HINDUSTHAN COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS)
COIMBATORE - 641 028

M.Sc. MATHEMATICS
SCHEME OF EXAMINATIONS-CBCS PATTERN
(For the Students admitted from the Academic year 2019 - 2020 and onwards)

Department of Mathematics								
Course Code	**Course Type**	**Course Title**	**Lecture Hours/ Week**	**Exam Duration**	**IE**	**EE**	**Total**	**Credit Points**
Semester – I								
19MAP01	DSC	Advanced Algebra with GEOGEBRA	6	3	30	70	100	5
19MAP02	DSC	Advanced Real Analysis	6	3	30	70	100	5
19MAP03	DSC	Ordinary Differential Equations with SCILAB	6	3	30	70	100	4
19MAP04	DSC	Numerical Analysis	6	3	30	70	100	4
19MAP05	SEC	Mathematical Softwares -I	3	3	30	70	100	2
19MAP06	SEC	**Practical I**:MathematicalSoftwares - I	3	3	40	60	100	2
Semester – II								
19MAP07	DSC	Advanced Complex Analysis with TABLEAU	6	3	30	70	100	4
19MAP08	DSC	Partial Differential Equations with SCILAB	6	3	30	70	100	4
19MAP09	DSC	Mechanics	6	3	30	70	100	4
19MAP10	DSC	Optimization Techniques	6	3	30	70	100	4
19MAP11	DSC	Fuzzy logic and fuzzy set.	4	3	30	70	100	4
19GSP01	AECC	Skill based - Cyber security	2	-	100	-	100	2
Semester – III								
19MAP12	DSC	Topology	6	3	30	70	100	5
19MAP13	DSC	Advanced Topics in Fluid Dynamics	6	3	30	70	100	4
19MAP14	DSC	Probability theory and Mathematical statistics	6	3	30	70	100	4
19MAP15A	DSE	**Elective – I:** Graph Theory (Or)	6	3	30	70	100	4
19MAP15B		**Elective – I:** Stochastic Differential Equations						
19MAP16	SEC	Mathematical Softwares -II	3	3	30	70	100	4
19MAP17	SEC	**Practical II**: Mathematical Softwares -II	3	3	40	60	100	2
Semester – IV								
19MAP18	DSC	Functional Analysis	6	3	30	70	100	4
19MAP19	DSC	Mathematical Methods	6	3	30	70	100	4
19MAP20	DSC	C++ Programming (Theory)	3	3	30	70	100	2
19MAP21	DSC	**Practical III**:C++ Programming	3	3	40	60	100	2
19MAP22A	DSE	**Elective - II**: Magneto Hydro Dynamics (Or)	5	3	30	70	100	4
19MAP22B		**Elective - II**: Operator Theory						

19MAP23	SEC	**Practical IV**: Mathematical Softwares -III	3	3	40	60	100	2
19MAP24	SEC	Project Work	4	-	50	150	200	5

Papers	Course Type	Total Credit Points
01	Ability Enhancement Compulsory course(AECC)	02
16	Discipline Specific Course(DSC)	63
2	Discipline Specific Elective(DSE)	08
6	Skill Enhancement Course(SEC)	17
25	**TOTAL**	**90**

PG-REGULATIONS(From 2019-2020 Onwards)

1.Internal Marks for all PG

Components	Marks
Test I	5
Model Exam	10
Assignment	5
Attendance*	5
Seminar	5(3+2)**
TOTAL	30

*Split-up of Attendance Marks for PG

- 75-79 - 1 marks
- 80-84 - 2 marks
- 85-89 - 3 marks
- 90-94 - 4 marks
- 95-100 - 5 marks

**3-For External paper presentation/ Mini Project

**2-Internal paper presentation/ Mini Project

Question Paper Pattern for IE test I

Duration: Two Hours **Maximum: 50 Marks**

Section-A (3 x 6=18 Marks)

Answer **ALL** Questions

Either or Type

ALL questions carry EQUAL Marks

Section-B (4 x 8=32 Marks)

Answer **ALL** Questions

Either or Type

ALL questions carry EQUAL Marks

Question Paper Pattern for IE Model Exam

Duration: Three Hours

Maximum: 70 Marks

SECTION – A (5x6=30 marks)
Answer **ALL** Questions
ALL Questions carry **EQUAL** Marks

Q.No 1 to 5: Either or type questions
(One question from each Unit)

SECTION – B (5x8=40 Marks)
Answer **ALL** Questions
ALL Questions carry **EQUAL** Marks

Q.No 6 to 10: Either or type questions
(One question from each Unit)

2 a) Components for Practical I. E.

Components	Marks
Test –I	20
Test - II	20
Total	**40**

2 b) Components for Practical E. E.

Components	Marks
Completion of Experiments	50
Record	5
Viva	5
Total	**60**

3. Institutional/ Industrial Training, Mini and Major Project Work

Institutional / Industrial Training		Mini Project	Project Work		
Components	**Marks**		**Components**		**Marks**
I.E Work Diary Report Viva –voce Examination	 25 50 25	 - 50 50	*I. E* a) Attendance Marks b) Review Marks	 20 30	 50
Total	**100**	**100**			
			E.E[1]* a) Final Report Marks b) Viva-voce Marks	 120 30	 150
				Total	**200**

*[1]Evaluation of report and conduct of viva voce will be done jointly by Internal and External Examiners.

4. Components for Cyber Security Paper

Components	Marks
Two Tests (2 x 40)	80
Two assignments (2 x 10)	20
Total	**100**

The question paper pattern is as follows:

a) Test I – 2 hours [4 out of 7 essay type questions] 4 x 10 = 40Marks
b) Test II – 2 hours [4 out of 7 essay type questions] 4 x 10 = 40 Marks

Total = 80 Marks

- The passing minimum for Cyber Security is 50
- In case the candidate fails to secure 50 marks which is the passing minimum, he/she may have to reappear for the same in the subsequent semesters.

5. Question Paper Pattern for EE Theory

Duration: Three Hours **Maximum: 70 Marks**

SECTION – A (5x6=30 marks)

Answer **ALL** Questions

ALL Questions carry **EQUAL** Marks

Q.No 1 to 5: Either or type questions
(One question from each Unit)

SECTION – B (5x8=40 Marks)

Answer **ALL** Questions

ALL Questions carry **EQUAL** Marks

Q.No 6 to 10: Either or type questions
(One question from each Unit)

Programme Code:	MMA	Programme Title: M.Sc. Mathematics		
Course Code:	19MAP01	Course Title	Batch:	2019-2020 and Onwards
		ADVANCED ALGEBRA WITH GEOGEBRA	Semester:	I
Hrs/Week:	6		Credits:	5

Course Objective

1. Algebra is an important life skill worth understanding well. It moves us beyond basic math and prepares us for statistics and calculus.

2. Along with developing critical thinking, the core concepts of algebra can help individual's better handle complex problems.

Course Outcomes (CO)

K1	CO1	Studies the algebraic structures known as groups and the advance ideas in Group theory.
K2	CO2	Recognize subgroup and the relation of conjugacy with Cauchy's theorem and Sylow's theorem.
K3	CO3	To relate ring as one of the fundamental algebraic structures used in abstract algebra with Euclidean rings and Polynomial rings.
K4	CO4	To explain field as a non-trivial division ring and Analyze the Roots of polynomials.

Mapping of Outcomes

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	M	S	M
CO3	S	S	S	S
CO4	S	S	S	S

S - Strong; M-Medium; L-Low.

19MAP01	ADVANCED ALGEBRA WITH GEOGEBRA	I
Unit No.	**Topics**	**Hours**
I	**Group Theory:** Permutation groups- Permutation groups and its product of its cycle- Another counting principle – Sub group-Cauchy theorem-Sylow's theorem –Second proof of sylow's theorem- third proof of sylow's theorem- Direct products. **Chapter 2: Sections 2.10– 2.13**	15
II	**Ring Theory:** The field of quotients of an integral domain-Euclidean rings–A particular Euclidean ring -Polynomial rings - Polynomials over the rational field. **Chapter 3: Sections 3.6- 3.10**	15
III	**Fields:** Extension Fields – The Transcendence of e-Roots of polynomials - Construction with straight edge and compass-More about roots. **Chapter 5: Sections 5.1-5.5**	14
IV	**Fields:** The elements of Galois theory –Fixed Field-Solvability by Radicals- Finite Fields. **Chapter 5: Sections 5.6-5.7, Chapter 7: Sections 7.1**	14
V	**Linear Transformations:** Canonical forms: Triangular form – Nilpotent transformations- Jordan form – Hermitian and unitary Transformations. **Chapter 6: Sections 6.4, 6.5,6.6 and 6.10**	14
GEOGEBRA Problems related to ADVANCED ALGEBRA have been included in Practical-IV (19MAP23) and **questions related to GEOGEBRA excluded in ADVANCED ALGEBRA (19MAP01) in the questions.**		

Text Book:

1. ***I.N.Herstein,*** *Topics in Algebra (II Edition),* Published June 20th 1975 by Wiley.

Reference Books:

1.J.B.Fraleigh, *A First Course in Abstract Algebra, Narosa Publishing House, New Delhi, 1988.*

Course Designed by	Verified by HOD	Checked by	Approved by
			CONTROLLER OF EXAMINATIONS HICAS CBE-28

Programme Code:	MMA	Programme Title: M.Sc. of Mathematics		
Course Code:	19MAP02	Course Title	Batch:	2019-2020 and Onwards
		ADVANCED REAL ANALYSIS	Semester:	I
Hrs/Week:	6		Credits:	5

Course Objective

1. On successful completion of this course, the students should gain the knowledge about Riemann-Stieltjes Integral, Sequences of Functions, Lebesgue Measure and integral.
2. To expose the students to the basics of real analysis and partial differential equations required for their subsequent course work

Course Outcomes (CO)

K1	CO1	Acquire the knowledge of Limits and continuity of functions and the Derivatives of Real function with it's higher order.
K2	CO2	Understand the Riemann Stieltjes integral of real valued functions on intervals and its properties.
K3	CO3	Demonstrate the idea in uniform convergence and differentiation and in uniform convergence and integration.
K4	CO4	Analyze the structure of the exponential, the logarithmic, the trigonometric, the gamma and beta functions.

Mapping of Outcomes

PO / CO	PO1	PO2	PO3	PO4
CO1	S	S	M	S
CO2	S	S	S	M
CO3	S	S	S	S
CO4	M	S	S	S

S - Strong; M-Medium; L-Low.

