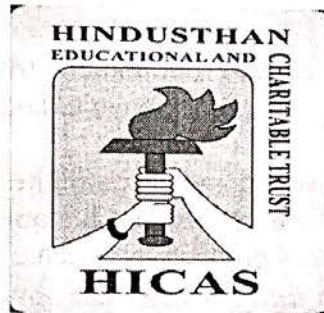


**LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK  
(LOCF)**

**in the**

**POST GRADUATE PROGRAMME IN MATHEMATICS**

**FOR THE STUDENTS ADMITTED FROM THE  
ACADEMIC YEAR 2022- 2023**



**HINDUSTHAN COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS)**

**(Affiliated to Bharathiar University and Accredited by NAAC)**

**COIMBATORE-641028**

**TAMILNADU, INDIA.**

Phone: 0422-4440555

Website: [www.hicas.ac.in](http://www.hicas.ac.in)

## **PREAMBLE**

The M.Sc., Mathematics programme is expected to be highly beneficial to the student community and to flourish strong-minded graduates with high level of analytic and technical skills required for the program. Moreover this program will furnish them with the necessary background for further study in Mathematics and enhance their research capabilities. Also it enables them to function effectively as teachers by giving student development programmes in the related subjects. Hence the curriculum is designed to assist the students in understanding the vital concept of Algebra, Differential Equations, Complex Analysis, Topology as well as Mathematical Softwares. At the end of the program, the student will gain in-depth knowledge in Mathematics subjects and play an active role in Mathematician research, government or non-government organization and private sectors.

## **VISION**

To center stage Mathematical knowledge in the curriculum; instill analytical and logical thinking among students and promote Mathematical thought as an important area of human thought.

We envision world with flexible problem-solving global leaders dedicated to conscientiously increase the understanding of Mathematics.

## **MISSION**

The mission of the M.Sc., Mathematics programme is to provide an environment where students can learn and become competent users of mathematics and mathematical application.

The M.Sc., Mathematics programme will contribute to the development of students as mathematical thinkers, enabling them to become lifelong learners, to continue, to grow in their chosen professions and to function as productive citizens.

## **PROGRAMME EDUCATIONAL OBJECTIVES (PEO)**

**PEO 1:** Provide a strong foundation in different areas of Mathematics, so that the students can compete with their contemporaries and excel in the various careers in Mathematics.

**PEO 2:** Have the calibre to work in foreign Universities and Shine in higher level of administration like IAS, IPS, Officers in Nationalized Banks, LIC, etc.,

**PEO 3:** Motivate and prepare the students to pursue higher studies and research in Mathematics and Interdisciplinary Sciences, thus contributing to the ever-increasing academic demands of the country.

**PEO 4:** Enrich the students with strong communication and interpersonal skills, broad knowledge and an understanding of multicultural and global perspectives, to work effectively in multidisciplinary teams, both as leaders and team members.

**PEO 5:** To learn to apply mathematics to real life situations and to communicate mathematical ideas with clarity and able to identify, formulate and solve mathematical problems.



## **PROGRAMME OUTCOME (PO)**

- PO1:** Demonstrate in-depth knowledge of Mathematics, both in theory and application.
- PO2:** Identify, formulate, and analyze the complex problems using the Principles of Mathematics
- PO3:** Equips students with advanced knowledge and insight in mathematics.
- PO4:** Solve critical problems by applying the Mathematical Software Tools.
- PO5:** Work individually or as a team member or leader in uniform and multidisciplinary settings.
- PO6:** Enhances professional skills in Mathematics and some specialized areas of applied mathematics.
- PO7:** Apply the Mathematical concepts, in all the fields of learning including higher research, and recognize the need and prepare for lifelong learning.

## **PROGRAMME SPECIFIC OUTCOME (PSO)**

- PSO1:** Communicate concepts of Mathematics and its applications.
- PSO2:** Acquire analytical and logical thinking through various mathematical tools and techniques.
- PSO3:** Investigate real life problems and learn to solve them through formulating mathematical models.
- PSO4:** Attain in-depth knowledge to pursue higher studies and ability to conduct research. Work as mathematical professional.
- PSO5:** Achieve targets of successfully clearing various examinations/interviews for placements in teaching, banks, industries and various other organizations/services.

