Modules of Classes and Examinations, Odd Semester - July to Dec. (2023-'24)

Curriculum and Credit Framework for Undergraduate Programme (CCFUP)
As per NEP 2020

3-Year UG Degree in Mathematics
Hiralal Bhakat College
Nalhati, Birbhum, WB.

Semester-I
Course Type: Major
Course No.: I
Course Title: Calculus, Geometry & Vector Calculus
Course Code: MATH1011

Evaluation process of this Major Course is divided into three (3) components, viz. **C1, C2, and C3.**

Total Marks: **75** (10+5+60), Credits: 4, Lecture Hours: 60

10 Marks for Internal Assessment (will be organized by the College in general and Department in Particular), that is **C1**. 10 Marks will be evaluated through **Class Test** or Assignment or Seminar. Appearance in **C1** is mandatory.

Marks division of Class Test will be 10 or **5+5** or 2+2+2+2+2 or 2+2+2+4.

Tentative **Date** and **Time** of Class Test or Assignment or Seminar: During the end of the 10^{th} week of the semester when approximately 60% of the syllabus of course is to be completed.

5 Marks for Attendance that is **C2**.

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

60 Marks for Semester-end-Examination (will be organized by University), that is **C3**.
Syllabus: Whole
Duration: Three Hours
Question Pattern:

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.

Topic List

Unit-I: **Calculus**

Sl. No.	Topic	Lecture Hours	Name of Teacher(s)
1	Hyperbolic functions, higher order derivatives, Leibnitz rule and its applications to problems of type $e^{ax+b}\sin x$, $e^{ax+b}\cos x$, $(ax+b)^n \sin x$, $(ax+b)^n \cos x$, indeterminate forms, L'Hospital's rule, concavity of curves, points of inflection, envelopes, asymptotes, curve tracing in Cartesian coordinates, tracing in polar coordinates of standard curves.	L-12H & T-4H	Dr. Banshidhar Sahoo
2	Reduction formulae, derivations and illustrations of reduction formulae for the integration of $sin\, nx$, cos nx, tan nx, sec nx, $(\log x)$^n , sin$n\, x$ sin mx, parametric equations, parametrizing a curve, arc length, arc length of parametric curves, area of surface of revolution.	L-10H & T-3H	

Unit-II: **Geometry**

Sl. No.	Topic	Lecture Hours	Name of Teacher(s)
1	Reflection properties of conics, translation and rotation of axes, general equation of second-degree, classification of conics, polar equations of conics, spheres, cylindrical surfaces. central conicoid, paraboloids, plane sections of conicoid, generating lines, classification of quadrics.	L-11H & T-4H	Dr. Banshidhar Sahoo

Unit-III: **Vector Calculus**

Sl. No.	Topic	Lecture Hours	Name of Teacher(s)
1	Triple product of vectors, introduction to vector functions, algebraic operations on vector-valued functions, limits and continuity of vector functions, differentiation and partial differentiation of vector functions, gradient of a scalar function, divergence and curl of vector functions.	L-12H & T-4H	Dr. Banshidhar Sahoo

Semester-I
Course Type: Minor
Course No.: I
Course Title: Calculus, Geometry & Vector Calculus
Course Code: MATH1021

Evaluation process of this Minor Course is divided into three (3) components, viz. **C1, C2, and C3.**

Total Marks: **75** (10+5+60), Credits: 4, Lecture Hours: 60

10 Marks for Internal Assessment (will be organized by the College in general and Department in Particular), that is **C1**. 10 Marks will be evaluated through **Class Test** or Assignment or Seminar. Appearance in **C1** is mandatory.

Marks division of Class Test will be 10 or **5+5** or 2+2+2+2+2 or 2+2+2+4.

Tentative **Date** and **Time** of Class Test or Assignment or Seminar: During the end of the 10th week of the semester when approximately 60% of the syllabus of course is to be completed.