19MAP02	ADVANCED REAL ANALYSIS	I
Unit No.	**Topics**	**Hours**
I	**Riemann Stieltjes integral:** Definition and Existence of the Integral –properties of the integral – Integration and differentiation -Integration of vector valued function. **Chapter 6: Sections 6.1 - 6.25**	**15**
II	**Sequence and Series of functions:** Uniform convergence and continuity – Uniform convergence and integration -uniform convergence and differentiation —The Stone Weirstrass theorem **Chapter 7: Sections 7.7 - 7.27**	**15**
III	**Functions of several variables:** Linear transformation –contraction principle –Inverse function theorem – Implicit function theorem. **Chapter 9: Sections 9.1 - 9.5, 9.22 - 9.28**	**14**
IV	**Lebesgue measure:** Outer measure –Measurable sets and Lebesgue measure –Measurable functions and non measurable sets. **Chapter 3 : Sections 3.1 - 3.5**	**14**
V	**Lebesgue integral:** The Lebesgue integral of bounded functions over a set of finite measure –integral of a non –negative function –General Lebesgue Integral – The integral comparision test –Lebesgue dominated convergence theorem. **Chapter 4: Sections 4.2 - 4.4**	**14**

Text Book:

1.W. Rudin, *Principles of Mathematical Analysis ,McGraw Hill New York, 1976.* ***(Unit I –III: Chapters 6, 7,9)***

2. H.L. Roydon*, Real Analysis , Third Edition, Macmillan New York, 1988.****(Unit IV –V: Chapters 3 and 4)***

Reference Books:

1.R.G.Bartle, *Elements of Real Analysis, 2nd Edition, John Wily and Sons, New York, 1976.*

2.W.Rudin, *Real and Complex Analysis, 3rd Edition, McGraw-Hill, New York, 1986*

Course Designed by	Verified by HOD	Checked by	Approved by
			CONTROLLER OF EXAMINATIONS HICAS CBE-28

Programme Code:	MMA	Programme Title: M.Sc. Mathematics		
Course Code:	19MAP03	Course Title	Batch:	2019-2020 and Onwards
		ORDINARY DIFFERENTIAL EQUATIONS WITH SCILAB	Semester:	I
Hrs/Week:	6		Credits:	4

Course Objective

1. End of this course, the students gain the knowledge about the method of solving Ordinary Differential Equations.
2. It also exposes Ordinary Differential Equation as a powerful tool in solving problems in Physical and Social sciences.

Course Outcomes (CO)

K1	CO1	Learn mathematical methods to solve higher order differential equations.
K2	CO2	Understand the concept of power series solution, special function, existence and uniqueness of solutions of ODE's.
K3	CO3	To Examine Some Special Functions of Mathematical Physics and it's properties.
K4	CO4	Infer the knowledge in Non-linear differential equations.

Mapping of Outcomes

PO / CO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	S	M	S
CO4	S	S	S	M

S - Strong; M-Medium; L-Low.

19MAP03	ORDINARY DIFFERENTIAL EQUATIONS WITH SCILAB	I
Unit No.	**Topics**	**Hours**
I	**Solutions in Power Series:** Introduction -Second order linear equations with ordinary points - Uniform convergence and Legendre equation and Legendre polynomials–Secondorderequationswithregularsingularpoints–PropertiesofBessel functions. **Sections 3.1 -3.5**	15
II	**Systems of Linear Differential Equations:** Introduction - Systems of first order equations- Model for Arms competition between two nations- Existence and uniqueness theorem – Fundamental matrix. **Sections 4.1 - 4.5**	15
III	**Non-homogeneous linear systems :** Linear systems with constant coefficients –linear systems with periodic co-efficients- Miscellaneous Exercises. **Sections 4.6 – 4.8**	14
IV	**Successive approximation:** Introduction-Preliminaries-Picard's theorem -Non-uniqueness of solution–Continuation and dependence on initial conditions, Existence of solutions in the large- Existence and uniqueness of solutions of systems-Fixed point method.. **Sections 5.1 – 5.9**	14
V	**Fundamental results** Sturm's comparison theorem –Elementary linear oscillations. Comparison theorem of Hille-Winter –oscillations of $x'+a\,t(x) = 0$. **Sections 8.1 – 8.9**	14
SCILAB Problems related to ORDINARY DIFFERENTIAL EQUATIONS have been included in Practical-IV (19MAP23) and **questions related to SCILAB excluded in ORDINARY DIFFERENTIAL EQUATIONS (19MAP03) in the questions.**		

Text Book:

1.S.G.Deo and V.Raghavendra*. Ordinary Differential Equations and Stability Theory. McGraw Hill, New Delhi 1997.*

Reference Books:

1.E.A.Coddingtonand N.Levinson*, Theory of Ordinary Differential Equations, McGraw Hill, New York, 1955.*

2.D.A.Sanchez*, Ordinary Differential Equations and Stability Theory, W.H.Freeman&Co., San Francisco.*

Course Designed by	Verified by HOD	Checked by	Approved by
			CONTROLLER OF EXAMINATIONS HICAS CBE-28

Programme Code:	MMA	Programme Title: M.Sc. Mathematics		
Course Code:	19MAP04	Course Title	Batch:	2019-2020 and Onwards
		NUMERICAL ANALYSIS	Semester:	I
Hrs/Week:	6		Credits:	4

Course Objective

1. End of this course, the students gain the knowledge about the method of solving Romberg integration, Relaxation method, Milne's method, Crank Nicolson method.
2. To provide the numerical methods of solving the non-linear equations, interpolation, differentiation, and integration.

Course Outcomes (CO)

K1	CO1	Learn various tools in solving numerical problems.
K2	CO2	To understand numerical methods of solving the non-linear equations, interpolation, differentiation, and integration.
K3	CO3	To Apply the Approximation methods and Iterative methods for finding solutions of Equations.
K4	CO4	Relate to competitive examinations.

Mapping of Outcomes

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	M
CO3	S	S	M	S
CO4	S	S	S	S

S - Strong; M-Medium; L-Low.

19MAP04	NUMERICAL ANALYSIS	I
Unit No.	**Topics**	**Hours**
I	**Solution of nonlinear equations:** Bisection method- Regula Falsi method-Newton's method – Convergence of Newton's method, Horner's method. **Chapter 3: Sections 3.1,3.3,3.4,3.5** **Numerical differentiation and integration:** Derivatives from Difference tables –Higher order derivatives –Divided difference, Central-Difference formulas – Composite formula of Trapezoidal rule –Romberg integration. **Chapter 9: Sections 9.1-9.4,9.6, 9.9-9.12**	15
II	**Solution of system of equations:** Gauss Elimination method – Gauss Jordan methods –LU Decomposition method –Matrix inversion by Gauss-Elimination method –Methods of Iteration–Jacobi and Gauss Seidal Iteration. **Chapter 4: Sections 4.1-4.4, 4.7-4.9**	15
III	**Solution of ordinary differential equations:** Taylor series method –Euler and Modified Euler methods –Runge kutta methods–Milne's method –Adam's method. **Chapter 11: Sections 11.5-11.7,11.9-11.18**	14
IV	**Characteristic value problems**: Eigen values of a matrix by Iteration –The power method Derivative boundary conditions, Jacobi method for finding Eigen values. **Chapter 13: Sections 13.1**	14
V	**Numerical solution of partial differential equations**: (Solutions of Elliptic, Parabolic and Hyperbolic partial differential equations)Representation as a difference equation–Laplace's equation on a rectangular region–Iterative methods for Laplace equation–The Poisson equation–Derivative boundary conditions–Solving the equation for time- dependent heat flow (i) The Explicit method (ii) The Crank Nicolson method. **Chapter 12: Sections 12.1-12.9**	14

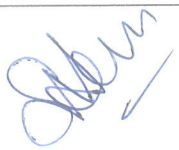
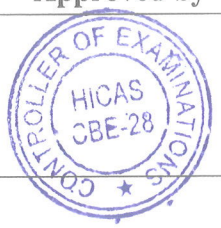
Text Book:

1.Dr.P.Kandasamy, Dr. P.Thilagavathy, Dr.K.Gunavathy: Numerical Methods First edition, S.Chand(1997)

Reference Books:

1.S.C. Chapra and P.C. Raymond: Numerical Methods for Engineers, tata McGraw Hill, New Delhi, (2000)

2..L. Burden and J. Douglas Faires: Numerical Analysis, P.W.S.Kent Publishing Company, Boston (1989), Fourth Edition.

Course Designed by	Verified by HOD	Checked by	Approved by
			

M.Sc. MATHEMATICS

Programme Code:	MMA	Programme Title: M.Sc. Mathematics		
Course Code:	19MAP05	Course Title	Batch:	2019-2020 and Onwards
		MATHEMATICAL SOFTWARES – I	Semester:	I
Hrs/Week:	3		Credits:	2

Course Objective

1. End of this course, the students are expected to gain the knowledge about mathematical softwares and their applications in decision making.
2. To improve the student's skills in numerical methods by using the numerical analysis software and computer facilities.

Course Outcomes (CO)

K1	CO1	Intended for students with no programming experience, provides the foundations of LATEX and programming in MATLAB. Variables, arrays, conditional statements, loops, functions, and plots are explained.
K2	CO2	Good understanding of Linear algebra and Signal processing concepts.
K3	CO3	Perform mathematical Modeling in MATLAB.
K4	CO4	Develop programs in MATLAB. Evaluate, analyze and plot results.

Mapping of Outcomes

PO / CO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	S	S	S
CO4	M	S	S	M

S - Strong; M-Medium; L-Low.

19MAP05	MATHEMATICAL SOFTWARES – I	I
Unit No.	**Topics**	**Hours**
I	**Basis of a Latex file:** Special Characters, Document layout and organization: Document class, Page style, Parts of the document. **Displayed Text**: Centering and indenting, Lists Theorem–like declarations, Boxes, Tables, Footnotes and marginal notes. **Chapter2:Section 2.5,Chapter3:Sections 3.1– 3.3,** **Chapter 4:Sections 4.2,4.3,4.5,4.7,4.8,4.10**	6
II	**Mathematical formulas** : Mathematical environments, Main elements of math mode, Mathematical symbols, Additional elements, Fine–tuning mathematics, Drawing pictures with LATEX. **Chapter 5: Sections 5.1 - 5.5,Chapter 6:Section 6.1**	6
III	**Basics of MATLAB :** MATLAB Windows, Online help. **Interactive Computation**: Matrices and Vectors–Matrix and Array Operations–Inline functions – using Built-in Functions and on –line help-saving and loading data-plotting simple graphs. **Chapter 1: Sections 1.6.1,1.6.2,Chapter 3: Sections 3.1, 3.2,3.5.1,3.6-3.8**	6
IV	**Programming in MATLAB:** Script files - Functions and function files- Loops - Language specific Features-Advanced data objects. **Chapter 4: Sections 4.1 -4.4**	6
V	**Linear and Nonlinear Algebra:** Linear Algebra – Data Analysis and Statistics – Ordinary Differential Equations–Nonlinear Algebraic Equations – Basic 2D and 3D Plots (Syntax only). **Chapter5:Sections 5.1, 5.3,5.5,5.6** **Chapter 6:Sections 6.1,6.3**	6

Text Book:

*1. **H. Kopka and P.W. Daly,** "A Guide to LATEX", Third Edition, Addison – Wesley, London,1999 **(for Units I and II)***

*2. **RudraPratap,** "Getting Started with MATLAB" Indian Edition, Oxford University Press **(for Units III, IV and V)***

Reference Books:

*1. **A. Gilat, John Wiley & Sons** "MATLAB An Introduction with Application",*
Singapore,2004.

