Under Graduate Degree Programme Choice Based Credit System (CBCS) Subject : Honours in Mathematics (HMT) ALGEBRA Course Code : CC - MT - 01

> প্রথম মুদ্রণ ঃ নভেন্বর, 2021 First Print : November, 2021

# Netaji Subhas Open University Under Graduate Degree Programme Choice Based Credit System (CBCS) Subject : Honours in Mathematics (HMT) Course : ALGEBRA Course Code : CC - MT - 01 : Board of Studies : Members

#### **Professor Kajal De**

(Chairperson) Professor of Mathematics and Director, School of Sciences, NSOU

**Mr. Ratnesh Mishra** Associate Professor of Mathematics, NSOU

**Mr. Chandan Kumar Mondal** Assistant Professor of Mathematics, NSOU

**Dr. Ushnish Sarkar** Assistant Professor of Mathematics, NSOU

**Dr. Rupa Pal** Associate Professor of Mathematics, WBES Bethune College

: Course Writer : Dr. Jayanta Kumar Datta Retd. Associate Professor Surendranath College **Dr. P. R. Ghosh** *Retd. Reader of Mathematics, Vidyasagar Evening College* 

**Professor Buddhadeb Sau** *Professor of Mathematics, Jadavpur University* 

**Dr. Diptiman Saha** Associate Professor of Mathematics, St. Xavier's College

**Dr. Prasanta Malik** Assistant Professor of Mathematics, Burdwan University

: Course Editor : Dr. Prabhat Ranjan Ghosh Retd. Associate Professor Vidyasagar Evening College

: Format Editors :

Professor Kajal De NSOU Dr. Ushnish Sarkar NSOU

### Notification

All rights reserved. No part of this Study material be reproduced in any form without permission in writing from Netaji Subhas Open University.



UG: Mathematics (HMT)

## ALGEBRA

# [CC - MT - 01]

Unit-1	Complex Numbers	7-33
Unit-2	Functions of Complex Numbers (Exponential and Trigonometric)	34-51
Unit-3	Theory of Equations	52-68
Unit-4	Relations connecting the Roots and Coefficients of an Equation	69-87
Unit-5	Cubic and Biquadratic Equations	88-104
Unit-6	Inequalities	105-121
Unit-7	Matrices	122-158
Unit-8	System of Linear Equations	159-170
Unit-9	Characteristic Equation of a Matrix	171-182
Unit-10	Relations and Functions	183-198
Unit-11	Integers	199-209
Unit-12	Principle of Mathematical Induction and Fundamental Theorem of Arithmetic	210-226

Netaji Subhas Open University Under Graduate Degree Programme Choice Based Credit System (CBCS) Subject : Honours in Mathematics (HMT)

> Course : Analytical Geometry Code : CC-MT-02

> > First Print : November, 2021

Printed in accordance with the regulations of the Distance Education Bureau of the University Grants Commission.

# Netaji Subhas Open University Under Graduate Degree Programme Choice Based Credit System (CBCS) Subject : Honours in Mathematics (HMT)

### **Course : Analytical Geometry**

## Code : CC-MT-02

### : Board of Studies :

#### Members

#### **Professor Kajal De**

(Chairperson) Professor of Mathematics and Director, School of Sciences, NSOU

Mr. Ratnesh Mishra Associate Professor of Mathematics NSOU

#### Mr. Chandan Kumar Mondal Assistant Professor of Mathematics NSOU

**Dr. Ushnish Sarkar** Assistant Professor of Mathematics NSOU **Dr. P.R.Ghosh** Retd. Reader of Mathematics Vidyasagar Evening College

**Professor Buddhadeb Sau** Professor of Mathematics Jadavpur University

**Dr. Diptiman Saha** Associate Professor of Mathematics St. Xavier's College

**Dr. Prasanta Malik** Assistant Professor of Mathematics Burdwan University

**Dr. Rupa Pal** Associate Professor. of Mathematics, WBES, Bethune College

> : Course Editor : Prof Arindam Bhattacharya Professor of Mathematics Jadavpur University

### : Format Editor :

#### **Professor Kajal De**

: Course Writer :

Dr. Bandana Das

Muralidhar Girls' College

Assistant Professor of Mathematics

Professor of Mathematics Netaji Subhas Open University **Dr. Ushnish Sarkar** Assistant Professor of Mathematics Netaji Subhas Open University

## Notification

All rights reserved. No part of this Study material be reproduced in any form without permission in writing from Netaji Subhas Open University.



