pvt. Ltd.

Semester-IV

Core Course (CC 1D): Algebra (Marks: 75)

Syllabus	Number of Lecture	Name of Teacher
Definition and examples of Groups, examples of abelian and non-abelian groups, the group Z_n of integer under addition modulo n and the group $U(n)$ of units under multiplication modulo n . cyclic groups from number systems, complex roots of unity, circle group, the general linear group $GL_n(n, R)$, groups of symmetric of (i) an isosceles triangle, (ii) an equilateral triangle, (iii) a rectangle, and (iv) a square, the permutation group $Sym(n)$, Group of quaternions.	20 L	Dr. Banshidhar Sahoo
Subgroups, cyclic subgroup, the concept of a subgroup generated by a subset and the commutator subgroup of group, examples of subgroups including the centre of a group. Cosets. Index of subgroup. Lagrange's theorem, order of an element. Normal subgroups; their definitions and properties. Quotient group.	20 L	
Definition and example of rings, examples of commutative and non-commutative rings: rings from number systems, Z_n , the ring of integers modulo n , ring of real quaternions, ring of matrices, polynomial rings and rings of continuous functions. Subrings and ideals. Integral domain and fields, examples of fields. Field of rational functions.	20 L	

Reference Books:

1. J.B. Fraleigh: A First Course in Abstract Algebra, 7th Ed., Pearson, 2002.
2. M. Martin: Abstract Algebra, 2nd Ed., Pearson, 2011.
3. S.K. Mapa: Higher Algebra (Abstract & Linear), Levant Books.
4. D.R. Finston and P.J. Morandi: Abstract Algebra, Birkhauser Verlag AG.

Skill Enhancement Course (SEC 2): Vector Calculus (Marks 50)

Syllabus	Number of Lecture	Name of Teacher
Differentiation and partial differentiation of a vector function. Derivative of sum, dot product and cross product of two vectors.	20 L	Dr. Banshidhar Sahoo
Gradient, divergent and Curl.	20 L	

Reference books:

1. P.C. Mathew's: Vector Calculus, Springer Verlag London Limited, 1998.
2. S. Narayan and P.K. Mittal: Vector Calculus, S. Chand.

Semester-VI

Core Course (DSE 1B): Linear Programming (Marks: 75)

Syllabus	Number of Lecture	Name of Teacher
Linear Programming Problem, Graphical Approach for solving some Linear Programms. Convex Sets, Supporting and separating Hyperplanes. Theory of simplex method, optimality and unboundedness, the simplex method, algorithm, simplex method in tableau format, introduction to artificial variables, two-phase method, Big-M method and their comparison.	40 L	Dr. Banshidhar Sahoo
Duality, formulation of the dual problem, primal-dual relationships, economic interpretation of the dual.	20 L	

Reference Books:

1. F.S. Hillier and G.J. Lieberman: Introduction to Operation Research, 8th Ed., Tata mcGrawHill, Singapore, 2004.
2. P.M. Karak: Linear Programming and Theory of Games, New Central Book Agency.
3. D.C. Sanyal and K. Das: Linear Programming and Game Theory, U.N. Dhur & Sons Pvt. Ltd.
4. S.D. Sharma: Operations Research, VISIONIAS ltd.

Skill Enhancement Course(SEC 4):Transportation & Game Theory

Syllabus	Number of Lecture	Name of Teacher
Transportation problem and its mathematical formulation. North-west corner method, least cost matrix method and Vogel's approximation method for determination of starting basic solution. Algorithm for solving transportation problem. Assignment problem and its mathematical formulation. Hungarian method for solving assignment problem.	25 L	Dr. Banshidhar Sahoo
Game Theory: function of two-person zero sum games, solving two-person zero sum games, games with mixed strategies, graphical solution procedure.	15 L	

Reference Books:

1. F.S. Hillier and G.J. Lieberman: Introduction to Operation Research, 8th Ed., Tata mcGrawHill, Singapore, 2004.
2. P.M. Karak: Linear Programming and Theory of Games, New Central Book Agency.
3. D.C. Sanyal and K. Das: Linear Programming and Game Theory, U.N. Dhur & Sons Pvt. Ltd.
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