PALMATHS

Maths coaching in Garia, Kolkata · palmaths.com

UNIVERSITY OF CALCUTTA · CCF (NEP 2020) UG SYLLABUS

Mathematics MDC (Pass) · Semester 2

Semester-wise syllabus · 3-Year Multidisciplinary Course · CC papers

What this file contains

- CC-2: Basic Algebra
- MMTH-SEC: C Language with Mathematical Applications
- Course structure page and question pattern

Source and note

The pages that follow are taken unchanged from the official University of Calcutta syllabus for Mathematics under the Curriculum and Credit Framework for Undergraduate Programmes (CCF, NEP 2020). PALMATHS has only selected the pages for this programme and semester and added this cover so students can find them quickly. Always check the University of Calcutta website (caluniv.ac.in) for later notifications, corrections or changes in paper options. PALMATHS is an independent coaching centre and is not part of, or endorsed by, the University of Calcutta.

B.Sc Mathematics classes at PALMATHS, online or offline

B.Sc Maths (Calcutta University): 9088261414 · School Maths, Class 8 to 12 and IIT-JEE: 9007293439

Ground Floor, Boral Co-operative Bank, near Sitala Mandir, Garia, Kolkata (2 min from Kavi Nazrul Metro)

More semester-wise syllabus files and question papers: palmaths.com/cu-pyqs/

University of Calcutta



Syllabus for four-year (Eight Semester) B. Sc. Honours and Honours with Research Course with Mathematics Major

&

Mathematics as a Minor subject

and

Syllabus for three-year (Six Semester) Multidisciplinary Course with Mathematics

Under

Curriculum and Credit Framework (CCF)

Odd Semester : July to December

Even Semester : January to June

The syllabus for the 4 Year B.A./B.Sc. Honours and Honours with Research Course with Mathematics Major is effective from the academic year **2023-24**.

The syllabus for the 3 Year Multidisciplinary Course with Mathematics is effective from the academic year **2023-24**.

Course Structure for
3-year Multi-Disciplinary Course with Mathematics as a Core/Minor Subject

1. Mathematics opted as First Core Subject (i.e. Core Course 1)

Semester	Paper Code	Name of Paper	Credit	Page No.
I	MMTH-MDC-CC1	Calculus, Geometry & Vector Analysis	3TH+1TU = 4	10
II	MMTH-MDC-CC2	Basic Algebra	3TH+1TU = 4	12
III	MMTH-MDC-CC3	Ordinary Differential equations & Group Theory	3TH+1TU = 4	80
IV	MMTH-MDC-CC4	Mechanics	3TH+1TU = 4	82
	MMTH-MDC-CC5	Advanced Calculus	3TH+1TU = 4	84
V	MMTH-MDC-CC6	Statistics & Numerical Analysis	3TH+1TU = 4	86
	MMTH-MDC-CC7	Mathematical Methods	3TH+1TU = 4	88
VI	MMTH-MDC-CC8	Discrete Mathematics	3TH+1TU = 4	90

2. Mathematics opted as Second Core Subject (i.e. Core Course 2)

Semester	Paper Code	Name of Paper	Credit	Page No.
I	MMTH-MDC-CC1	Calculus, Geometry & Vector Analysis	3TH+1TU = 4	10
II	MMTH-MDC-CC2	Basic Algebra	3TH+1TU = 4	12
III	MMTH-MDC-CC3	Ordinary Differential equations & Group Theory	3TH+1TU = 4	80
IV	MMTH-MDC-CC4	Mechanics	3TH+1TU = 4	82
	MMTH-MDC-CC5	Advanced Calculus	3TH+1TU = 4	84
V	MMTH-MDC-CC6	Statistics & Numerical Analysis	3TH+1TU = 4	86
VI	MMTH-MDC-CC7	Mathematical Methods	3TH+1TU = 4	88
	MMTH-MDC-CC8	Discrete Mathematics	3TH+1TU = 4	90

3. Mathematics opted as a Minor Subject

Semester	Paper Code	Name of Paper	Credit	Page No.
III	MMTH-MDC-mn1	Calculus, Geometry & Vector Analysis	3TH+1TU = 4	10
IV	MMTH-MDC-mn2	Basic Algebra	3TH+1TU = 4	12
V	MMTH-MDC-mn3	Ordinary Differential equations & Group Theory	3TH+1TU = 4	80
	MMTH-MDC-mn4	Mechanics	3TH+1TU = 4	82
VI	MMTH-MDC-mn5	Advanced Calculus	3TH+1TU = 4	84
	MMTH-MDC-mn6	Statistics & Numerical Analysis	3TH+1TU = 4	86

Note : Skill Enhancement Course (SEC) on C Language with Mathematical Applications shall be studied either in Semester One or in Semester Two or in Semester Three.