# Course : Analytical Geometry Code : CC-MT-02

Unit 1		Techniques for sketching parabola, ellipse and hyperbola and their reflection properties	7
Unit 2		Transformation of co-ordinates	21
Unit 3		General equation of second degree	28
Unit 4		Tangent, Normal, Pole, Polar, Conjugate diameters	43
Unit 5	٦	Equation of a chord of a conic in terms of its middle point	59
Unit 6		Polar Equations	69
Unit 7		Introduction to three dimensional geometry	93
Unit 8		Planes	101
Unit 9		Straight lines	118
Unit 10		Sphere, Cylinder, Cone	141
Unit 11		Central Conicoids, Conicoids and Tangent, Normal	187
Unit 12		Triple product of vectors	201
Unit 13		Vector equation and application to geometry	213

D:\Suvendu\Netaji Subhas Open University\CC-2 (Mathematics : Analytical Geometry) **Preface** \ 7th Proof

Under Graduate Degree Programme Choice Based Credit System (CBCS) Sub: Honours in Mathematics (HMT) Course Code : CC-MT-03 Course : Calculus

First Print : December, 2021

Under Graduate Degree Programme Choice Based Credit System (CBCS) Sub: Honours in Mathematics (HMT) Course Code : CC-MT-03

Course Code : CC-MII-

Course : Calculus

**Board of Studies** 

: Members :

#### Professor Kajal De

(Chairperson) Professor of Mathematics and Director, School of Sciences, NSOU

**Mr. Ratnes Misra** Associate Professor of Mathematics, NSOU

**Mr. Chandan Kumar Mondal** Assistant Professor of Mathematics, NSOU

**Dr. Ushnish Sarkar** Assistant Professor of Mathematics, NSOU **Dr. P. R. Ghosh** *Retd. Reader of Mathematics, Vidyasagar Evening College* 

**Professor Buddhadeb Sau** Professor of Mathematics, Jadavpur University

**Dr. Diptiman Saha** Associate Professor of Mathematics, St. Xavier's College

**Dr. Prasanta Malik** Assistant Professor of Mathematics, Burdwan University

**Dr. Rupa Pal,** *WBES*, Associate Professor of Mathematics, Bethune College

: Course Writer : Dr. Gurudas Biswas Assistant Professor of Mathematics, Hooghly Women's College

**Dr. Pulak Sahoo** Associate Professor of Mathematics, Kalyani University

: Course Editor :

: Format Editor :

Mr. Mrinal Nath

Assistant Professor of Mathematics, Netaji Subhas Open University

## Notification

All rights reserved. No part of this Study meterial be reproduced in any form without permission in writing from Netaji Subhas Open University.



UG : Mathematics (HMT)

## Course : Calculus Course Code : CC-MT-03

Unit-1	Hyperbolic Functions	7-12
Unit-2	Higher Order Derivatives	13-23
Unit-3	Curvature	24-36
Unit-4	Concavity, Convexity and Points of Inflection	37-42
Unit-5	□ Asymptotes	43-54
Unit-6	Envelope	55-61
Unit-7	Curve Tracing	62-70
Unit-8	L'Hospital's Rule	71-77
Unit-9	□ Applications in Business Economics and Life Sciences	78-83
Unit-10	Reduction Formula	84-94
Unit-11	□ Arc Length	95-100
Unit-12	□ Volume and Area of Surface of Revolution	101-111
Unit-13	Vector Valued Functions of Scalar Variables	112-132

Under Graduate Degree Programme Choice Based Credit System (CBCS) Sub: Honours in Mathematics (HMT) Course : Real Analysis Course Code : CC-MT-04

First Print : November, 2021

Under Graduate Degree Programme Choice Based Credit System (CBCS) Sub: Honours in Mathematics (HMT) Course : Real Analysis Course Code : CC - MT - 04

: Board of Studies :