*2. **W.J. Palm** "Introduction to Matlab 7 for Engineers" McGraw-Hill Education, New York,2005.*

Course Designed by	Verified by HOD	Checked by	Approved by
			CONTROLLER OF EXAMINATIONS HICAS CBE-28

Programme Code:	MMA	Programme Title: M.Sc. Mathematics		
Course Code:	19MAP06	Course Title	Batch:	2019-2020 and Onwards
		MATHEMATICAL SOFTWARES - I (PRACTICAL)	Semester:	I
Hrs/Week:	3		Credits:	2

Course Objective

1. End of this course, the students are expected to gain the knowledge about mathematical software and their applications in decision making.
2. To improve the student's skills in numerical methods by using the numerical analysis software and computer facilities.

Course Outcomes (CO)

K1	CO1	Intended for students with no programming experience, provides the foundations of LATEX and programming in MATLAB. Variables, arrays, conditional statements, loops, functions, and plots are explained.
K2	CO2	Good understanding of Linear algebra and Signal processing concepts.
K3	CO3	Perform mathematical Modeling in MATLAB.
K4	CO4	Develop programs in MATLAB. Evaluate, analyze and plot results.

Mapping of Outcomes

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	M	S
CO2	S	M	S	S
CO3	S	S	S	S
CO4	S	S	S	M

S - Strong; M-Medium; L-Low.

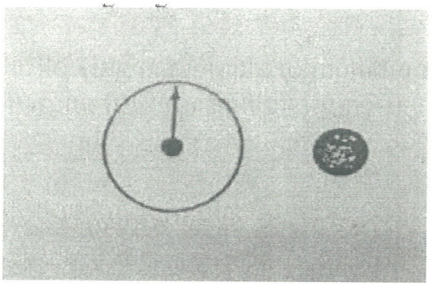
LaTex and MATLAB – List of Practical Problems

1. Using LaTex, type the following paragraph, to including the 9.5in text height, 6.30in text width, 0.10in left margin, 0.120in right margin, -0.6in top margin, 1.5in line space and foot notes.

2. Using LaTex, type the following formula

$$a_0 + \cfrac{1}{a_1 + \cfrac{1}{a_2 + \cfrac{1}{a_3 + \cfrac{1}{a_4}}}} + \begin{pmatrix} a & b \\ c & d \end{pmatrix} + \sum_{\alpha=0}^{\infty} (\beta^{\alpha} + \Gamma^{\alpha})$$

3. Using LaTex, draw the following diagram:



4. Create the following table using LaTex: S.No. Register Number Name of the Student Percentage of Marks Rank

S.No.	Register Number	Name of the Student	Percentage of Marks	Rank
1	XXXXXX	XXXXXX	XXXXX	XXXX
2	XXXXXX	XXXXXXX	XXXX	XXXX
3	XXXXXX	XXXXXX	XXXX	XXXXX

5. By using MATLAB, Plotting a function.

6. By using MATLAB, Polar plot.

7. By using MATLAB, Addition of two matrices.

8. By using MATLAB, Finding the determinant of a matrix.

9. By using MATLAB, Write the MATLAB program to generate Fibonacci series.

10. Using MATLAB, Solve the following system of equations by matrix method

    2x+y=13, x-3y = -18.

11. Using MATLAB, solve the following first order linear differential equation using Euler method: dy/dx = -y , y(0)=1. Draw the graph and compare the exact solution.

12. Calculate mean, median, standard deviation, variance, maximum value, minimum value, range, skewness and kurtosis for the following data: 40 41 45 49 50 51 55

Course Designed by	Verified by HOD	Checked by	Approved by
			CONTROLLER OF EXAMINATIONS HICAS CBE-28

Programme Code:	MMA	Programme Title: M.Sc. Mathematics		
Course Code:	19MAP07	Course Title	Batch:	2019-2020 and Onwards
		ADVANCED COMPLEX ANALYSIS WITH TABLEAU	Semester:	II
Hrs/Week:	6		Credits:	4

Course Objective

1. Complex Analysis is an important life skill worth understanding well. It is useful for many jobs some of which a student may enter as a second career.
2. Along with developing critical thinking, specifically logic, patterns, problem-solving, deductive and inductive reasoning, understanding the core concepts of algebra can help individual's better handle complex problems.

Course Outcomes (CO)

K1	CO1	Lay the foundation for topics in Advanced Complex Analysis by studying analytic f unctions and conformal mapping.
K2	CO2	To understand fundamental theorems used in complex analysis.
K3	CO3	To compare the concept of residues with Poisson's formula.
K4	CO4	Analyze the Taylor series, Laurent series and elliptic functions. Develop clear thinking and analyzing capacity for research.

Mapping of Outcomes

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	M
CO3	S	S	M	S
CO4	S	S	S	M

S - Strong; M-Medium; L-Low.

19MAP07	ADVANCED COMPLEX ANALYSIS WITH TABLEAU	II
Unit No.	**Topics**	**Hours**
I	**Introduction to the concept of analytic function:** Limits and continuity –Analytic functions, Polynomials – Conformality: Arcs and closed curves –Analytic functions in regions – Conformal Mapping –Length and Area **Chapter 2: Sections 1.1 - 1.3 Chapter 3: Sections 2.1 - 2.4**	15
II	**Complex Integration:** Line Integrals Rectifiable Arcs –Line Integrals as Functions of Arcs – Cauchy's theorem for a rectangle -Cauchy's theorem in a disk, Cauchy's Integral formula: The Index of a point with respect to a closed curve – Removable singularity- Taylor's Theorem –Zeros and Poles –The Local Mapping **Chapter 4: Sections 1.1 - 1.5 ,2.1,3.1-3.3**	15
III	**The Calculus of Residues:** The Residue theorem –The Argument principle –Evaluation of definite integrals. Harmonic functions: The Definitions and basic Properties – Mean value property –Poisson's Formula. **Chapter 4: Sections 5.1 - 5.3,6.1-6.3**	14
IV	**Series and Product Developments:** Weierstrass Theorem–The Taylor Series The Laurent Series–Partial fractions and Factorization: Partial Fractions-Infinite Products **Chapter 5: Sections 1.1 - 1.3,2.1,2.2**	14
V	**The Riemann Mapping Theorem** The Riemann Mapping Theorem –Use of the reflection principle – Analytic arcs –Conformal mapping of Polygons: The Behavior at an angle –The Schwarz –Christoffel Formula –Mapping on a rectangle **Chapter 6: Sections 1.1,1.3,1.4,2.1-2.3**	14
TABLEAU Problems related to ADVANCED COMPLEX ANALYSIS have been included in Practical-IV (19MAP23) and **questions related to TABLEAU excluded in ADVANCED COMPLEX ANALYSIS (19MAP07) in the questions.**		

Text Book:

***L.V. Ahlfors**, Complex Analysis, McGraw Hill, New York, 1979.*

Reference Books:

*1.**T.WGamelin**, complexanalysis,* Springer, New York, 2001

*2.**B. Choudhary**, The elements of complex analysis,* John Wiley and Sons Ltd (April 11, 1984)

Course Designed by	Verified by HOD	Checked by	Approved by
			CONTROLLER OF EXAMINATIONS HICAS CBE-28

M.Sc. MATHEMATICS

Programme Code:	MMA	Programme Title: M.Sc. Mathematics		
Course Code:	19MAP08	Course Title	Batch:	2019-2020 and Onwards
		PARTIAL DIFFERENTIAL EQUATIONS WITH SCILAB	Semester:	II
Hrs/Week:	6		Credits:	4

Course Objective

1. Partial differential equation is an important life skill worth understanding well. It is useful for many jobs some of which a student may enter as a second career.
2. Along with developing critical thinking, specifically logic, patterns, problem-solving, deductive and inductive reasoning, understanding the core concepts of differential equation can help individuals for better solving the problems.

Course Outcomes (CO)

K1	CO1	Identify various methods of solving different kinds of Partial differential equations.
K2	CO2	Have a clear understanding on the concept of elliptic, parabolic and hyperbolic equations.
K3	CO3	Applying the core concepts of differential equation which can help individuals for better solving the problems.
K4	CO4	Analyze partial derivative equation techniques to predict the behaviour of certain phenomena.

Mapping of Outcomes

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	M	S
CO2	S	M	L	S
CO3	S	S	S	M
CO4	M	M	M	S

S - Strong; M-Medium; L-Low.