HINDUSTHAN COLLEGE OF ARTS & SCIENCE (AUTONOMOUS),

COIMBATORE-641028

**SCHEME OF EXAMINATIONS - CBCS & LOCF PATTERN**

*(For the Students admitted from the Academic year 2022-2023)*

**PG PROGRAMME**

Programme: M.Sc

Branch: MATHEMATICS

Course Code	Course Type	Course Title	Credit points	Lecture Hours/ Week		Exam Duration (hours)	MAX. MARKS		
				Theory	Practical		I.E.	E.E	Total
<b>Semester - I</b>									
22MAP01	DSC	Advanced Algebra with GEOGEBRA	4	5		3	50	50	100
22MAP02	DSC	Advanced Real Analysis	4	5		3	50	50	100
22MAP03	DSC	Ordinary Differential Equations with SCILAB	4	5		3	50	50	100
22MAP04	DSC	Numerical Methods	4	5		3	50	50	100
22MAP05	DSC	Mathematical Software – I-MATLAB	4	5		3	50	50	100
22MAP06	DSC	<b>Practical I:</b> Mathematical Software – I- MATLAB	2	-	4	3	50	50	100
22MAP07	SEC	Internship / Institutional Training / Mini-Project	2	-		3	100	-	100
22MAPE01	AEE	Open Elective - I	2	3		3	100	-	100
22MAPV01	ACC	VAC-I	1*	2		2	50**	-	50**
22MAPJ01	SEC	Aptitude / Placement Training	Grade*	2		2	50**	-	50**



			Assessment will be done in the end of Third semester						
-	SEC	SDR – Student Development Record					500	300	800
		<b>Total</b>	<b>26</b>	<b>32</b>	<b>4</b>				
		<b>Semester - II</b>							
22MAP08	DSC	Advanced Complex Analysis with TABLEAU	4	5		3	50	50	100
22MAP09	DSC	Partial Differential Equations with SCILAB	4	5		3	50	50	100
22MAP10	DSC	Mechanics	4	5		3	50	50	100
22MAP11	DSC	Optimization Techniques	4	5		3	50	50	100
22MAP12	DSC	Mathematical Software – II - MATHEMATICA	4	5		3	50	50	100
22MAP13	DSC	<b>Practical II:</b> Mathematical Software - II – MATHEMATICA	2	-	4	3	50	50	100
22MAP14	SEC	Internship / Institutional Training / Mini-Project / Extension Activity	2	-		3	100	-	100
22MAPE02	AEE	Open Elective - II	2	3		3	100		100
22MAPV02	ACC	VAC-II	1*	2		2	50	-	50**
22MAPJ02	SEC	<b>Online Courses</b>	Grade*	-		-	-	-	C/NC
22MAPJ03	SEC	<b>Aptitude / Placement Training</b>	Grade*	2		2	50		50**
		<b>Total</b>	<b>26</b>	<b>32</b>	<b>4</b>	<b>-</b>	<b>500</b>	<b>300</b>	<b>800</b>
		<b>Semester – III</b>							
22MAP15	DSC	Topology	4	5		3	50	50	100
22MAP16	DSC	Advanced Topics in Fluid Dynamics	4	4		3	50	50	100

22MAP17	DSC	Probability theory and Mathematical statistics	4	5		3	50	50	100
22MAP18	DSC	C++ Programming (Theory)	4	5		3	50	50	100
22MAP19 A	DSE	Elective -I	3	3		3	50	50	100
22MAP19 B									
22MAP20 A	DSE	Elective -II	3	3		3	50	50	100
22MAP20 B									
22MAP21	DSC	<b>Practical III:</b> GEOGEBRA, SCILAB ,TABLEAU And C ++ Programming .	2	-	4	3	50	50	100
22MAP22	SEC	Internship / Institutional Training / <b>Mini-Project</b> / Extension Activity	2	-		2	100	-	100
22MAPE0 3	AEE	Open Elective-III	2	3		3	100	-	100
22MAPV0 3	ACC	VAC-III	1*	2		2	50**	-	50**
22MAPJ0 4	SEC	<b>Aptitude / Placement Training</b>	Grade*	2		2	50**		50**
22MAPJ0 5	SEC	<b>Online Courses</b>	Grade*	-		-	-	-	C/NC
22MAPJ0 6	SEC	SDR – Student Development Record	2*	-	-	-	-	-	-
<b>Total</b>			<b>28</b>	<b>32</b>	<b>4</b>		<b>550</b>	<b>350</b>	<b>900</b>
<b>Semester - IV</b>									
22MAP23 A	DSE	Elective-III	3	5		3	50	50	100
22MAP23 B									
22MAP24 A	DSE	Elective -IV	3	5		3	50	50	100
22MAP24 B									
22MAP25	SEC	<b>Self-Study Course</b>	3	-	-	3	50	50	100