### Members

### **Professor Kajal De**

(Chairperson) Professor of Mathematics and Director, School of Sciences, NSOU

Mr. Ratnes Misra Associate Professor of Mathematics, NSOU

**Mr. Chandan Kumar Mondal** Assistant Professor of Mathematics, NSOU

**Dr. Ushnish Sarkar** Assistant Professor of Mathematics, NSOU **Dr. P. R. Ghosh** *Retd. Reader of Mathematics, Vidyasagar Evening College* 

**Professor Buddhadeb Sau** Professor of Mathematics, Jadavpur University

**Dr. Diptiman Saha** Associate Professor of Mathematics, St. Xavier's College

**Dr. Prasanta Malik** Assistant Professor of Mathematics, Burdwan University

**Dr. Rupa Pal,** *WBES*, Associate Professor of Mathematics, Bethune College

: Course Editor : Dr. Sanjay Kumar Ghosal Associate Professor of Mathematics, North Bengal University

Unit 1-3 : Dr. Shyamal Kumar Hui Associate Professor of Mathematics, University of Burdwan Unit 4 : Mr. Chandan Kumar Mondal

: Course Writer :

Assistant Professor of Mathematics, Netaji Subhas Open University

> : Format Editor : Mr. Chandan Kumar Mondal, NSOU

### Notification

All rights reserved. No part of this Study meterial be reproduced in any form without permission in writing from Netaji Subhas Open University.



UG : Mathematics (HMT)

# Course : Real Analysis Course Code : CC - MT - 04

Unit-1 🗖	Preliminaries	7-15
Unit-2 🗖	Real Numbers	16-66
Unit-3 🗖	Sequences	67-109
Unit-4 🗖	Series of Real Number	110-138

Under Graduate Degree Programme Choice Based Credit System (CBCS) Subject : Honours in Mathematics (HMT) Course Code : CC-MT-05 Course : Numerical Methods

First Print : April, 2022

Netaji Subhas Open University Under Graduate Degree Programme Choice Based Credit System (CBCS) Subject : Honours in Mathematics (HMT) Course Code : CC-MT-05 Course : Numerical Methods

## **Board of Studies**

### Prof. Kajal De

(Chairperson) Professor of Mathematics and Director, School of Sciences, NSOU

Mr. Ratnesh Mishra Associate Professor of Mathematics, NSOU

**Dr. Nemai Chand Dawn** Associate Professor of Mathematics, NSOU

**Mr. Chandan Kumar Mondal** Assistant Professor of Mathematics, NSOU

**Dr. Ushnish Sarkar** Assistant Professor of Mathematics Dr. P. R. Ghosh Retd. Reader of Mathematics, Vidyasagar Evening College Prof. Buddhadeb Sau Professor of Mathematics, Jadavpur University Dr. Diptiman Saha Associate Professor of Mathematics, St. Xavier's College Dr. Prasanta Malik Assistant Professor of Mathematics Burdwan University Dr. Rupa Pal Associate Professor of Mathematics, WBES, Bethune College

Course Writer Prof. Mridula Kanoria

Retd. Professor of Mathematics, C.U. Professor & HOD, Mathematics, Sister Nivedita University Course Editor

Dr. Diptiman Saha

Associate Professor of Mathematics, St. Xavier's College

Format Editing Prof. Kajal De NSOU

## Notification

All rights reserved. No part of this study material may be reproduced in any form without permission in writing from Netaji Subhas Open University.



UG : Mathematics (HMT)

Course Code : CC–MT-05 Course : Numerical Methods

## **CONTENTS**

Unit 1	Error Analysis	7-13
Unit 2	Transcendental and Polynomial Equations	14-33
Unit 3	System of linear algebratic equations	34-62
Unit 4	Interpolation	63-79
Unit 5	Numerical Differentiation	80-86
Unit 6	Numerical Integration	87-97
Unit 7	Computer Language	98-102
Unit 8	Number System	103-111
	References	112



Netaji Subhas Open University Under Graduate Degree Programme Choice Based Credit System (CBCS) Subject : Honours in Mathematics Course Code : CC-MT-06 Computer Programming & Numerical Methods Lab