19MAP08	PARTIAL DIFFERENTIAL EQUATIONS WITH SCILAB	II
Unit No.	**Topics**	**Hours**
I	**Mathematical Models:** The Classical equation –The vibrating string –The vibrating membrane– Conduction of Heat in solids –Canonical forms–equations with constant coefficients –general solution. **Chapter 2:Sections 2.2, 2.3, 2.5 Chapter3: Sections 3.1 –3.5, Chapter4: Sections 4.2 –4.4**	**15**
II	**The Cauchy problem:** Cauchy–Kowlalewsky theorem –Homogeneous wave equation –Initial – Boundary value problems–Non-homogeneous boundary conditions – Non-homogeneous wave equation, Riemann Method. **Chapter 5: Sections 5.1 - 5.8**	**15**
III	**Methods of separation of variables:** Séparation of variables –The vibrating string problem –Existence and Uniqueness of solution of the vibrating string problem. The heat conduction problem –existence and uniqueness of solution of the heat conduction problem. **Chapter 7: Sections 7.1 - 7.6**	**14**
IV	**Boundary value problems:** Maximum and minimum principles –Uniqueness and continuity theorems–Dirichlet problems for a circle –Neumann problem for a circle Dirichlet problem for a rectangle –Neumann problem for a rectangle. **Chapter 9: Sections 9.1 – 9.4, 9.6,9.7,9.9**	**14**
V	**Green's function:** The delta function –Green's function –method of Green's function – Dirichlet problem for the Laplace operator–method of images–method of eigen functions. **Chapter 11: Sections 11.1 –11.8**	**14**
SCILAB Problems related to PARTIAL DIFFERENTIAL EQUATIONS have been included in Practical-IV (19MAP23) and **questions related to SCILAB excluded in PARTIAL DIFFERENTIAL EQUATIONS (19MAP08) in the questions.**		

Text Book:

TynMyint. U with LokenathDebnath, *Partial Differential Equations for Scientists and Engineers, 3rd Edition.*

Reference Books:

Sneddon. I.N., *Elements of Partial Differential Equations, McGraw Hill, London, 1957.*

Course Designed by	Verified by HOD	Checked by	Approved by

BOS meeting approved: 22.06.2019

Approved in 5th Academic Council meeting on: 29..06.2019
Item No : XXVI

M.Sc. MATHEMATICS

Programme Code:	MMA	Programme Title: M.Sc. Mathematics		
Course Code:	19MAP09	Course Title	Batch:	2019-2020 and Onwards
		MECHANICS	Semester:	II
Hrs/Week:	6		Credits:	4

Course Objective

1. To give a detailed knowledge of the mechanical system of particles.
2. To study the applications of Lagrange's and Hamilton's equations.

Course Outcomes (CO)

K1	CO1	Remember the postulates governing static and dynamic system and to study difference application of these concepts.
K2	CO2	End of this course, the students are expected to gain the knowledge about the Canonical Transformations and Introduction to Relativity
K3	CO3	Analyze the mechanism of solving the problem.
K4	CO4	On successful completion of this course, the students should gain knowledge about Hamilton's Equations, Hamilton-Jacobi Theory and analyze them. .

Mapping of Outcomes

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	S	S	S
CO4	M	M	S	S

S - Strong; M-Medium; L-Low.

19MAP09	MECHANICS	II
Unit No.	**Topics**	**Hours**
I	**Introductory concepts:** Mechanical system –Generalized Coordinates – Coplanar Motion – Constraints –Virtual Work –Energy and Momentum- **Sections 1.1 -1.5**	15
II	**lagrange's equations:** Introduction to Lagranges equations- Derivations of Lagrange's Equations –Examples –Integrals of Motion. **Sections 2.1 -2.3**	15
III	**Hamilton's equations:** Introduction to Hamilton's equations-Hamilton's methods- Action and Hamilton's Principle –Hamilton's Equations. **Sections 4.1 -4.2**	14
IV	**Hamilton –Jacobi theory:** Hamilton's Principle function –Hamilton –Jacobi Equation and waves of constant action –Separability. **Sections 5.1 - 5.3**	14
V	**Canonical transformations:** Differential forms and Generating Functions – Lagrange and Poisson Brackets-Theory of Dimensions. **Sections 6.1 - 6.4**	14

Text book :

D.T.Greenwood: *Classical Dynamics, Dover Publication, New York, 1997.*

Reference Books:

*1.**F. Gantmacher**, Lectures in Analytic Mechanics, MIR Publishers, Moscow, 1975.*

*2.**I.M. Gelfand and S.V. Fomin**, Calculus of Variations, Prentice Hall.*

*3.**S.L. Loney**, An Elementary Treatise on Statics, Kalyani Publishers, New Delhi, 1979.*

Course Designed by	Verified by HOD	Checked by	Approved by
			CONTROLLER OF EXAMINATIONS HICAS CBE-28

Programme Code:	MMA	Programme Title: M.Sc. Mathematics		
Course Code:	19MAP10	Course Title	Batch:	2019-2020 and Onwards
		OPTIMIZATION TECHNIQUES	Semester:	II
Hrs/Week:	6		Credits:	4

Course Objective

1. On successful completion of this course. the students should gain knowledge about optimal use of resources.
2. End of this course, the students are expected to gain the knowledge about the simulation, Inventory control, Network programming.

Course Outcomes (CO)

K1	CO1	Identify shortest route and shortest distance algorithms, Inventory models, Game theory concepts and Queuing Models.
K2	CO2	Understand shortest route and shortest distance algorithms, Inventory models, Game theory concepts and Queuing Models.
K3	CO3	Proficient in implementing Optimization methods for a variety of multi disciplinary applications.
K4	CO4	Analyze some managerial decision making problems.

Mapping of Outcomes

PO / CO	PO1	PO2	PO3	PO4
CO1	S	S	M	S
CO2	S	S	S	S
CO3	S	S	S	S
CO4	S	S	S	M

S - Strong; M-Medium; L-Low.

19MAP010	OPTIMIZATION TECHNIQUES	II
Unit No.	**Topics**	**Hours**
I	**Simplex Methods:** What is operation research?–Models and Modeling in OR –Simplex method –Artificial Variables Techniques –Special cases in the Simplex method - Revised simplex method. **Chapter1, Chapter3 : Sections 3.1, 3.2, 3.3 Chapter 4: Sections 4.1**	15
II	**Duality:** Definition –Primal –Dual relationship –Dual simplex method – Transportation model –Assignment model. **Chapter 5 : Sections 5.1- 5.5, Chapter 7: Sections 7.1 - 7.3, Chapter 8: Sections 8.1 - 8.6**	15
III	**Network Models:** Minimal spanning tree algorithm –Shortest root algorithm (Dijkstra's algorithm only) – CPM - PERT. **Chapter 15 : Sections 15.1 - 15.7**	14
IV	**Inventory Models:** Types of inventories – Inventory cost – EOQ with no shortages – EOQ with shortages – EOQ with price breaks. **Chapter 12 : Sections 12.1 - 12.9**	14
V	**Simulation Modeling:** Monte Carlo simulation –Types of simulation –Elements of discrete event simulation –Generation of random numbers. **Chapter 17 : Sections 17.1 - 17.7**	14

Text book :
Sundaresan.V,GanapathySubramanian.K.S, Ganesan.K.,*Resource Management Techniques, Sixth Edition, A.R.Publications, Chennai (2012).*

ReferenceBook:
Taha. H.A.,*Operations Research: An Introduction, Eighth Edition, Prentice Hall of India Private Limited, NewDelhi (2006).*

Course Designed by	Verified by HOD	Checked by	Approved by
			CONTROLLER OF EXAMINATIONS HICAS CBE-28

Programme Code:	MMA	Programme Title: M.Sc. Mathematics		
Course Code:	19MAP11	Course Title	Batch:	2019-2020 and Onwards
		FUZZY LOGIC AND FUZZY SET	Semester:	II
Hrs/Week:	4		Credits:	4

Course Objective

1. On successful completion of this course, the students should gain knowledge about fuzzy techniques.
2. End of this course, the students are expected to gain the knowledge about applications of fuzzy sets and fuzzy logic in decision making.

Course Outcomes (CO)

K1	CO1	To Identify the fundamental theory and concepts of Fuzzy Logic.
K2	CO2	To understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic control and other machine intelligence applications of fuzzy logic
K3	CO3	To Apply the operations on fuzzy sets and the combinations of operations.
K4	CO4	Inference from conditional fuzzy propositions, Fuzzy quantifiers.

Mapping of Outcomes

PO / CO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	M	S	M
CO3	S	S	S	S
CO4	S	S	S	S

S - Strong; M-Medium; L-Low.

19MAP011	FUZZY LOGIC AND FUZZY SET	II
Unit No.	**Topics**	**Hours**
I	**FUZZY SETS:** Basic types – Basic concepts – α-cuts – Additional properties of α- cuts – Representation of fuzzy sets– Decompositions theorems –Extension principle for Fuzzy sets. **Chapter 1: Sections 1.3 - 1.4,Chapter 2: Sections 2.1 - 2.3**	9
II	**OPERATIONS ON FUZZY SETS:** Types of operations – Fuzzy complements – Fuzzy Intersections: t- Norms – Fuzzy Unions: t-conorms – Combinations of operations. **Chapter 3: Sections 3.1 - 3.5**	9
III	**FUZZY ARITHMETIC:** Fuzzy numbers –Linguistic variables– Arithmetic operations on intervals– Arithmetic operations on Fuzzy numbers. **Chapter 4: Sections 4.1 - 4.4**	9
IV	**FUZZY RELATIONS:** Crisp and fuzzy relations – Binary fuzzy relations – Binary relations on a single set-Fuzzy equivalence relations–Fuzzy compatibility relations – Fuzzy ordering relations–Fuzzymorphism–Sup-icompositions of binary fuzzy relations – Inf- ωi compositions of fuzzy relations. **Chapter 5: Sections 5.1, 5.3 – 5.10**	9
V	**APPLICATIONS:** Natural, life and Social Sciences -Engineering-Medicine-Management and decision making **Chapter 6: Sections 6.2 - 6.5**	9

Text book :

1. ***George J.Klir and Bo Yuan****, Fuzzy Sets and Fuzzy Logic, Prentice Hall of India* ***(For Units I toIV)***
2. ***George J. Klir and Tina A. Folger****, "Fuzzy Sets, Uncertainty and Information", Prentice-Hall of IndiaPrivate Limited-Fourth printing-June 1995* ***(For UnitV)***

Reference books

1. ***H.J. Zimmermann,*** *Fuzzy Set Theory and its Applications, Allied PublishersLimited*
2. ***G.J. Klir and B. Yuan,*** *Fuzzy Sets and Fuzzy Logic, Prentice Hall of India, New Delhi,1995.*

Course Designed by	Verified by HOD	Checked by	Approved by
			CONTROLLER OF EXAMINATIONS HICAS CBE-28

Programme Code:	MMA	Programme Title: M.Sc. Mathematics		
Course Code:	19MAP12	Course Title	Batch:	2019-2020 and Onwards
		TOPOLOGY	Semester:	III
Hrs/Week:	6		Credits:	5

Course Objective

1. To study the concepts concerned with properties that are preserved under continuous deformations of objects.
2. To train the students to develop analytical thinking and the study of continuity and connectivity.

Course Outcomes (CO)

K1	CO1	Understand the generalized notions lying behind real and complex spaces and understand the way these spaces are generalized to topological spaces.
K2	CO2	Have a thorough knowledge about different topological spaces, their properties and get an insight about the significance of topological spaces in mathematical analysis.
K3	CO3	To know and analyse the topological properties of function spaces and distinguish between the properties of spaces with strong and weak topologies.
K4	CO4	To inculcate the concept of Compactness in Metric Spaces.

