Title	Modules of Syllabus, Classes and Examinations
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×(4+2)=72	Theory+Tuitorial 12×(5+1)=72	12×75=900
2.	Elective Course DSE (6 Papers)	6×(4+2)=36	6×(5+1)=36	6×75=450
3	Ability Enhancement Core Course (AECC) AECC-1 (ENVS) AECC-2 (English/MIL)	4×1=4 2×1=2	4×1=4 2×1=2	100 50
4.	SEC (4 Papers)	4×2=8	4×2=8	4×50=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 Equations

- Total 75 Marks
- 60 Marks for Semester-end-Examination[#] (will be organized by University)
- 10+5=15 Marks for Internal Assessment (will be organized by College in general andDepartment in Particular)
- 10 Marks for Class Test/ Assignment/ Seminar
- 5 Marks for Attendance
  - Attendance: 50% & above but below 60% - 2 Marks
  - Attendance: 60% & above but below 75% - 3 Marks
  - Attendance: 75% & above but below 90% - 4 Marks
  - Attendance: 90% & Above - 5 Marks

Internal Assessment	Component 1 (C$_1$)
Weightage	10 Marks (Class test)
Number of Questions	5
Date	22.08.2023
Time	11.30 am
Syllabus	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. Linear homogeneous equations with constant coefficients. Linear non-homogeneous equations. Methods of variable of parameters. Cauchy-Euler equation. Simultaneous differential equation.
Name of Teacher	Dr. Banshidhar Sahoo
Number of Classes	67 (Tentative)

** Component 2 (C$_2$):

- 60Marks for Semester-end-Examination (will be organized by University)
- Answer 10 questions out of 15 carrying 02 marks each = 10 x 02 = 20 marks
- Answer 04 questions out of 06 carrying 05 marks each = 04 x 05 = 20 marks
- Answer 02 questions out of 04 carrying 10 marks each = 02 x 10 = 20 marks

** Syllabus:

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.

Linear homogeneous equations with constant coefficients. Linear non-homogeneous equations. Methods of variable of parameters. Cauchy-Euler equation. Simultaneous differential equation.
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.

Classification of second order partial differential equations into elliptic, parabolic and hyperbolic through illustration only.

Semester-IV

Core Course (CC 1D):   Algebra

- Total 75 Marks
- 60 Marks for Semester-end-Examination[#] (will be organized by University)
- 10+5=15 Marks for Internal Assessment (will be organized by College in general andDepartment in Particular)
- 10 Marks for Class Test/ Assignment/ Seminar
- 5 Marks for Attendance
  - Attendance: 50% & above but below 60% - 2 Marks
  - Attendance: 60% & above but below 75% - 3 Marks
  - Attendance: 75% & above but below 90% - 4 Marks
  - Attendance: 90% & Above - 5 Marks

Internal Assessment	Component 1 (C_1)
Weightage	10 Marks (Class test)
Number of Questions	5
Date	29.05.2023
Time	11.30 am
Syllabus	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 U9n) of units under multiplication module n. cyclic groups from number systems, complex roots of unity, circle group, the general lineargroup GL_n(n, R), groups of symmetric of 9i) an isosceles triangle, (ii) an equilateral triangle, (iii) a rectangle, and (iv) a square, the permutation group Sym (n), Group of quaternions. 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.
Name of Teacher	Dr. Banshidhar Sahoo
Number of Classes	64 (Tentative)

** Component 2 (C_2):
- 60Marks for Semester-end-Examination (will be organized by University)
- Answer 10 questions out of 15 carrying 02 marks each = 10 x 02 = 20 marks
- Answer 04 questions out of 06 carrying 05 marks each = 04 x 05 = 20 marks
- Answer 02 questions out of 04 carrying 10 marks each = 02 x 10 = 20 marks

** Syllabus:

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 U9n) of units under multiplication module n. cyclic groups from number systems, complex roots of unity, circle group, the general lineargroup $GL_n(n, R)$, groups of symmetric of 9i) an isosceles triangle, (ii) an equilateral triangle, (iii) a rectangle, and (iv) a square, the permutation group Sym (n), Group of quaternions.