First Edition : May, 2022



Netaji Subhas Open University Under Graduate Degree Programme Choice Based Credit System (CBCS) Subject : Honours in Mathematics Course Code : CC-MT-06 Course : Computer Programming & Numerical Methods Lab

#### : Board of Studies :

: Members :

### **Professor Kajal De**

(Chairperson) Professor of Mathematics and Director, School of Sciences Netaji Subhas Open University

#### Mr. Ratnesh Mishra

Associate Professor of Mathematics Netaji Subhas Open University

#### Mr. Chandan Kumar Mondal

Assistant Professor of Mathematics Netaji Subhas Open University

### Dr. Ushnish Sarkar

Assistant Professor of Mathematics Netaji Subhas Open University

#### : Course Writer : Mr. Mrinal Nath

Assistant Professor of Computer Science Netaji Subhas Open University **Dr. P. R. Ghosh** *Retd. Reader of Mathematics Vidyasagar Evening College* 

**Professor Buddhadeb Sau** Professor of Mathematics Jadavpur University

**Dr. Diptiman Saha** Associate Professor of Mathematics St. Xavier's College

**Dr. Prasanta Malik** Assistant Professor of Mathematics Burdwan University

**Dr. Rupa Paul** Associate Professor of Mathematics, WBES Bethune College

> : Course Editor : Dr. Tushar Kanti Saha Associate Professor, Department of Mathematics Surendranath College

## : Format Editor :

#### Mr. Mrinal Nath

Assistant Professor of Computer Science Netaji Subhas Open University

## Notification

All rights reserved. No part of this Self-Learning Material (SLM) may be reproduced in any form without permission in writing from Netaji Subhas Open University.



# Course Code : CC-MT-06

# Computer Programming & Numerical Method Lab under CBCS (BDP)

Unit - 1 🗆	Problem Solving Techniques	7 - 32
Unit - 2 🗆	Introducing C	33 - 46
Unit- 3 🗆	Variables, Constants and Input/Output	47 – 74
Unit - 4 🗆	Expression and Operators	75 – 91
Unit - 5 🗆	Decision and Loop Control Statements	92 - 128
Unit - 6 🗆	Arrays	129 - 152
Unit - 7 🗆	Application of C Programming : Solution of Non-Linear Equations	153 – 188
Unit - 8 🗅	Application of C Programming : Solution of System of Linear Equations by Direct Methods : Gauss Elimination and Gauss Jordan Elimination	189 – 218
Unit - 9 🗆	Application of C Programming : Solution of System of Linear Equations by Direct Methods : Matrix Inverse and LU Decomposition	219 – 240
Unit - 10 🗆	Application of C Programming : Solution of System of Linear Equations by Iterative Methods : Jacobi and	
	Gauss-Siedel Method	241 – 256
Unit - 11 🗆	Application of C Programming : Interpolation	257 – 277
Unit - 12 □	Application of C Programming : Integration	278 – 296

Under Graduate Degree Programme Choice Based Credit System (CBCS) Subject : Honours in Mathmatics (HMT) Course : Differential Equations Code : CC - MT - 07

First Print : May, 2022

Under Graduate Degree Programme Choice Based Credit System (CBCS) Subject : Honours in Mathmatics (HMT) Course : Differential Equations Code : CC - MT - 07

### : Board of Studies :

#### Members of the Board of Studies in Under Graduate Mathematics

#### **Professor Kajal De**

(Chairperson) Professor of Mathematics and Director, School of Sciences Netaji Subhas Open University

**Mr. Ratnesh Mishra** Associate Professor of Mathematics *Netaji Subhas Open University* 

**Dr. Nemai Chand Dawn** Associate Professor of Mathematics *Netaji Subhas Open University* 

**Mr. Chandan Kumar Mondal** Assistant Professor of Mathematics, *Netaji Subhas Open University* 

Dr. Ushnish Sarkar Assistant Professor of Mathematics Netaji Subhas OfcoutsaiWnisery:

> **Dr. Koushik Ghosh** Assistant Professor

University Inst. of Technology, Burdwan University

**Dr. P.R.Ghosh** Retd. Reader of Mathematics Vidyasagar Evening College

**Professor Buddhadeb Sau** Professor of Mathematics Jadavpur University

**Dr. Diptiman Saha** Associate Professor of Mathematics St. Xavier's College

**Dr. Prasanta Malik** Assistant Professor of Mathematics Burdwan University

**Dr. Rupa Pal** Associate Professor. of Mathematics, WBES Bethune College

#### : Course Editor :

**Dr. Nurul Islam** Retd. Associate Professor RKM Residential College, Narendrapur

: Format Editor : Professor Kajal De

Netaji Subhas Open University

### Notification

All rights reserved. No part of this study material may be reproduced in any form without permission in writing from Netaji Subhas Open University.