Mapping of Outcomes

PO / CO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	M	S	M
CO3	S	S	S	S
CO4	S	S	S	S

S - Strong; M-Medium; L-Low.

19MAP12	TOPOLOGY	III
Unit No.	**Topics**	**Hours**
I	**Topological spaces and Continuous functions:** Topological spaces - Basis for a Topology-The Order Topology - The Product Topology on X x Y-The Subspace Topology - Closed Sets and Limit Points -Continuous Functions - The Product topology - The Metric Topology. **Chapter 2: Sections 12 – 20**	15
II	**Connectedness and Compactness:** Connected Spaces -Connected subspaces of the Real Line - Components and Local Connectedness -Compact Spaces -Compact Subspaces of the Real line- Limit Point Compactness. **Chapter 3: Sections 23 – 28**	15
III	**Countability and Separation Axioms:** The Countability Axioms - The Separation Axioms - Normal Spaces - The Urysohn Lemma - The UrysohnMetrization Theorem - The Tietze Extension Theorem. **Chapter 4: Sections 30 – 35**	14
IV	**Completely regular spaces:** The Tychonoff Theorem -The Stone-CechCompactification. **Chapter 5: Sections 37 - 38**	14
V	**Complete Metric Spaces :** Compactness in Metric Spaces -Pointwise and Compact Convergence - The Compact-Open Topology. **Chapter 7: Sections 45 - 46**	14

***Text book*:**

1. James R.Munkres, Topology; PHI Learning Private Limited, New Delhi, 2nd edition 2014.

Reference Book:

1.Dugundji.J, Topology, Allyn and Bacon, 1966 (Reprinted in India by Prentice Hall of India Private Limited.)

Course Designed by	Verified by HOD	Checked by	Approved by
			Co-ordinator Curriculum Development Cell Hindusthan College of Arts & Science, Coimbatore-641 028.

Programme Code:	MMA	Programme Title: M.Sc. Mathematics		
Course Code:	19MAP13	Course Title	Batch:	2019-2020 and Onwards
		ADVANCED TOPICS IN FLUID DYNAMICS	Semester:	III
Hrs/Week:	6		Credits:	4

Course Objective

1. Togive the students an introduction to the behavior of fluids in motion.

2. Togive the students a feel of the applications of Complex Analysis in the analysis of the flow of liquids.

Course Outcomes (CO)

K1	CO1	To Analyze fluid flow problems with the application of the momentum and energy equations.
K2	CO2	To understand modelling approximations in finding exact solutions.
K3	CO3	To Apply basic principles of multi-variable calculus, differential equations and complex variables to fluid dynamic problems.
K4	CO4	Inference from Viscous flows and incompressible flows.

Mapping of Outcomes

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	M	S	M
CO3	S	S	S	S
CO4	S	S	S	S

S - Strong; M-Medium; L-Low.

19MAP13	ADVANCED TOPICS IN FLUID DYNAMICS	III
Unit No.	**Topics**	**Hours**
I	**Introductory notions:** velocity-stream lines, path lines-Stream Tubes and Filaments-fluid body-density-pressure Differentiation following the fluid-Equation of continuity-Boundary conditions-kinematical and physical- Rate of change of linear momentum-Equation of motion of an inviscid fluid. **Chapter I : Sections 1.0-1.3,3.10-3.41(omit 3.32)**	15
II	**Conservative forces:** Euler's momentum theorem--Bernoulli's theorem in steady motion-Energy equation for inviscid fluid-circulation-Kelvin's theorem-vortex motion-Helmholtz equation. **Chapter III : Sections 3.42-3.53(omit 3.44)**	15
III	**Two Dimensional Motion:** Two Dimensional Functions-Complex potential- Basic singularities-source-sink-vortex-doublet-Circle theorem. Flow past a circular cylinder with circulation-conformal transformation-Blasius theorem-lift force. **Chapter III : Sections 3.1-3.7.5(omit 3.3.4,3.4,3.5.2,3.6)**	14
IV	**Viscous flows:** Viscous flows- Navier – stokes equations- some exact solutions of Navier Stokes equations- Flow between parallel flat plates- Coutte flow- Plane Poiseuille flow- Steady flow in pipes: Flow through a pipe **Chapter V : Sections 5.1-5.3.3**	14
V	**Laminar Boundary Layer in incompressible flow:** Boundary Layer concept – Boundary Layer equations- Displacement thickness, Momentum thickness- Kinetic energy thickness – integral equation of boundary layer- flow parallel to semi-infinite flat plate. **Chapter VI : Sections 6.1-6.3,1(omit 6.2.2,6.2.5)**	14

Text book :

1. Milne Thomson.L.M.,– Theoretical Hydrodynamics Fifth Edition (Revised and Enlarged),Dover Publications, Inc. New York.

Reference Book:

1. RaisinghaniaM.D. –Fluid Dynamics (Hydro Dymamics) (S.CHAND & CO LTD 2002)

Course Designed by	Verified by HOD	Checked by	Approved by
			Co-ordinator Curriculum Development Cell Hindusthan College of Arts & Science, Coimbatore-641 028.

Programme Code:	MMA	Programme Title: M.Sc. Mathematics		
Course Code:	19MAP14	Course Title	Batch:	2019-2020 and Onwards
		PROBABILITY THEORY AND MATHEMATICAL STATISTICS	Semester:	III
Hrs/Week:	6		Credits:	4

Course Objective

1. To provide a thorough treatment of probability ideas and techniques necessary for a firm understanding of the subject.
2. Understanding of the ideas in their proofs, and ability to make direct application of those results to related problems.

.Course Outcomes (CO)

K1	CO1	The ability to use and simulate random variables, distribution functions, probability mass functions, and probability density functions, through calculus and functional transformations, to answer quantitative questions about the outcomes of probabilistic systems.
K2	CO2	The ability to use and simulate multivariate distributions, independence, conditioning, and functions of random variables, including the ability to compute expectations, moments, and correlation functions, to describe relationships between different experimental conditions.
K3	CO3	The ability to use probabilistic reasoning and the foundations of probability theory to describe probabilistic engineering experiments in terms of sample spaces, event algebras, classical probability, and axioms.
K4	CO4	The ability to use Markov chain from measurements and transition matrices to make reasonable quantitative inferences about engineering systems.

Mapping of Outcomes

PO / CO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	M	S	M
CO3	S	S	S	S
CO4	S	S	S	S

S - Strong; M-Medium; L-Low.

19MAP14	PROBABILITY THEORY AND MATHEMATICAL STATISTICS	III
Unit No.	**Topics**	**Hours**
I	**Random Events:** Preliminary remarks –random events and operations performed on them –System of axiom of the theory of Probability,Conditional probability,Bayes theorem. Independent Events –Parameters of the distribution of a random variable-expected values,moments,Chebyshev inequality –absolute moments. **Chapter 1: Sections 1.1 - 1.7, Chapter 3: Sections 3.1 - 3.4**	15
II	**Characteristic Functions:** Properties of characteristic functions - the characteristic function and moments –semi-invariants –the characteristic function of the sum of independent random variables –Determination of the distribution function of multidimensional random vectors –probability –generating functions. **Chapter 4: Sections 4.1 - 4.4,4.6-4.7**	15
III	**Some Probability distributions:** The uniform distribution -the normal distribution –the gamma distribution –The Cauchy and Laplacedistributions –Limit theorems – preliminary remarks –Stochastic convergence –the convergence of a sequence of distribution functions –the Levy-Cramer theorem – The De Moivre Laplace theorem -the Lindeberg-Levy theorem **Chapter 5: Sections 5.6 - 5.8,5.10,Chapter 6: Sections 6.1 ,6.2,6.4,6.6-6.8**	14
IV	**Sample moments and their functions:** The notion of a sample –the notion of a Statistic –the distribution of the arithmetic mean of independent normally distributed random variables –the chi squaredistribution –the distribution of the statistic (X,S) –student's t-distribution –Fisher's Z-distribution **Chapter 9: Sections 9.1 – 9.7**	14
V	**The Theory of Estimation**: Preliminary notions –Consistent estimates –unbiased estimates –the sufficiency of an estimate –the efficiency of an estimates – Asymptotically most efficient estimates –methods of finding estimates – Maximum likely hood estimate –confidence intervals **Chapter 13: Sections 13.1 - 13.8**	14

Text book :

1. MarekFisz,John Wiley, Probability Theory and Mathematical Statistics,, Third Edition, New York, 2006.

Reference Book:

1. Feller W. " An Introduction to Probability Theory and its Applications", Vol. I, John Wiley, Third Edition, 1968.

Course Designed by	Verified by HOD	Checked by	Approved by
			Co-ordinator

Curriculum Development Cell
Coimbatore-641 028.

Programme Code:	MMA	Programme Title: M.Sc. Mathematics		
Course Code:	19MAP15A	Course Title	Batch:	2019-2020 and Onwards
		ELECTIVE I : GRAPH THEORY	Semester:	III
Hrs/Week:	6		Credits:	4

Course Objective

1. This course Explain basic concepts in graph theory, with an emphasis on applications and modelling. The main objective is to discuss the key ideas, theorems, and proofs of the important result.
2. Learn to model problems using graphs and to solve these problems algorithmically. Modern applications of graph theory will be explored

K1	CO1	Be able to grasp features, properties of special graphs
K2	CO2	Be able to formulate and prove central theorems about trees, matching, connectivity, coloring and planar graphs;
K3	CO3	To discuss the concept of graph, tree, Euler graph, cut set and Combinatories
K4	CO4	Be able to use graph theory as a modeling tool

Mapping of Outcomes

PO / CO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	M	S	M
CO3	S	S	S	S
CO4	S	S	S	S

S - Strong; M-Medium; L-Low.