4-yr Credit Distribution | MDC Credit Distribution | Course Overview
Major | Minor | MDC | Question Pattern

Basic Algebra

Semester : II	Paper Code : MTHM-DSCC 2-TH MMTH-MN2-TH MMTH-MDC-CC2-TH
Semester : IV	Paper Code : MMTH-MN2-TH MMTH-MDC-mn2-TH
Credit : 4	Full Marks : 100 (Theory : 75 & Tutorial : 25)
Minimum number of classes required : 60	

4-yr Credit Distribution | MDC Credit Distribution | Course Overview

Major | Minor | MDC | Question Pattern

Course Outcome

CO1 : To study exponential, logarithmic, trigonometric, and hyperbolic functions of a complex variable.

CO2 : To develop the ability to solve cubic and biquadratic equations.

CO3 : To acquire knowledge of equivalence relations, partial order relations, linear order relations, and composition of mappings.

CO4 : To understand the well-ordering property of positive integers, the division algorithm, and congruence relations among integers.

CO5 : To learn about the existence and uniqueness of solutions to systems of linear equations, including row reduction and echelon forms.

CO6 : To study the algebraic and geometric properties of vectors in n-dimensional space, including linear independence and its algebraic and geometric characterizations.

Group A [Marks : 25] [20 classes]

- Polar representation of complex numbers, n-th roots of unity, De Moivre's theorem for rational indices and its applications. Exponential, logarithmic, trigonometric and hyperbolic functions of complex variable.
- Theory of equations : Relation between roots and coefficients, transformation of equation, Descartes rule of signs, application of Sturm's theorem, cubic equation (solution by Cardan's method) and biquadratic equation (solution by Ferrari's method).
- Inequalities : The inequality involving $AM \geq GM \geq HM$, Cauchy-Schwartz inequality.

Group B [Marks : 25] [20 classes]

- Relation : equivalence relation, equivalence classes & partition, partial order relation, poset, linear order relation.
- Mapping : composition of mappings, relation between composition of mappings and various set theoretic operations. Meaning and properties of $f^{-1}(B)$, for any mapping $f : X \to Y$ and $B \subseteq Y$.
- Well-ordering property of positive integers, Principles of Mathematical induction, equivalence of Well-ordering property and Principles of Mathematical induction (statement only), division algorithm, divisibility and Euclidean algorithm. Prime numbers and their properties, Euclid's theorem. Congruence relation between integers. Fundamental Theorem of Arithmetic. Chinese remainder theorem. Arithmetic functions, some arithmetic functions such as φ, τ, σ and their properties.

Group C [Marks : 25] [20 classes]

- Systems of linear equations, homogeneous and non-homogeneous systems. Existence and uniqueness of solution. The matrix equation $Ax = b$, row reduction and echelon forms, uniqueness of reduced echelon form. Rank of a matrix and characterization of invertible matrices, Pivot positions, basic and free variables, parametric description of the solution set. Existence and uniqueness theorem.
- Vectors in $\mathbb{R}^n$, algebraic and geometric properties of the vectors. Vector form of a linear system and the column picture. Existence of solutions and linear combination of vectors. Geometry of linear combination and subsets spanned by some vectors. Uniqueness of solution and Linear independence of vectors. Algebraic and geometric characterizations of linearly independent subsets.

References

[1] Titu Andreescu and Dorin Andrica, Complex Numbers from A to Z, 2nd Ed., Springer Nature, 2014.

[2] W. S. Burnside and A.W. Panton, Theory of equations, Dublin University Press Series, S. Chand & Co., Pvt. Ltd., 1986.

[3] Edgar G. Goodaire and Michael M. Parmenter, Discrete Mathematics with Graph Theory, 3rd Ed., Pearson Education (Singapore) P. Ltd., Indian Reprint, 2005.

[4] Anton Howard and Chris Rorres, Elementary Linear Algebra with Supplemental Applications, 11th Ed., Wiley, 2014.

[5] K. Hoffman, R. Kunze, Linear algebra, Prentice Hall India Learning Pvt. Ltd., 2015.

[6] David C. Lay, Linear Algebra and its Applications, 3rd Ed., Pearson Education Asia, Indian Reprint, 2007.

[7] Gilbert Strang, Introduction to Linear Algebra, 5th Ed., Wellesley-Cambridge Press, 2019.

4-yr Credit Distribution | MDC Credit Distribution | Course Overview

Major | Minor | MDC | Question Pattern

C Language with Mathematical Applications

Semester : I	Paper Code : MTHM-SEC 1-TH MMTH-SEC-TH
Semester : II or III	Paper Code : MMTH-SEC-TH
Credit : 4	Full Marks : 100 (Theory : 75 & Tutorial : 25)
Minimum number of classes required : 60	

4-yr Credit Distribution | MDC Credit Distribution | Course Overview
Major | Minor | MDC | Question Pattern

Course Outcome

CO1 : To learn C language in detail.