5 Marks for Attendance that is **C2**.

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

60 Marks for Semester-end-Examination (will be organized by University), that is **C3**.
Syllabus: Whole
Duration: Three Hours
Question Pattern:

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.

Topic List

Unit-I: **Calculus**

Sl. No.	Topic	Lecture Hours	Name of Teacher(s)
1	Hyperbolic functions, higher order derivatives, Leibnitz rule and its applications to problems of type $e^{ax+b}\sin x$, $e^{ax+}\ \cos x$, $(ax+b)^n \sin x$, $(ax+b)^n \cos x$, indeterminate forms, L'Hospital's rule, concavity of curves, points of inflection, envelopes, asymptotes, curve tracing in Cartesian coordinates, tracing in polar coordinates of standard curves.	L-12H & T-4H	Dr. Banshidhar Sahoo

2	Reduction formulae, derivations and illustrations of reduction formulae for the integration of $sin\, nx$, cos nx, tan nx, sec nx, $(\log x)$^n , sin$n\, x$ sin mx, parametric equations, parametrizing a curve, arc length, arc length of parametric curves, area of surface of revolution.	L-10H & T-3H	

Unit-II: **Geometry**

Sl. No.	Topic	Lecture Hours	Name of Teacher(s)
1	Reflection properties of conics, translation and rotation of axes, general equation of second-degree, classification of conics, polar equations of conics, spheres, cylindrical surfaces. central conicoid, paraboloids, plane sections of conicoid, generating lines, classification of quadrics.	L-11H & T-4H	Dr. Banshidhar Sahoo

Unit-III: **Vector Calculus**

Sl. No.	Topic	Lecture Hours	Name of Teacher(s)
1	Triple product of vectors, introduction to vector functions, algebraic operations on vector-valued functions, limits and continuity of vector functions, differentiation and partial differentiation of vector functions, gradient of a scalar function, divergence and curl of vector functions.	L-12H & T-4H	Dr. Banshidhar Sahoo

Semester-I
Course Type: Skill Enhancement Course (SEC)
Course No.: I
Course Title: Graph Theory
Course Code: MATH1051

Evaluation process is divided into three (3) components, viz. C1, C2, and C3.

Total Marks: **50** (10+40), Credits: 3, Lecture Hours: 90

10 Marks for Internal Assessment (will be organized by the College in general and Department in Particular), that is **C1**. 10 Marks will be evaluated through **Class Test** or Assignment or Seminar. Appearance in C1 is mandatory.

Marks division of Class Test will be 10 or **5+5** or 2+2+2+2+2 or 2+2+2+4.

Tentative **Date** and **Time** of Class Test or Assignment or Seminar: During the end of the 10th week of the semester when approximately 60% of the syllabus of course is to be completed.

C2 is not applicable for SEC.

40 Marks for Semester-end-Examination (will be organized by University) that is **C3**.
Syllabus: Whole
Duration: Four Hours
Question Pattern:
Laboratory Notebook – 05 marks
Viva-voce – 10 marks
Experiments – 25 marks

Topic List

Sl. No.	Topic	Lecture Hours	Name of Teacher(s)
1	Definition, examples and basic properties of graphs, complete graphs, Havel-Hakimi theorem (Statement and its application), bi-partite graphs, isomorphism of graphs.	L-8H & T-4H	Dr. Banshidhar Sahoo
2	Königsberg bridge problem, Eulerian graph, Hamiltonian graph, Representation of a graph by a matrix, the adjacency matrix, incidence matrix, weighted graph.	L-9H & T-4H	
3	Travelling salesman's problem, shortest path, Tree and their properties, spanning tree, Dijkstra's algorithm, Warshall algorithm.	L-9H & T-5H	
4	Planar and non-planar graphs, Euler's formula, colouring of graphs, four colour problem, five colour theorem.	L-4H & T-2H	

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B.Sc General in Mathematics
Hiralal Bhakat College, Nalhati