19MAP15A	ELECTIVE I : GRAPH THEORY	III
Unit No.	**Topics**	**Hours**
I	**Graphs, Sub graphs :** Graphs, Sub graphs: Graphs and simple graphs – Graph Isomorphism- The Incidence and Adjacency Matrices – Sub graphs spanning and induced sub graphs - vertex Degrees –Paths and Connection -Cycles – Cayley's formula. **Chapter 1 : Sections 1.1 – 1.7 ,Chapter 2: 2.1 – 2.4**	15
II	**Trees, Connectivity, Euler tours and Hamilton cycles:** Trees: Trees – Cut edges and Bonds – Cut vertices .Connectivity – Blocks. Euler tours and Hamilton Cycles: Euler tours – Hamilton Cycles. **Chapter 3: Sections 3.1 – 3.2, Chapter 4 : 4.1 – 4.2**	15
III	**Matching and Edge colorings:** Matching – Matching coverings in Bipartite Graphs - Perfect Matching. Edge colorings: Edge chromatic number – Vizing's theorem. **Chapter 5: Sections 5.1 – 5.3, Chapter 6: 6.1 – 6.2**	14
IV	**Independent sets Cliques and Vertex Colorings:** Independent sets - Ramsey's theorem. Vertex Colorings: Chromatic Number – Brook's theorem – Hajos Conjecture. **Chapter 7: Sections 7.1 – 7.2 , Chapter 8: 8.1 – 8.5**	14
V	**Planar graphs and Directed Graphs :** Plane and planar Graphs – Dual Graphs – Euler's formula – Bridges – Kuratowski's Theorem (proof omitted) – the five color theorem – Four colour conjecture. **Chapter 9: Sections 9.1 – 9.7**	14

Text book :

1. *Bondy.J.A. andMurty.U.S.R., Graph Theory with applications, American Elsevier Publishing Co.,Newyork.*2011

Reference Book:

1. NarsinghDeo,Graph theory with applications to engineering and computer science,Prentice Hall India.-19th printing May 2000

Course Designed by	Verified by HOD	Checked by	Approved by

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

M.Sc. MATHEMATICS

Programme Code:	MMA	Programme Title: M.Sc. Mathematics		
Course Code:	19MAP15B	Course Title	Batch:	2019-2020 and Onwards
		ELECTIVE - I: STOCHASTIC DIFFERENTIAL EQUATIONS	Semester:	III
Hrs/Week:	6		Credits:	4

Course Objective

1. This course covers Stochastic processes, Renewal processes and branching processes with an emphasis on model building
2. End of this course, the students are expected to gain the knowledge about applications of stochastic differential equations.

Course Outcomes (CO)

K1	CO1	Know the basics knowledge about stochastic process.
K2	CO2	Acquire more detailed knowledge about Markov Process with discrete and continuous state space.
K3	CO3	To find the Existence and Uniqueness Result and Weak and Strong Solutions
K4	CO4	Inference from Diffusion properties.

Mapping of Outcomes

PO / CO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	M	S	M
CO3	S	S	S	S
CO4	S	S	S	S

S - Strong; M-Medium; L-Low.

19MAP15B	ELECTIVE - I : STOCHASTIC DIFFERENTIAL EQUATIONS	III
Unit No.	**Topics**	**Hours**
I	**Introduction** Stochastic Analogs of Classical Differential Equations, Filtering Problems, Stochastic Approach to Deterministic Boundary Value Problems, Optimal Stopping, Stochastic Control and Mathematical Finance. Some mathematical preliminaries:Probability Spaces, Random Variables andStochastic Processes and anImportantExample: Brownian Motion	15
II	**Ito Integrals:** Construction of the Ito integral , Some Properties of the Ito Integral and Extensions of the Ito Integral	15
III	**The Ito formula and the Martingale Representation Theorem:** The 1-dimentional Ito Formula, the Multi dimensional Ito Formula and the Martingale Representation Theorem. Stochastic Differential Equations: Examples and Some Solution Methods, An Existence and Uniqueness ResultandWeakandStrong Solutions	14
IV	**The Filtering problem:** Introduction, The 1-dimentionalLinear Filtering Problem and the Multi-dimensional Linear Filtering Problem.	14
V	**Diffusions:** Basic Properties: The Markov Property, the Strong Markov Property, the Generator of an Ito Diffusion, the Dynkin Formula, the Characteristic Operator	14

1. BerntOksendal "Stochastic Differential Equations -An Introduction with Applications", (Sixth Edition), Springer-Verlag, Heidelberg, 2003.

Reference book:

1. Berntoksendal, Stochastic Differential Equations -An Introduction with Applications",

Course Designed by	Verified by HOD	Checked by	Approved by
			Co-ordinator Curriculum Development Cell Hindusthan College of Arts & Science, Coimbatore - 641 028.

Programme Code:	MMA	Programme Title: M.Sc. Mathematics		
Course Code:	19MAP16	Course Title	Batch:	2019-2020 and Onwards
		MATHEMATICAL SOFTWARES -II	Semester:	III
Hrs/Week:	3		Credits:	4

Course Objective

1.This course provides basic fundamentals on MATHEMATICA, primarily for numerical computing

2. To enhance the programming skills with the help of MATHEMATICA and its features which allow tolearn and apply specialized technologies.

Course Outcomes (CO)

K1	CO1	It lays foundation for doing matrix manipulations, plotting of functions and data, implementation of algorithms, and creation of user interfaces.
K2	CO2	It helps in integrating computation, visualization and programming in an easy to use environment where problems and solutions are expressed in familiar mathematical notations.
K3	CO3	This software is a more flexible programming tool for users in order to create large and complex application programs. .
K4	CO4	It consists of set of tools that facilitates for developing, managing, debugging and profiling M-files, and MATHEMATICA's applications.

Mapping of Outcomes

PO / CO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	M	S	M
CO3	S	S	S	S
CO4	S	S	S	S

S - Strong; M-Medium; L-Low.

19MAP16	MATHEMATICAL SOFTWARES -II	III
Unit No.	**Topics**	**Hours**
I	**Introduction to Mathematica:** Running Mathematica-Numerical calculations–Building up calculations–Using the Mathematica system–Algebraic calculations-Symbolic mathematics **Chapter 1: Sections 1.0.1 – 1.5.16**	6
II	**Numerical Mathematics:** Basic operations – Numerical sums, product and integrals -Numerical equation solving – Numerical differential equations – Numerical optimization –Manipulating numerical data – Statistics. **Functions And Programs:** Defining functions – functions as procedures – Repetitive operations – Transformation rules for functions .LISTS – Collecting objects together – Making tables of values – Vectors and matrices – Getting pieces of lists – Testing and searching list elements – adding, removing and modifying list elements – combining lists – rearranging lists – ordering in lists. **Chapter 1: Sections 1.6.1-1.8.11**	6
III	**Graphics:** Basic plotting – options– Redrawing and Combining plots– manipulating options– Threedimensionalsurface-plots– convertingbetweentypesof Graphics. **Input And Output In Notebooks:** Entering Greek letters – Two dimensional inputs – editing and evaluating two – dimensional expressions – entering formulas – entering tables and matrices – subscripts, bars and other modifiers – Non-English characters and key boards – other mathematical Notation – Forms of input and output – mixing text and formulation - displaying and printing mathematica notebooks. Advanced mathematics in mathematica- Calculus. **Chapter1: Sections 1.9.1-1.9.7,1.10.1,1.10.11,Chapter3:Sections3.5.1-3.5.12**	6
IV	**Series, Limits And Residues .Linear Algebra :** Constructing matrices – Getting pieces of matrices – Scalars, Vectors and Matrices – Operations on scalars, vectors and matrices – Multiplying Vectors and matrices – Matrix inversion – Basic matrix operations – Solving linear systems – Eigen values and Eigen vectors. **Chapter 3: Sections 3.6 .1- 3.7.9**	6
V	**Numerical Operations On Data :** Curve fitting – Approximate functions and Interpolation – Fourier Transforms. **Numerical Operations On Functions :** Numerical Integration – Numerical evaluation of sums and products – Numerical Solution of Polynomial equations – Numerical root finding – Numerical solution of Differential equations **Chapter 3: Sections 3.8.2 - 3.8.4,3.9.3-3.9.7**	6

Text book:

1. *Stephen Wolfram, "The Mathematica Book" Fifth Edition, Wolfram media, Cambridge, 2003.*

Reference book:

1. Eugene Don,mathematica (Schaum's outline) Mc.Graw Hill.

Course Designed by	Verified by HOD	Checked by	Approved by
			Co-ordinator Curriculum Development Cell Hindusthan College of Arts & Science, Coimbatore-641 028.

Programme Code:	MMA	Programme Title: M.Sc. Mathematics		
Course Code:	19MAP17	Course Title	Batch:	2019-2020 and Onwards
		MATHEMATICAL SOFTWARES - II (PRACTICAL)	Semester:	III
Hrs/Week:	3		Credits:	2

Course Objective

1. End of this course, the students are expected to gain the knowledge about mathematical software and their applications in decision making.
2. To improve the student's skills in numerical methods by using the numerical analysis software and computer facilities.

Course Outcomes (CO)

K1	CO1	Intended for students with no programming experience, provides the foundations of MATHEMATICA and programming in MATHEMATICA. Variables, arrays, conditional statements, loops, functions, and plots are explained.
K2	CO2	Good understanding of Linear algebra and Signal processing concepts.
K3	CO3	Perform mathematical Modeling in MATHEMATICA.
K4	CO4	Develop programs in MATHEMATICA.Evaluate, analyze and plot results.

Mapping of Outcomes

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	M	S
CO2	S	M	S	S
CO3	S	S	S	S
CO4	S	S	S	M

S - Strong; M-Medium; L-Low.

MATHEMATICAL SOFTWARES - II -LIST OF PRACTICALS

1. Using MATHEMATICA to compute the area bounded by the curves $f(x) = 1-x^2$ and $g(x) = x^2-3x^2$.

2. Using MATHEMATICA, sketch the Sphere $x^2 +y^2+z^2 =14$ and its tangent plane at the point (1,2,3).

3. Using MATHEMATICA, plot the (five) solutions for : $d^2 y/dx^2+0.3 dy/dx+siny=0$ with $0\leq x\leq 30$ and using initial conditions $y'(0)=0, y(0)= -2,-1,0,1$ and 2.

4. Using MATHEMATICA, solve the differential equation $dy/dx =1+1/2 y^2$, $y(0)=1$, $0\leq x\leq 1$, with DSolve and NDSolve and compare the results.

5. Using MATHEMATICA, Numerical Calculations.

6. Using MATHEMATICA, Mathematical Functions.

7.Using MATHEMATICA, Algebraic Calculations.

8. Using MATHEMATICA, Symbolic Mathematics.

9.Using MATHEMATICA, Lists

10.Using MATHEMATICA, Graphics-Two Dimensional Plots

11.Using MATHEMATICA, Graphics – Three Dimensional Plots

12.Using MATHEMATICA, Input and Output in Notebooks

M.Sc. MATHEMATICS

Programme Code:	MMA	Programme Title: M.Sc. Mathematics		
Course Code:	19MAP18	Course Title	Batch:	2019-2020 and Onwards
		FUNCTIONAL ANALYSIS	Semester:	IV
Hrs/Week:	6		Credits:	4

Course Objective

1. To impart analytic knowledge on infinite-dimensional vector spaces, of which the most important cases are Banach spaces and Hilbert spaces. .
2. This course provides an introduction to the basic concepts which are crucial in the modern study of partial differential equations, Fourier analysis, quantum mechanics, applied probability and many other fields

.

