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UNIVERSITY OF CALCUTTA · CCF (NEP 2020) UG SYLLABUS

Mathematics Minor · Semester 1

Semester-wise syllabus · Minor stream · MMTH-MN papers

What this file contains

- MMTH-MN-1: Calculus, Geometry and Vector Analysis (Semester 1 or 3)
- 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.

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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

4-year B.A./B.Sc. Honours & Honours with Research, with Mathematics as a Minor Subject

Semester	Paper Code	Name of Paper	Credit	Page No.
I	MMTH-MN1	Calculus, Geometry & Vector Analysis	3TH+1TU = 4	10
II	MMTH-MN2	Basic Algebra	3TH+1TU = 4	12
III	MMTH-MN1	Calculus, Geometry & Vector Analysis	3TH+1TU = 4	10
IV	MMTH-MN2	Basic Algebra	3TH+1TU = 4	12
V	MMTH-MN3	Ordinary Differential equations & Group Theory	3TH+1TU = 4	80
	MMTH-MN4	Mechanics	3TH+1TU = 4	82
VI	MMTH-MN3	Ordinary Differential equations & Group Theory	3TH+1TU = 4	80
	MMTH-MN4	Mechanics	3TH+1TU = 4	82

Note :

1. MMTH-MN1 and MMTH-MN2 shall be studied in either Semester One and Two respectively or in Semester Three and Four respectively.
2. MMTH-MN3 and MMTH-MN4 (both) shall be studied in either Semester Five or in Semester Six.

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

Major | Minor | MDC | Question Pattern

Calculus, Geometry & Vector Analysis

Semester : I	Paper Code : MTHM-DSCC 1-TH MMTH-MN1-TH MMTH-MDC-CC1-TH
Semester : III	Paper Code : MMTH-MN1-TH MMTH-MDC-mn1-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 understand and compute higher-order derivatives, apply Leibniz's rule and its applications, and use L'Hospital's rule to evaluate limits.

CO2 : To develop proficiency in solving problems involving higher-order derivatives, Leibniz's rule, and L'Hospital's rule.

CO3 : To learn reduction formulae and apply them to determine the arc length of a curve, the area under a curve, and the area and volume of surfaces of revolution.

CO4 : To study the classification of conic sections, reduce them to canonical form, and determine equations of tangents, normals, and polars.

CO5 : To acquire detail knowledge of spheres, cylindrical surfaces, central conicoids, different quadric surfaces.

CO6 : To apply vector equations to problems in geometry and mechanics, and to perform differentiation and integration of vector functions.

Group A : Calculus [Marks : 20] [16 classes]

- Differentiability of a function at a point and in an interval. Meaning of sign of derivative. Differentiating Hyperbolic functions, higher order derivatives, Leibnitz rule and its applications to functions 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 (statement and example).
- Reduction formulae, derivations and illustrations of reduction formulae of the type $\int \sin^n x dx$, $\int \cos^n x dx$, $\int \tan^n x dx$, $\int \sec^n x dx$, $\int (\log x)^n dx$, $\int \sin^n x \sin mx\, dx$, $\int \sin^n x \cos^m x\, dx$. Parametric equations, parametrizing a curve, arc length of a curve, arc length of parametric curves, area under a curve, area and volume of surface of revolution.

Group B : Geometry [Marks : 35] [28 classes]

- Rotation of axes and second degree equations, classification of conics using the discriminant, reduction to canonical form, tangent and normal, polar equations of conics.
- Spheres, Cylindrical surfaces. Central conicoids, paraboloids, plane sections of conicoids, generating lines, identification of quadric surfaces like cone, cylinder, ellipsoid, hyperboloid, classification of quadrics.

Group C : Vector Analysis [Marks : 20] [16 classes]

- Triple product, vector equations, applications to geometry and mechanics — concurrent forces in a plane, theory of couples, system of parallel forces. Introduction to vector functions, operations with vector-valued functions, limits and continuity of vector functions, differentiation and integration of vector functions of one variable.

References

[1] H. Anton, I. Bivens and S. Davis, Calculus, 10th Ed., John Wiley and Sons (Asia) P. Ltd., Singapore, 2015.

[2] T. Apostol, Calculus, Volumes I and II, Wiley and Sons, 1969.

[3] R. Courant and F. John, Introduction to Calculus and Analysis (Volumes I & II), Springer-Verlag, New York, Inc., 1989.

[4] R. R. Goldberg, Methods of Real analysis, Oxford and IBH Publishing, 2020.

[5] M. J. Strauss, G. L. Bradley and K. J. Smith, Calculus, 3rd Ed., Dorling Kindersley (India) P. Ltd. (Pearson Education), Delhi, 2022.

[6] G. B. Thomas and R. L. Finney, Calculus, 14th Ed., Pearson Education, Delhi, 2018.

[7] Robert J. T. Bell, Co-ordinate Geometry of Three Dimensions, Macmillan and Co. Ltd., London, 2018.

[8] S. L. Loney, Co-ordinate Geometry, 6th Ed., Arihant Publications, 2016.

[9] J. Marsden and Tromba, Vector Calculus, W. H. Freeman and Co., 6th Ed., 2011.

[10] M. R. Speigel, Schaum's outline of Vector Analysis, Tata McGraw Hill, 2011.

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.