22MAP26	SEC	Project Work /Student Research	5	-			100	100	200
		<b>Total</b>	<b>14</b>	<b>10</b>			<b>250</b>	<b>250</b>	<b>500</b>

- \* denotes Extra credits which are not added with total credits.
- \*\* denotes Extra marks which are not added with total marks.
- VAC-Value Added Course (Extra Credit Courses)
- Grade -Grades depends on the marks obtained

Range of marks	Equivalent remarks
80 and above	Exemplary
70 – 79	Very good
60 – 69	Good
50 – 59	Satisfactory
Below 50	Not Satisfactory = Not Completed

- I.E-Internal Exam
- E.E-External Exam
- J-Job Oriented Course
- E-Open Elective Papers

#### PASSING MINIMUM

- Passing Minimum for PG 50% (Both Internal and External)

## Abstract for Scheme of Examination

(For the students admitted during the academic year 2022 - 2023)

Course	Papers	Credit	Total Credits	Marks	Total Marks
Core /DSC	14	4	56	100	1400
Electives/DSE	4	3	12	100	400
Practical /DSC	3	2	6	100	300
Project /SEC	1	5	5	200	200
Internship/Institutional Training/Mini-Project / Extension Activity	3	2	6	100	300
Open Electives /AEE	3	2	6	100	300
Self-Study Course /SEC	1	3	3	100	100
Value Added Course	3	1*	3*	50	150**
Aptitude /Placement Training SEC	3	Grade*	Grade*	50	150**
Online Courses/ SEC	2	Grade*	Grade*	-	-
SDR - SEC	1	2*	2*	-	-
Total			94 + (5 Extra Credits)		3000 (300**)



### List of Open Elective Papers & VAC / JOC

<p>Open Electives</p>	<p>Yoga for Human Excellence  Human Health &amp; Hygiene  Indian Culture and Heritage  Indian Constitution and Political System  Consumer Awareness and Protection  Professional Ethics and Human Values  Human Rights, Women's Rights &amp; Gender Equality  Disaster Management  Green Farming  Campus to Corporate  How to start a Business?  Research Methodology and IPR  General Studies for Competitive Examinations  IIT JAM Examination (for Science only)  CUCET Examination</p>
<p>VAC</p>	<p>Quantitative and Reasoning Skill  Numerical Ability  Statistics for Data Analytics  Big Data Analytics  SAS(Statistical Analysis System)  R Programming.  Amazon web services</p>

Note: VAC / JOC courses can be added along with the above open electives.

**List of Elective Papers/ DSE**  
(Can choose any one of the paper as electives)

Electives/ DSE-I	Course Code	Title
	22MAP19A	<b>Elective – I: Graph Theory</b>
	22MAP19B	<b>Elective – I: Number Theory</b>
Electives/ DSE-II	22MAP20A	<b>Elective - II: Mathematical Softwares-III - LATEX</b>
	22MAP20B	<b>Elective - II: Operator Theory</b>
Electives/ DSE-III	22MAP23A	<b>Electives III : Functional Analysis</b>
	22MAP23B	<b>Electives III : Cryptography</b>
Electives/ DSE-IV	22MAP24A	<b>Electives IV : Mathematical Methods</b>
	22MAP24B	<b>Electives IV : Fuzzy logic and fuzzy set.</b>



**Syllabus Coordinator**



**BOS-Chairman/Chairperson**

Dr. S. ANURADHA,  
M.Sc.,M.B.A.,M.Phil.,PGDCA.,Ph.D.,  
Professor & Head,  
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**Academic Council – Member Secretary**

**Principal**  
**PRINCIPAL**

Hindusthan College of Arts & Science (Autonomous),  
Hindusthan Gardens, Bedare, Nava India,  
Coimbatore - 641 028.