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 defintions and properties. Quotient group.

Definition and example of rings, examples of commuitative 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.

Skill Enhancement Course (SEC 2):   Vector Calculus

- ➢ Total 50 Marks
- ➢ 40 Marks for Semester-end-Examination[**] (will be organized by University)
- ➢ 10 Marks for Internal Assessment (will be organized by College in general and Department in Particular)
- ➢ 10 Marks for Class Test/ Assignment/ Seminar

Internal Assessment	Component 1 (C1)
Weightage	10 Marks (Assignment)
Number of Questions	5
Date	To be announced.
Time	11.30 am
Syllabus	Differentiation and partial differentiation of a vector function. Derivative of sum, dot product and cross product of two vectors.
Name of Teacher	Dr. Banshidhar Sahoo
Number of Classes	23 (Tentative)

** Component 2 (C$_2$):

- ➢ 40Marks for Semester-end-Examination (will be organized by University)
- ➢ Answer 10 questions out of 15 carrying 02 marks each = 10 x 02 = 20 marks
- ➢ Answer 04 questions out of 06 carrying 05 marks each = 04 x 05 = 20 marks

** Syllabus:

Differentiation and partial differentiation of a vector function. Derivative of sum, dot product and cross product of two vectors.
Gradient, divergent and Curl.

Semester-VI

Core Course (DSE 1B): Linear Programming

- Total 75 Marks
- 60 Marks for Semester-end-Examination[#] (will be organized by University)
- 10+5=15 Marks for Internal Assessment (will be organized by College in general andDepartment in Particular)
- 10 Marks for Class Test/ Assignment/ Seminar
- 5 Marks for Attendance
  - Attendance: 50% & above but below 60% - 2 Marks
  - Attendance: 60% & above but below 75% - 3 Marks
  - Attendance: 75% & above but below 90% - 4 Marks
  - Attendance: 90% & Above - 5 Marks

Internal Assessment	Component 1 (C_1)
Weightage	10 Marks (Seminar)
Date	30.05.2023
Time	11.30 am
Syllabus	Linear Programming Problem, Graphical Approach for solving some Linear Programms. Convex Sets, Supporting and separting 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.
Name of Teacher	Dr. Banshidhar Sahoo
Number of Classes	66 (Tentative)

** Component 2 (C_2):
- 60Marks for Semester-end-Examination (will be organized by University)
- Answer 10 questions out of 15 carrying 02 marks each = 10 x 02 = 20 marks
- Answer 04 questions out of 06 carrying 05 marks each = 04 x 05 = 20 marks
- Answer 02 questions out of 04 carrying 10 marks each = 02 x 10 = 20 marks

** Syllabus:

Linear Programming Problem, Graphical Approach for solving some Linear Programms. Convex Sets, Supporting and separting 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.
Duality, formulation of the dual problem, primal-dual relationships, economic interpretation of the dual.

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

- ➢ Total 50 Marks
- ➢ 40 Marks for Semester-end-Examination[**] (will be organized by University)
- ➢ 10 Marks for Internal Assessment (will be organized by College in general and Department in Particular)
- ➢ 10 Marks for Class Test/ Assignment/ Seminar

Internal Assessment	Component 1 (C$_1$)
Weightage	10 Marks (Assignment)
Number of Questions	5
Date	To be announced.
Time	11.30 am
Syllabus	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.
Name of Teacher	Dr. Banshidhar Sahoo
Number of Classes	24 (Tentative)

** Component 2 (C$_2$):

- ➢ 40Marks for Semester-end-Examination (will be organized by University)
- ➢ Answer 10 questions out of 15 carrying 02 marks each = 10 x 02 = 20 marks
- ➢ Answer 04 questions out of 06 carrying 05 marks each = 04 x 05 = 20 marks

** Syllabus:

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.

Game Theory: function of two person zero sum games, solving two person zero sum games, games with mixed strategies, graphical solution procedure.

Head
Department of Mathematics
Hiralal Bhakat College
Nalhati,Birbhum

Principal
Hiralal Bhakat College
Nalhati,Birbhum

Estd-1986
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