CO2 : To learn how to use different types of control statements and arrays.

CO3 : To learn how to write different types of computer programs using C language.

- **Overview** of architecture of a computer, compiler, interpreter, assembler, machine language, high level language, procedural vs object oriented language.
- **Constants, Variables and Data types :** Character set, constants and variables, data types, C statements, declaration.
- **Operations and Expressions:** Arithmetic operators, relational operators, logical operators, assignment operator, expressions.
- **Decision Making and Branching:** decision making with if, if-else, Nested if, switch-case, break and continue statements.
- **Control Statements:** while, do-while and for statements.
- **Arrays and Strings:** One-dimensional, two-dimensional and multidimensional arrays, declaration of arrays, initialization of arrays, strings.
- **User-defined Functions:** Definition of functions, Scope of variables, return values and their types, function declaration, function call by value, Nesting of functions, passing of arrays to functions, Recursive function.
- **Introduction to Library functions:** stdio.h, math.h, string.h, stdlib.h, time.h etc.

Sample problems:

1. Display first 15 natural numbers.
2. Compute the sum of first 10 natural numbers.
3. Read 10 numbers from keyboard and find their average.
4. Find the sum of first 15 even natural numbers.
5. Write a program to find factorial of a number using recursion.
6. Write a program to make a pyramid pattern with numbers increased by 1.

7. From the terminal read three values, namely, length, width, height. Print a message whether the box is a cube or rectangle or semi-rectangle.
8. Find the AM, GM, HM of a given set of numbers.
9. Write a program to print multiplication table.
10. Find the maximum and minimum element of a given array.
11. Sort the elements of an array in ascending order.
12. Write a program to read in an array of names and to sort them in alphabetical order.
13. Write a program for addition of two matrices.
14. Find the transpose of a given matrix.
15. Find the product of two matrices.
16. Write a program to check whether two given strings are an anagram.
17. Write a program to check Armstrong and Perfect numbers.
18. Write a program to check whether a number is a prime number or not.
19. Prepare a code for summing a Series.
20. Compute approximate value of pi .
21. Compute the area under a given curve.
22. Solve a quadratic equation.
23. Write a program to solve a system of two linear equations in two unknowns.
24. Write a program to find the shortest distance between two straight lines (parallel or intersecting or skew) in space.
25. Prepare an investment report by calculating compound interest.

Note: A practical notebook must be maintained for internal assignments and submitted for the partial fulfillment of the course.

References

[1] E. Balagurnsamy, Programming in ANSI C, Tata McGraw Hill, 2004.

[2] Y. Kanetkar, Let Us C, BPB Publication, 1999.

[3] B. W. Kernighan and D. M. Ritchi, The C-Programming Language, 2nd Edi. (ANSI Refresher), Prentice Hall, 1977.

[4] V. Rajaraman, Computer Oriented Numerical Methods, Prentice Hall of India, 1980.

[5] C. Xavier, C-Language and Numerical Methods, New Age International, 2007.

4-yr Credit Distribution | MDC Credit Distribution | Course Overview

Major | Minor | MDC | Question Pattern

Question Pattern for

3-year Multidisciplinary Course with Mathematics and Mathematics as a Minor subject

MMTH-MN1-TH **MMTH-MDC-mn1-TH** **MMTH-MDC-CC1-TH**	**Calculus, Geometry & Vector Analysis**
Group A : Calculus (Marks : 20)	(a) Short answer type questions: 4 questions are to be attempted out of 7 questions each carrying 2 marks. (b) Long answer type questions: 3 questions are to be attempted out of 6 questions each carrying 4 marks.
Group B : Geometry (Marks : 35)	(a) Short answer type questions: 2 questions are to be attempted out of 4 questions each carrying 2.5 marks (b) Long answer type questions: 5 questions are to be attempted out of 9 questions each carrying 6 marks
Group C : **Vector Analysis** (Marks : 20)	(a) Short answer type questions: 4 questions are to be attempted out of 7 questions each carrying 2 marks. (b) Long answer type questions: 3 questions are to be attempted out of 6 questions each carrying 4 marks.
MMTH-MN2-TH **MMTH-MDC-mn2-TH** **MMTH-MDC-CC2-TH**	**Basic Algebra**
Group A, B, C : (Each group carries 25 marks)	(a) Short answer type questions: 2 questions are to be attempted out of 4 questions each carrying 2.5 marks. (b) Long answer type questions: 4 questions are to be attempted out of 7 questions each carrying 5 marks.
MMTH-SEC-TH	**C Language with Mathematical Applications**
(Marks : 75)	(a) Short answer type questions: 5 questions are to be attempted out of 8 questions each carrying 3 marks. (b) Long answer type questions: 5 questions are to be attempted out of 8 questions each carrying 8 marks. (a) Longer answer type questions: 2 questions are to be attempted out of 4 questions each carrying 10 marks.