UG-Mathematics (HMT)

Course : Differential Equations Course Code : CC - MT-07

# **Differential Equation**

Unit - 1	07 - 14
Unit - 2	15 - 36
Unit - 3	37 - 111
Further Reading	112

Under Graduate Degree Programme Choice Based Credit System (CBCS) Subject : Honours in Mathematics (HMT) Course : Theory of Real Functions and Functions of Several Variables Course Code : CC-MT-08

First Print : May, 2022

Under Graduate Degree Programme Choice Based Credit System (CBCS) Subject : Honours in Mathematics (HMT)

**Course : Theory of Real Functions and Functions of Several Variables** 

#### Course Code : CC-MT-08

**Board of Studies** 

: Members :

**Professor Kajal De**, (*Chairperson*) *Professor of Mathematics and Director*, *School of Sciences*, *NSOU* 

Mr. Ratnes Misra Associate Professor of Mathematics, NSOU

**Dr. Nemai Chand Dawn** Associate Professor of Mathematics, NSOU

**Mr. Chandan Kumar Mondal** Assistant Professor of Mathematics, NSOU

**Dr. Ushnish Sarkar** Assistant Professor of Mathematics, NSOU

> : Course Writer : Dr. Subir Kumar Mukherjee Reader of Mathematics. Retd. Srirampur College

**Dr. P. R. Ghosh** *Retd. Reader of Mathematics, Vidyasagar Evening College* 

**Professor Buddhadeb Sau** *Professor of Mathematics, Jadavpur University* 

**Dr. Diptiman Saha** Associate Professor of Mathematics, St. Xavier's College

**Dr. Prasanta Malik** Assistant Professor of Mathematics, Burdwan University

**Dr. Rupa Pal,** WBES, Associate Professor of Mathematics, Bethune College

: Course Editor :

**Prof. Pratulananda Das** Professor of Mathematics, Jadavpur University

: Format Editors :

Mr. Chandan Kumar Mondal & NSOU

Prof. Kajal De NSOU

### Notification

All rights reserved. No part of this Study meterial be reproduced in any form without permission in writing from Netaji Subhas Open University.



# UG Mathematics (HMT)

# Subject : Honours in Mathematics (HMT) Course : Theory of Real Functions and Functions of Several Variables Course Code : CC-MT-08

Unit-1 🗆	Limits of Functions	7-34
Unit-2 🗆	Continuity of Functions	35-72
Unit-3 🗖	Differentiation of Functions	73-122
Unit-4 🗆	Maxima-Minima of a Function	123-146
Unit-5 🗆	Miscellaneous Examples & Exercises	147-172
Unit-6 🗆	Limit and continuity for function of two variables	173-189
Unit-7 🗆	Partial Differentiation	190-224

Under Graduate Degree Programme Choice Based Credit System (CBCS) Subject: Honours in Mathematics (HMT) Course : Riemann Integration and Series of Functions Course Code : CC-MT-09

First Print : May, 2022

Under Graduate Degree Programme Choice Based Credit System (CBCS) Subject: Honours in Mathematics (HMT) Course : Riemann Integration and Series of Functions Course Code : CC-MT-09 : Board of Studies : Members

**Professor Kajal De**, (Chairperson) Professor of Mathematics and Director, School of Sciences, NSOU

**Mr. Ratnesh Mishra** Associate Professor of Mathematics, NSOU

**Dr. Nemai Chand Dawn** Associate Professor of Mathematics, NSOU

Mr. Chandan Kumar Mondal Assistant Professor of Mathematics, NSOU

**Dr. Ushnish Sarkar** Assistant Professor of Mathematics, NSOU

: Course Writer : Dr. Biswajit Saha Assistant Professor Department of Mathematics Govt. General Degree College, Muragachha