Course Outcomes (CO)

K1	CO1	Appreciate how ideas from different areas of mathematics combine to produce new tools that are more powerful than would otherwise be possible.
K2	CO2	Understand how functional analysis underpins modern analysis
K3	CO3	Develop their mathematical intuition and problem-solving capabilities, especially in predicting the space in which the solution of a partial differential equation belongs to.
K4	CO4	Describe the spectral theorem

Mapping of Outcomes

PO / CO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	M	S	M
CO3	S	S	S	S
CO4	S	S	S	S

S - Strong; M-Medium; L-Low.

19MAP18	FUNCTIONAL ANALYSIS	IV
Unit No.	**Topics**	**Hours**
I	**Banach Spaces:** The definition and some examples-Continuous linear transformations-The Hahn-Banach theorem - The natural imbedding of N in N^{**}- The open mapping theorem - The conjugate of an operator. **Chapter 9 : Sections 46 - 51**	15
II	**Hilbert spaces:** The definition and some simple properties -Orthogonal complements-Orthonormal sets-The conjugate space H^{*}. **Chapter 10 : Sections 52 - 55**	15
III	**Hilbert Spaces:** The adjoint of an operator - Self-ad joint operators-Normal and unitary operators-Projections. **Chapter 10 : Sections 56 – 59**	14
IV	**Finite dimensional Spectral theory:** Matrices-Determinants and the spectrum of an operator - The spectral theorem – A Survey of the situation. **Chapter 11 : Sections 60 – 63**	14
V	**General Preliminaries on BanachAlgebras:** The Definition and some examples-Regular and singular elements - Topological divisors of zero - The Spectrum - The formula for the Spectral Radius. **Chapter 12 : Sections 64 - 68**	14

Text book:

1. Simmons.G.F., Introduction to Topology and Modern Analysis Tata McGraw-Hill Edition 2004

Reference Book:

1.Erwin Kreyszig-John wiely and sonsIntroduction To Functional Analysis with Application (1978)

Course Designed by	Verified by HOD	Checked by	Approved by

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

Programme Code:	MMA	Programme Title: M.Sc. Mathematics		
Course Code:	19MAP19	Course Title	Batch:	2019-2020 and Onwards
		MATHEMATICAL METHODS	Semester:	IV
Hrs/Week:	6		Credits:	4

Course Objective

1. To introduce fundamentals and use of integral transforms, integral equations and variationalcalculus

2. To study the different types of transforms and their properties.

Course Outcomes (CO)

K1	CO1	To Know about Fourier and Laplace's transforms.
K2	CO2	To be Familiar with Volterra and Fredholm integral equations.
K3	CO3	To Describe the functionals of the integral forms.
K4	CO4	To apply the acquired knowledge in solving applied problems of science and engineering. .

Mapping of Outcomes

PO / CO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	M	S	M
CO3	S	S	S	S
CO4	S	S	S	S

S - Strong; M-Medium; L-Low.

19MAP19	MATHEMATICAL METHODS	IV
Unit No.	**Topics**	**Hours**
I	**FourierTransforms:** Fourier Transforms – Definition. Inversion theorem – Fourier cosine transforms - Fourier sine transforms – Fourier transforms of derivatives - Fourier transforms of some simple functions - The convolution integral – convolution theorem – Parseval'stheorem for Fourier transforms – Solution of PDE by Fourier transform. The Linear diffusion equation on a semi-infinite line The two-dimensional diffusion equation **Chapter 2: Sections 2.4 - 2.7,2.9,2.10,2.16-2(a).(b).(c)**	15
II	**Integral equations:** Reduction to a system of Algebraic equations - Types of Integral equations - Equation with separable kernel - Fredholm Alternative - Approximate method – Volterra integral equations. **Chapter 2: Section 2.1 - 2.5, Chapter 3: Section 3.3 - 3.4**	14
III	**Hankel transforms:** Definition – Elementary properties of Hankel Transforms –Hankel inversion theorem - Hankel Transforms of Derivatives of functions - The Parseval relation for Hankel transforms – Relation between Fourier and Hankel transforms – Application to PDE. Axisymmetric Dirichlet problem for a half – space. **Chapter 5: Sections 5.2 - 5.4,5.6-5.7,5.10.1**	15
IV	**Application of integral equation to ordinary differential equation** initial value problems – Boundary value problems – singular integral equations – Abel Integral equation **Chapter 5: Sections 5.1 – 5.3, Chapter 8: Section 8.1 – 8.2**	14
V	**Calculus of variations:** Variation and its properties – Euler's equation – Functionals of the integral forms - Functional dependent on higher order derivatives – functionals dependent on the functions of several independent variables – variational problems in parametric form - Applications. **Chapter 6: Sections 6.1 – 6.7**	14

Text book :

1. Ian.N.Sneedon,The use of integral equations for Unit I and Unit II

Reference Book:

1. Kanwal.R.P. , Linear Integral equations theory &Technique for Unit III and Unit IV

2. Elsgolts.L,Differential equations and calculus of variations for Unit V

Course Designed by	Verified by HOD	Checked by	Approved by

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

Programme Code:	MMA	Programme Title: M.Sc. Mathematics		
Course Code:	19MAP20	Course Title	Batch:	2019-2020 and Onwards
		C++ PROGRAMMING	Semester:	IV
Hrs/Week:	3		Credits:	2

Course Objective

1. Provide an insight to theoretical computer science and to get across to the notion of effective computability using programming in C++.
2. Provide an effective computability, using programming in C++.

Course Outcomes (CO)

K1	CO1	Understand the basic concepts of Oops.
K2	CO2	Know fundamentals of C++ programming language
K3	CO3	Understand advanced features of C++ such as stream I/O templates and operator overloading
K4	CO4	Know fundamentals of C++ programming language with the means of writing efficient, maintainable and portable code in Numerical Problems.

Mapping of Outcomes

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	M	S	M
CO3	S	S	S	S
CO4	S	S	S	S

S - Strong; M-Medium; L-Low.

19MAP20	C++ PROGRAMMING	IV
Unit No.	**Topics**	**Hours**
I	**Principles of Object-Oriented Programming:** Software crisis - Software Evolution - A look at Procedure--oriented Programming - Object-Oriented Programming Paradigm - Basic Concepts of Object-Oriented Programming - Benefits of OOP - Object-Oriented languages - Applications of OOP -Applications of C++ - Structure of C++ Program. **Chapter 1 : Sections 1.1 – 1.8** **Chapter 2 : Sections 2.2 and 2.6**	6
II	**Tokens, Expressions and Control Structures:** Introduction - Tokens - Keywords - Identifiers and Constants -Basic Data Types – User-Defined Data Types - Derived Data Types - Symbolic Constants - Type Compatibility - Declaration of Variables - Dynamic Initialization of Variables - Reference Variables - Operators in C++ - Scope Resolution Operator –Member Dereferencing Operators - Memory Management Operators - Manipulators - Type Cast Operator - Expressions and their Types - Special Assignment Expressions - Implicit Conversions - Operator Overloading - Operator Precedence -Control Structures. **Chapter 3 : Sections 3.1 – 3.24**	6
III	**Functions in C++:** Introduction - The Main Function - Function Prototyping - Call by Reference - Return by Reference - Inline Functions - Default Arguments - const Arguments - Function Overloading - Friend and Virtual Functions - Math Library Functions. **Managing Console I/O Operations:** Introduction - C++ Streams - C++ Stream Classes - Unformatted I/O Operations -Formatted Console I/O Operations - Managing Output with Manipulators. **Chapter 4 : Sections 4.1 – 4.11** **Chapter 10 : Sections 10.1 – 10.6**	6
IV	**Classes and Objects:** Introduction - C Structures Revisited - Specifying a Class - Defining Member Functions - A C++ Program with Class -Making an Outside Function Inline - Nesting of Member Functions - Private Member Functions - Arrays within a Class -Memory Allocation for Objects - Static Data Members - Static Member Functions - Arrays of Objects - Objects as Function Arguments - Friendly Functions - Returning Objects - const Member Functions. **Constructors and Destructors:** Introduction - Constructors - Parameterized Constructors -Multiple Constructors in a Class - Constructors with Default Arguments - Dynamic Initialization of Objects - Copy Constructor - Constructing Two-dimensional Arrays - const Objects - Destructors **Chapter 5 : Sections 5.1 – 5.17** **Chapter 6 : Sections 6.1 – 6.7,6.9 – 6.11**	6

V	**Operator Overloading and Type Conversions:** Introduction - Defining Operator Overloading - Overloading Unary Operators - Overloading Binary Operators - Overloading Binary Operators Using Friends - Manipulation of Strings Using Operators - Rules for Overloading Operators. **Inheritance - Extending Classes:** Introduction - Defining Derived Classes - Single Inheritance -Making a Private Member Inheritable - Multilevel Inheritance -Multiple .Inheritance - Hierarchical Inheritance - Hybrid Inheritance. **Chapter 7 : Sections 7.1 – 7.7** **Chapter 8 : Sections 8.1 – 8.8**	6

Text book :

1. Balagurusamy. E Object –Oriented Programming with C++, Fourth Edition ,Tata McGraw-Hill Publishing Company limited, 1999.

Reference Book:

1. RaviChandran.D – 'Programming with C++', Tata McGraw-Hill publishing company limited (1996), New Delhi.

Course Designed by	Verified by HOD	Checked by	Approved by
			Co-ordinator Curriculum Development Cell Hindusthan College of Arts & Science, Coimbatore-641 028.

Programme Code:	MMA	Programme Title: M.Sc. Mathematics		
Course Code:	19MAP21	Course Title	Batch:	2019-2020 and Onwards
		PRACTICAL II - C++ PROGRAMMING	Semester:	IV
Hrs/Week:	3		Credits:	2

Course Objective

1. To learn the characteristics of the object oriented programming language, data abstraction, dynamic memory allocation, inheritance, and operator overloading and type conversions.
2. To enhance problem solving and programming skills with extensive programming sessions.

Course Outcomes (CO)

K1	CO1	Understand advanced features of C++ such as stream I/O templates and operator overloading.
K2	CO2	Ability to use different data structures and memory allocation method. .
K3	CO3	Apply the major object oriented concepts to implement object oriented programs in C++, encapsulation and inheritance.
K4	CO4	Develop programs in C++ Evaluate, analyze and plot results.