Details of Courses of B.Sc. General under CBCS

Semester-III

Core Course (CC 1C): Real Analysis

- 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	To be announced.
Time	30 Minutes
Syllabus	Finite and infinite sets, countable and uncountable sets. Real line, bounded sets, supremum and infimia, completeness, property of R. Archimedean property of R, intervals. Concept of cluster points and statement of Bolzano-weierstrass theorem. Real sequence, Bounded sequence, Cauchy convergent critarion for sequences. Cauchy's theorem on limits, monotone sequences and their convergence.
Name of Teacher	Dr. Banshidhar Sahoo
Number of Classes	70 (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:

Finite and infinite sets, countable and uncountable sets. Real line, bounded sets, supremum and

infimia, completeness, property of R. Archimedean property of R, intervals. Concept of cluster points and statement of Bolzano-weierstrass theorem.

Real sequence, Bounded sequence, Cauchy convergent critarion for sequences. Cauchy's theorem on limits, monotone sequences and their convergence.

Infinite series, Cauchy convergence criterion for series, positive term series, geometric series, comparison test, convergence of p-series. Root test, alternating series. Leibnitz's test. Definition and example of absolute and conditionally convergent series.

Sequence and series of functions, Pointwise and uniform convergence, M_n –test, M-test. Statement of theresult about uniform convergence and integrability and differentiability of function. Power series and radius of convergence.

Skill Enhancement Course (SEC 1): Integral 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 (C_1)
Weightage	10 Marks (Assignment)
Number of Questions	5
Date	To be announced.
Time	30 Minutes
Syllabus	Integration by Partial fractions, integration of rational and irrational functions. Properties of definite integrals. Reduction formulae for integrals of rational, trigonometric, exponential and logaritmmic function and their properties.
Name of Teacher	Dr. Banshidhar Sahoo
Number of Classes	30 (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:

Integration by Partial fractions, integration of rational and irrational functions. Properties of definite integrals. Reduction formulae for integrals of rational, trigonometric, exponential and logaritmmic function and their properties.

Areas and length of curves in the plane, volumes and surfaces of solids of revolution. Doublend triple integrals.

Semester-V

Core Course (DSE 1A): Linear 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	To be announced.
Time	30 Minutes
Syllabus	Vector Spaces, subspaces, algebra of subspaces, quotient spaces, linear combination of vectors, linear span, linear independence, basis and dimension, dimension of subspaces. Linear transformations, null space, range, rank and nullity of a linear transformation, matrix representation of a linear transformation.
Name of Teacher	Dr. Banshidhar Sahoo
Number of Classes	70 (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:

Vector Spaces, subspaces, algebra of subspaces, quotient spaces, linear combination of vectors, linear span, linear independence, basis and dimension, dimension of subspaces.

Linear transformations, null space, range, rank and nullity of a linear transformation, matrix representation of a linear transformation. Matrix representation of linear transformation, algebra of linear transformations. Dual space, Dual Basis, Double Dual. Eigen values and eigen vectors. Characteristic polynomial. Isomorphisms, Isomorphism theorems, invertibility and isomorphisms, change of coordinate matrix.

Skill Enhancement Course (SEC 3): Probability and Statistics

- 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	30 Minutes
Syllabus	Sample space, probability axioms, real random variables, cumulative distribution function, probability mass functions. Mathematical expectation, moments, moments generating function, characteristic function. Discrete distributions: uniform, binomial, Poisson. Continious distribution: uniform, normal, exponential.
Name of Teacher	Dr. Banshidhar Sahoo
Number of Classes	30 (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:

. Sample space, probability axioms, real random variables, cumulative distribution function, probability mass functions. Mathematical expectation, moments, moments generating function, characteristic function. Discrete distributions: uniform, binomial, Poisson. Continious distribution: uniform, normal, exponential.

Joint comulative distribution function and its properties, joint probability density functions, marginal and contional distribtuions. Expectation of function of two random variables, conditional expectations, independent random variables.

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