Dr. P. R. Ghosh Retd. Reader of Mathematics, Vidyasagar Evening College Professor Buddhadeb Sau Professor of Mathematics, Jadavpur University

**Dr. Diptiman Saha** Associate Professor of Mathematics, St. Xavier's College

**Dr. Prasanta Malik** Assistant Professor of Mathematics, Burdwan University

**Dr. Rupa Pal** Associate Professor of Mathematics, WBES Bethune College

> : Course Editor : **Prof. Sanjib Kumar Datta**  *Professor Department of Mathematics University of Kalyani*

: Format Editor : Mr. Mrinal Nath NSOU

### Notification

All rights reserved. No part of this Study material be reproduced in any form without permission in writing from Netaji Subhas Open University.



UG Mathematics (HMT)

# Course : Riemann Integration and Series of Functions Course Code : CC-MT-09

Unit-1	The Riemann Integral	9–66
Unit-2	Improper Integrals	67–100
Unit-3	Sequence And Series Of Functions	103-160

Netaji Subhas Open University Under Graduate Degree Programme Choice Based Credit System (CBCS) Subject : Honours in Mathematics (HMT) Course : Group Theory Course Code : CC-MT-10

First Print : March, 2022

Netaji Subhas Open University Under Graduate Degree Programme Choice Based Credit System (CBCS) Subject : Honours in Mathematics (HMT) Course : Group Theory Course Code : Core Course CC-MT-10 : Board of Studies : : Members :

### **Professor Kajal De**

(Chairperson) Professor & Head, Dept. of Mathematics and Director, School of Sciences Netaji Subhas Open University

### Mr. Ratnesh Mishra

Associate Professor of Mathematics Netaji Subhas Open University

### Dr. Nemai Chand Dawn

Associate Professor of Mathematics NSOU

### Mr. Chandan Kumar Mondal

Assistant Professor of Mathematics Netaji Subhas Open University

## **Dr. Ushnish Sarkar** Assistant Professor of Mathematics Netaji Subhas Open University

: Course Writer : Mr. Chandan Kumar Mondal Netaji Subhas Open University **Dr. P. R. Ghosh** *Retd. Reader of Mathematics Vidyasagar Evening College* 

**Professor Buddhadeb Sau** *Professor of Mathematics Jadavpur University* 

**Dr. Diptiman Saha** Associate Professor of Mathematics St. Xavier's College

**Dr. Prasanta Malik** Assistant Professor of Mathematics Burdwan University

**Dr. Rupa Paul** Associate Professor of Mathematics WBES Bethune College

: Course Editor : Prof. Kajal De Netaji Subhas Open University

# : Format Editor : Mr. Chandan Kumar Mondal

Netaji Subhas Open University

### Notification

All rights reserved. No part of this Self-Learning Material (SLM) may be reproduced in any form without permission in writing from Netaji Subhas Open University.



UG : Mathematics (HMT)

## Course : Group Theory Course Code : CC-MT-10

Unit 1 🗆	Set Relation and Mappings	7–25
Unit 2 🗆	Introduction to Groups	26–45
Unit 3 🗆	Cyclic Groups and Cyclic Subgroups	46–56
Unit 4 🗆	Cosets and Normal Subgroups	57–69
Unit 5 🗆	Permutation Groups	70-81
Unit 6 🗆	Quotient Groups and Group Homomorphism	82–97
	Further Reading	98



UG-Mathematics (HMT)

# Course : Statistical Techniques Course Code : GE - MT - 11

Unit - 1	Probability	7 - 52
Unit - 2	Theoretical Distribution	53 - 92
Unit - 3	Survey Methodology	93 - 107
Unit - 4	Estimation Theory	108 - 143
Unit - 5	Testing Statistical Hypothesis	144 - 159
Unit - 6	Correlation and Regression	160 - 175
	Appendix	176 - 183

Under Graduate Degree Programme Choice Based Credit System (CBCS) Subject : Honours in Mathematics (HMT) Course : Statistical Techniques Course Code : GE - MT - 11