Mapping of Outcomes

PO / CO	PO1	PO2	PO3	PO4
CO1	S	S	M	S
CO2	S	M	S	S
CO3	S	S	S	S
CO4	S	S	S	M

S - Strong; M-Medium; L-Low.

PRACTICAL II - C++ PROGRAMMING- LIST OF PRACTICALS

1..DISTANCE CONVERSION PROBLEM:

Create two classes DM and DB which store the value of distances. DM store the value ofdistances. DM stores distances in meters and centimeters in DB in feet and inches. Write a Program that can create the values of the class objects and add one object DM with another object DB.Use a friend function to carry out addition operation. The object that stores the result may be DM object or DB object depending on the units in which results are required. The display should be in the order of meter and centimeter and feet or inches depending on theorder of display.

2.OVERLOADING OBJECTS:

Create a class FLOAT that contains one float data member overload all the four arithmetic operators so that operate on the objects of FLOAT.

3.OVERLOADING CONVERSIONS:

Design a class polar which describes a pant in a plane using polar Co-ordinates radius and angle. A point in polar Co-ordinates is as shown below.Use the overloader + operator to add two objects of polar. Note that we cannot add polar values of two points directly. This requires first the conversion.Points into rectangular Co-ordinates and finally converting the result into polar Co-ordinates.
You need to use following trigonometric formulas.
X= r * cos (a);
Y= r * sin (a);
$a= \tan^{-1}(Y/X)$
r = sqrt (X * X +Y * Y);

4.OVRELOADING MATRIX:

Create a class MAT of size M*N. Define all possible matrix operations for MAT type objects. Verify the identity(A-B)^2 = A^2+B^2 –2*A*B

5.AREA COMPUTATION USING DERIVED CLASS:

Area of rectangle = X*Y
Area of triangle = ½ * X * Y

6.VECTOR PROBLEM:

Define a class for vector containing scalar values. Apply overloading concepts for vector addition, Multiplication of a vector by a scalar quantity; replace the values in a position vector.

7.INHERITANCE

Create three classes' alpha, beta and gamma, each containing one data member. The class gamma should be inherited from both alpha and beta. Use a constructor function in the class gamma to assign values to the data members of all the classes. Write a program to print the data members of all the three classes

8. CLASS AND OBJECTIVES

Create a class which consists of employee details E.No. , E.Name, Dept, Basic Salary. Write a member function to get and display them.Derive a class pay from the above class and write a member function to calculate DA, HRA and PF depending on the grade.

9. OVERLOADING OPERATORS

Create a class FLOAT that contains one float data member. Over load all four arithmetic operators.

10. DISPLAYING STRINGS

Write a C++ program to display strings using WRITE function.

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

M.Sc. MATHEMATICS

Programme Code:	MMA	Programme Title: M.Sc. Mathematics		
Course Code:	19MAP22A	Course Title	Batch:	2019-2020 and Onwards
		ELECTIVE - II : MAGNETO HYDRO DYNAMICS	Semester:	IV
Hrs/Week:	5		Credits:	4

Course Objective

1. Introduce the Definition of electromagnetism, MHD basis, one and two fluid equations, equilibrium and stability; equations of kinetic theory.

2. End of this course, the students are expected to gain the knowledge about derivation of fluid equations and stabilities.

Course Outcomes (CO)

K1	CO1	Describe and explain the domains of validity of one-fluid MHD.
K2	CO2	Demonstrate the basic properties of MHD.
K3	CO3	To Analyze the types of flows and it's properties.
K4	CO4	Inference from stability and instability of the fluid.

Mapping of Outcomes

PO / CO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	M	S	M
CO3	S	S	S	S
CO4	S	S	S	S

S - Strong; M-Medium; L-Low.

19MAP22A	ELECTIVE - II : MAGNETO HYDRO DYNAMICS	IV
Unit No.	**Topics**	**Hours**
I	**Electromagnetism:** Fundamental Laws –Electrostatic Energy –Electrodynamics – Ampere's Law –Lorentz force on a moving charge –Magnetostatic Energy –Faraday's Law of Induction –Poynting stresses – Electromagnetic Equations with respect to moving axes –boundary conditions of electric and magnetic fields.	12
II	**Kinematics of fluid motion:** equation of continuity –Stress tensor –Navier-stokes equations – boundary condition – Velocity Magneto fluid dynamic equations – MHD approximation –equation of Magnetic diffusion in a moving conducting medium –Magnetic Reynolds number	12
III	**Alfven's theorem Law of isorotation :** Magneto hydrostatics –Force-free field –Alfven waves in incompressible MHD	12
IV	**HartmannFlow:** Incompressible viscous flows in the presence of magnetic field – unsteady Hartmann flow –Magnetofluid dynamic pipe flow.	12
V	**Stability :** Instability of linear pinch –Sausage and flute types –Method of small oscillations –gravitational instability.	12

Text book :

1.Crammer K.R. and Pai S.I, Magneto Fluid Dynamics for Engineers and Applied Physicists, McGraw Hill, 1973.

Reference book:

1.Ferraro, VCA and Plumpton: Introduction to Magneto Fluid Dynamics, Oxford, 1966

Course Designed by	Verified by HOD	Checked by	Approved by
			Coordinator Curriculum Development Cell Hindusthan College of Arts & Science, Coimbatore-641 028.

M.Sc. MATHEMATICS

Programme Code:	MMA	Programme Title: M.Sc. Mathematics		
Course Code:	19MAP22B	Course Title	Batch:	2019-2020 and Onwards
		ELECTIVE - II : OPERATOR THEORY	Semester:	IV
Hrs/Week:	5		Credits:	4

Course Objective

1. To study linear operators on function spaces, beginning with differential operators and integral operators.
2. End of this course, the students are expected to gain the knowledge about operators and it's characterization.

Course Outcomes (CO)

K1	CO1	To Identify Fundamental properties of bounded linear operators.
K2	CO2	To understand Partial isometry operator and its characterization.
K3	CO3	To know the Relations among several classes of non-normal operators.
K4	CO4	Inference Further development of bounded linear operators.

Mapping of Outcomes

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	M	S	M
CO3	S	S	S	S
CO4	S	S	S	S

S - Strong; M-Medium; L-Low.

19MAP22B	ELECTIVE - II : OPERATOR THEORY	IV
Unit No.	**Topics**	**Hours**
I	**Fundamental properties of bounded linear operators Bounded linear operators on a Hilbert space:** Norm of bounded linear operators –Adjoint operators –Generalized polarization identity and its applications–Several properties on projection operators –Generalized Schwarz inequality and square root of positive operator –spectral representations of self adjoint operator.	12
II	**Partial isometryoperator:Partialisometry operator and its characterizationPolar decomposition of an operator:** Invariant subspace and reducing subspace –Polar decomposition of non-normal operator–Hereditary property on the polar decomposition of an operator.	12
III	**Spectrum of an operator:** Two kinds of classification of spectrum –Spectral mapping theorem Numerical range of an operator: Numerical range is a convex set – Numerical radius is equivalent to operator norm –The closure of numerical range includes the spectrum –Normaloid operator and spectraloid operator.	12
IV	**Relations among several classes of non-normal operators:** Paranormal operators –Characterizations of convexoid operators: some examples related to hyponormal, paranormal, normaloid and convexoid operators –Relations among several non-normal operators.	12
V	**Further development of bounded linear operators:** Young inequality and Holder –McCarthy inequality –Aluthge transformation on p-hyponormal operators and log-hyponormal operators	12

Text book :

1. Takayuki furuta,taylor ,invitation to linear operators, Francis, 2001.

Reference Book:

1. Halmos.P.R.,Hilbert space problembook,SpringerVerlag, New York

Course Designed by	Verified by HOD	Checked by	Approved by
			Co-ordinator Curriculum Development Cell Hindusthan College of Arts & Science, Coimbatore-641 028.

M.Sc. MATHEMATICS

Programme Code:	MMA	Programme Title: M.Sc. MATHEMATICS		
Course Code:	19MAP23	Course Title	Batch:	2019-2020 and Onwards
		PRACTICAL- IV: MATHEMATICAL SOFTWARES – III - LAB	Semester:	IV
Hrs/Week:	3		Credits:	2

Course Objective

1. End of this course, students are expected to gain the knowledge about mathematical software and to provide fundamentals of differentiation and integration and show their significant role through mathematical software.

2. To gain Knowledge of limits, Differential derivatives and related formulas by using the mathematical software GEOGEBRA, SCILAB AND TABLEAU.

Course Outcomes (CO)

K1	CO1	Learn math tools for graphing, geometry, 3D by using GEOGEBRA.
K2	CO2	Demonstrate Linear algebra and Trigonometry concepts by mathematical software.
K3	CO3	Develop programs in SCILAB and Evaluate, analyze, plot results.
K4	CO4	Use computational tools of TABLEAU.

Mapping of Outcomes

PO / CO	PO1	PO2	PO3	PO4
CO1	S	M	S	S
CO2	S	M	S	S
CO3	S	L	S	S
CO4	S	M	S	S

S - Strong; M-Medium; L-Low.

Code No	Course Title	Semester No
19MAP23	PRACTICAL- IV: MATHEMATICAL SOFTWARES – III - LAB	IV

1. Find one intersection point using a numerical, iterative method starting at the given parameters.
2. List containing the intersection points of two objects.
3. Creates a cube having the segment between the two points as an edge.
   Calculates the area of the polygon defined by the given points.
4. Creates all angles of a polygon in mathematically positive orientation.
5. Calculation of 20 terms of a sequence defined by recurrence by:

$$\begin{cases} u_1 = 4 \\ u_{n+1} = u_n + 2n + 3 \end{cases}$$

6. To plot the surface $z=2x^2 + y^2$ (elliptic paraboloid).
7. Generate a heart shape with its core functions by using SCILAB.
8. Population of four states of India in 2020 is given below. Represent the data by means of a suitable diagram by using tableau.

State	Population in lakhs
Andhra Pradesh	663
Karnataka	448
Kerala	290
Tamilnadu	556

9. Find the Rank for following data by using Tableau
   120, 132, 112, 100, 103, 106, 107, 99, 125, 150 , 175,125,46,52,96.
10. Draw the scatter diagram for the data given below by using Tableau.

Age	18	19	20	21	20	18
Mark	80	92	93	90	97	85

11. Using Tableau, Fit a linear trend line:

Year	1995	1996	1997	1998	1999	2000	2001
Profit	32	36	44	37	71	72	109

12. Using Tableau, Find the Average of the following numbers : 12, 26, 13, 19, 25

Course Designed by	Verified by HOD	Checked by	Approved by

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.