## PG Scheme of Evaluation (Internal & External Components)

(For the students admitted during the academic year 2022-2023 and onwards)

### 1. Internal Marks

#### # List of components for Internal Assessment

Components	Marks
Test	15
Model Exam	15
Internal Assessment components	20 #
<b>TOTAL</b>	<b>50</b>

S.No	Components
1	Multiple choice questions ✓
2	Video teach
3	Co-operative or Collaborative Learning
4	Mini Project/Assignment ✓
5	Case study ✓
6	Seminar ✓
7	Role Play
8	Management Games

(Any four components from the above list with five marks each will be calculated  $4 \times 5 = 20$  marks)

### 2. a) Components for Practical I.E.

### b) Components for Practical E.E.

Components	Marks
Test -I	15
Test - II	15
Observation	10
Application*	10
<b>Total</b>	<b>50</b>

Components	Marks
Experiments/Exercise	40
Record	5
Viva	5
<b>Total</b>	<b>50</b>

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

Internships/Industrial Training (I.E)		Mini Project (I.E)	Major Project Work		
Component	Marks		Component	Marks	Total Marks
Work diary	25	-	I.E a) Attendance	20	100
Report	50	50	b) Review	30	
Viva-voce	25	50	c) Report	25	
			d) Moc Viva-Voce/ Presentation	25	
<b>Total</b>	<b>100</b>	<b>100</b>	<b>E.E*</b>		
			a) Final report	60	100
			b) Viva-voce	40	
			<b>Total</b>		<b>200</b>

\*Evaluation of report and conduct of viva voce will be done jointly by Internal and External Examiners

### 4. Value Added Courses and Aptitude/Placement courses:

Components	Marks
Two Test (each 1 hour) of 25 marks each QP is objective pattern (25x1=25)	50
<b>Total</b>	<b>50</b>

## 5. Guideline for Open Elective

Two tests(each 2 hours) of 50 marks each [5 out of 8 descriptive type questions 5x10=50 Marks	Marks
	100

### Guidelines:

1. The passing minimum for these items should be 50%
2. If the candidate fails to secure 50% passing minimum, he / she may have to reappear for the same in the Subsequent semesters
3. Item No's:4 is to be treated as 100% Internals and evaluation through online.
4. Item No.2: \* - Application should be from the relevant practical subject other than the listed programmes. It must be enclosed in the practical record.



For all PG/MBA/MCA Programmes

(2022-2023 Regulations)

**QUESTION PAPER PATTERN FOR CIA EXAM**

Reg.No:-----

Q.P.CODE:

HINDUSTHAN COLLEGE OF ARTS & SCIENCE (AUTONOMOUS)  
PG/MBA/MCA DEGREE CIA EXAMINATIONS -----20-----

(-----Semester)

BRANCH: -----

Subject Name: -----

Time: Two Hours

Maximum: 50 Marks

**Section-A (4 x 4=16 Marks)**

Answer ALL Questions

ALL questions carry EQUAL Marks  
(Q.No: 1 to 4 Either Or type)

**Section-B (3 x 8=24 Marks)**

Answer any THREE Questions out of FIVE Questions

ALL questions carry EQUAL Marks  
(Q.No: 5 to 9)

**Section-C (1 x 10=10 Marks)**

(Compulsory Question: It should be a Case study/Application oriented/Critical analysis  
from any of the units)  
(Q.No: 10)

**QUESTION PAPER PATTERN FOR MODEL / END SEMESTER EXAM**

Reg.No:-----

Q.P.CODE:

HINDUSTHAN COLLEGE OF ARTS & SCIENCE (AUTONOMOUS)  
PG/MBA/MCA DEGREE MODEL EXAMINATIONS -----20-----

(-----Semester)

BRANCH: -----

Subject Name: -----

Time: Three Hours

Maximum: 60 Marks

**SECTION – A (5x4=20 marks)**

Answer ALL Questions

ALL Questions carry EQUAL Marks  
(Q.No 1 to 5 Either Or type)  
(One question from each Unit)

**SECTION – B (3x10=30 Marks)**

Answer any THREE Questions Out of FIVE Questions

ALL Questions carry EQUAL Marks  
(Q.No 6 to 10)  
(One question from each Unit)

**SECTION – C (1x10=10Marks)**

(Compulsory Question: It should be a Case study/Application oriented/Critical analysis  
from any of the units)  
(Q.No: 11)



**Blue Print of Question Paper for all PG Programmes**  
(For the academic year 2021-22, 2022-23)

**FOR CIA I - QUESTION PATTERN**

Sec	Question No	Type	No of Question	Questions to be answered	Mark per question	K-level	Max. Marks
A	1 to 4	Either or Type (a or b)	8	4	4 (4x4=16)	2 Questions will be in K1 4 Questions will be in K2 2 Questions will be in K3	
B	5 to 9	Open choice	5	3	8 (3x8=24)	2 Questions will be in K1 2 Questions will be in K2 1 Questions will be in K3	
C	10	Compulsory	1	1	10 (1x10=10)	1 Question will be in K3	