> : Board of Studies : Members

#### **Professor Kajal De**

(Chairperson) Professor of Mathematics and Director, School of Sciences, NSOU

Mr. Ratnes Misra Associate Professor of Mathematics, NSOU

Mr. Chandan Kumar Mondal Assistant Professor of Mathematics, NSOU

**Dr. Ushnish Sarkar** Assistant Professor of Mathematics, NSOU **Dr. P. R. Ghosh** *Retd. Reader of Mathematics Vidyasagar Evening College* 

**Professor Buddhadeb Sau** Professor of Mathematics Jadavpur University

**Dr. Diptiman Saha** Associate Professor of Mathematics St. Xavier's College

**Dr. Prasanta Malik** Assistant Professor of Mathematics Burdwan University

**Dr. Rupa Pal, WBES** Associate Professor. of Mathematics, Bethune College

#### : Course Editor : Prof. Ashis Chatterjee

Professor of Statistics & Pro Vice-Chancellor (Academic Affair) University of Calcutta

: Format Editor : Professor Kajal De, NSOU

### Notification

All rights reserved. No part of this study material may be reproduced in any form without permission in writing from Netaji Subhas Open University.

Kishore Sengupta Registrar

## : Course Writer :

Presidency College]

**Dr. Ashit Baran Aich** Director, Study Centre Netaji Subhas Open University [Ex-Reader, Statistics

Under Graduate Degree Programme Choice Based Credit System (CBCS) Subject : Honours in Mathematics (HMT) Course : Statistical Techniques Course Code : GE - MT - 11

First Print : December, 2021

Choice Based Credit System (CBCS) Honours in Mathematics (HMT) Course : Dianamical System Course Code : GE-MT-21

First Print : November, 2021

# NETAJI SUBHAS OPEN UNIVERSITY Choice Based Credit System (CBCS) Subject: Honours in Mathematics (HMT) Course : Dianamical System Course Code : GE-MT-21

### Board of Studies Members

Professor Kajal De

(Chairperson) Professor of Mathematics and Director, School of Sciences, NSOU **Mr. Ratnes Misra** Associate Professor of Mathematics NSOU

**Mr. Chandan Kumar Mondal** Assistant Professor of Mathematics, NSOU

**Dr. Ushnish Sarkar** Assistant Professor of Mathematics, NSOU

: Course Writer :

Associate Professor of Mathematics

**Dr. Swarup Poria** 

University of Calcutta

Dr. P.R.Ghosh Retd. Reader of Mathematics Vidyasagar Evening College Professor Buddhadeb Sau Professor of Mathematics Jadavpur University Dr. Diptiman Saha Associate Professor of Mathematics St. Xavier's College Dr. Prasanta Malik Assistant Professor of Mathematics Burdwan University Dr. Rupa Pal Associate Prof. of Mathematics , WBES Bethune College

> : Course Editor : Prof. Gora Chand Layek Professor of Mathematics Burdwan University

: Format Editor : Mr. Chandan Kumar Mondal Assistant Professor of Mathematics Netaji Subhas Open University

#### Notification

All rights reserved. No part of this Study material be reproduced in any form without permission in writing from Netaji Subhas Open University.



UG : Mathematics (HMT)

# **Course : Dianamical System Course Code : GE-MT-21**

Unit 1 🗖 First Order Equations	7
Unit 2 🗖 Planar Linear Systems	20
Unit 3 🗖 Stability Analysis of a System	39
Unit 4 🗖 Bifurcations and Manifolds	56
Unit 5 🗖 Discrete Systems	72

Under Graduate Degree Programme Choice Based Credit System (CBCS) Subject: UG Mathematics (HMT) Course : Applications of Algebra Course Code - GE-MT-31

First Print : August, 2022

Under Graduate Degree Programme Choice Based Credit System (CBCS) Subject: UG Mathematics (HMT) Course : Applications of Algebra Course Code - GE-MT-31

> : Board of Studies : Members

### Professor Kajal De

(Chairperson) Professor of Mathematics and Director, School of Sciences, NSOU

Mr. Ratnesh Mishra Associate Professor of Mathematics, NSOU

**Dr. Nemai Chand Dawn** Associate Professor of Mathematics, NSOU

**Mr. Chandan Kumar Mondal** Assistant Professor of Mathematics, NSOU

**Dr. Ushnish Sarkar** Assistant Professor of Mathematics, NSOU **Dr. P. R. Ghosh** *Retd. Reader of Mathematics, Vidyasagar Evening College* 

### Professor Buddhadeb Sau

Professor of Mathematics, Jadavpur University

**Dr. Diptiman Saha** Associate Professor of Mathematics, St. Xavier's College

**Dr. Prasanta Malik** Assistant Professor of Mathematics, Burdwan University

**Dr. Rupa Pal** Associate Professor of Mathematics, WBES Bethune College

: Course Editor :

Dr. Sujit Kumar Sardar

Professor of Mathematics,

Jadavpur University

: Course Writer : Chapter-1 & 2 Mrinal Nath Assistant Professor of Computer Science, NSOU

Chapter-3, 4 & Dr. Satyabrota Kundu 5 Assistant Professor of Mathematics, Loreto College

: Format Editors : Mr. Mrinal Nath NSOU

## Notification

All rights reserved. No part of this Study material be reproduced in any form without permission in writing from Netaji Subhas Open University.



UG Mathematics (HMT)

# Course : Applications of Algebra Course Code - GE-MT-31

Unit-1	Coding Theory	7–42
Unit-2	Block Design	43-67
Unit-3	Symmetry Groups and Color Pattern	68–97
Unit-4	Application of Linear Transformation	98–144
Unit-5	Matrix Theory	145-205

Under Graduate Degree Programme Choice Based Credit System (CBCS)

> Subject : UG Mathematics (HMT) Generic Elective Course Course : Modeling and Simulation Course Code: GE-MT-41

> > First Print : January, 2022

**Under Graduate Degree Programme** 

**Choice Based Credit System (CBCS)** 

Subject : UG Mathematics (HMT) Generic Elective Course Course : Modeling and Simulation Course Code: GE-MT-41

> : Board of Studies : Members

#### **Professor Kajal De**

(Chairperson) Professor & HOD, Dept. of Mathematics and Director, School of Sciences, NSOU

**Mr. Ratanes Misra** Associate Professor of Mathematics NSOU

**Dr. Nemai Chand Dawn** Associate Professor of Mathematics NSOU

**Mr. Chandan Kumar Mondal** Assistant Professor of Mathematics NSOU

**Dr. Ushnish Sarkar** Assistant Professor of Mathematics NSOU

#### : Course Writers :

Unit 1-4: **Dr. Ushnish Sarkar** Assistant Professor of Mathematics Netaji Subhas Open University

#### Unit 5 : Prof. (Dr.) Mridula Kanoria

Prof. & HOD, Dept. of Mathematics Sister Nivedita University (Retd.) Dept. of Applied Maths., C.U. **Dr. P. R. Ghosh** *Retd. Reader of Mathematics Vidyasagar Evening College* 

**Professor Buddhadeb Sau** *Professor of Mathematics Jadavpur University* 

**Dr. Diptiman Saha** Associate Professor of Mathematics St. Xavier's College

**Dr. Prasanta Malik** Assistant Professor of Mathematics The University of Burdwan

**Dr. Rupa Pal** Associate Professor of Mathematics WBES, Bethune College

: Course Editors :

**Prof. (Dr.) Mridula Kanoria** Prof. & HOD, Dept. of Mathematics Sister Nivedita University (Retd.) Dept. of Applied Maths., C.U.

**Prof. (Dr.) Kajal De** Professor & HOD, Dept. of Mathematics and Director, School of Sciences, NSOU

: Format Editor : Dr. Ushnish Sarkar NSOU

### Notification

All rights reserved. No part of this Study material be reproduced in any form without permission in writing from Netaji Subhas Open University.



UG-Mathematics (HMT)

# Course : Modeling and Simulation Course Code: GE-MT-41

Unit	1 🗅	Introduction	7-12
Unit	2 🗅	Discrete Models	13-56
Unit	3 🗖	Continuous Models	57-121
Unit	4 🗅	Further Models	122-135
Unit	5 🗖	Numerical Solution of the model and its graphical representation	136-171
Refe	172-173		