**FOR MODEL/ESE - QUESTION PATTERN**

Sec	Question No	Type	No of Questions	Questions to be answered	Mark per question	K-level	Max. Marks
A	1 to 5	Either or Type (a or b)	10	5	4 (5x4=20)	2 Questions will be in K1 4 Questions will be in K2 4 Questions will be in K3	
B	6 to 10	Open choice	5	3	10 (3x10=30)	2 Questions will be in K1 2 Questions will be in K2 1 Questions will be in K3	
C	11	Compulsory	1	1	1 (1x10=10)	1 Question will be in K3	

**Distribution of section-wise marks with K levels for PG 2021-22, 2022-23**

CIA - PG								
Sec.	K1	K2	K3	K4	K5	Total questions	Questions to be answered	Total marks
A- Either or type	2	4	2			8	4	4x4=16
B - Open choice			2	2	1	5	3	3x8=24
C- Compulsory Question					1	1	1	1x10=10
<b>Total Marks</b>	<b>8</b>	<b>16</b>	<b>16</b>	<b>16</b>	<b>18</b>			
<b>% of marks without choice</b>	<b>9.52</b>	<b>19.05</b>	<b>19.05</b>	<b>119.05</b>	<b>21.43</b>			<b>100</b>

Model Exam - PG								
Sec.	K1	K2	K3	K4	K5	Total questions	Questions to be answered	Total marks
A- Either or type	2	4	4			10	5	5x4=20
B - Either or type			2	2	1	5	3	3x10=30
C - Compulsory Question					1	1	1	1x10=10
<b>Total Marks</b>	<b>8</b>	<b>16</b>	<b>36</b>	<b>20</b>	<b>20</b>			<b>100</b>
<b>% of marks without choice</b>	<b>8</b>	<b>16</b>	<b>36</b>	<b>20</b>	<b>20</b>			<b>100</b>



## PG Programme Regulations for the academic year 2022-2023

1. Internal marks components for all the candidates admitted from the academic year 2022-2023 and onwards is as follows.

### For Theory courses

Components	Marks
Test	15
Model Exam	15
Internal Assessment components	20
<b>TOTAL</b>	<b>50</b>

### For Practical courses

Components	Marks
Test -I	15
Test - II	15
Observation/Excercise	10
Application*	10
<b>TOTAL</b>	<b>50</b>

2. Pattern of question paper for External Examination will be maximum of 60 marks for all theory courses. The marks obtained will be converted into 50 marks as per the scheme.
3. Passing minimum marks for all PG programme is 50 % in internal and 50% in External and the composition of total 50 marks out of 100 marks.
4. Project work is considered as a special course involving application of knowledge in problem solving / analyzing /exploring a real-life situation. A Project work may be given in lieu of a discipline specific elective paper. Distribution of marks for major project work for all PG Programmes will be of 50:50 pattern for both Internal and External in total of 200 marks.
5. Internship / Institutional Training / Mini-Project/ Extension Activity is related to the discipline. The students can be permitted to complete the Internship / Institutional Training / Mini-Project/ Extension Activity before the end of respective semesters (end of I, II and III semester) and submit a report.

Internship / Institutional Training/ Extension Activity	Not more than seven days
Mini project	During the course of study for not more than seven days.

6. For fully internal subjects, Two test will be conducted one at the time of CIA I and the other will be during Model Examinations.
7. Retest for the failure candidates in the above case should be conducted immediately before the End Semester Examinations.
8. For the Theory cum Practical blended courses, 50:50 Internal and External pattern will be followed for theory examination and Fully internal pattern will be followed for Practical examination. For theory part, External examination will be conducted as regular pattern (max of 70 marks) and it will be converted into 25 marks.

Course	Internal Marks		External marks		Total marks (Max. marks 50)	
	Min.	Max.	Min.	Max.	Min.	Max.
Theory	12.5	25	12.5	25	25	50
Practical	25	50	-	-	25	50



9. For Practical components for Theory cum Practical courses (Fully Internal)

Components	Marks
Test I	10
Test II	10
Experiment/Exercise	20
Record	5
Viva	5
<b>Total</b>	<b>50</b>

The Internal mark 50 will be converted into 25.

10. For the candidates admitted under the Fast Track System (FTS) must register their names to their concerned department heads and get approval from the COE office at the beginning of the II semester.
11. Self Study will be a Core Paper of the department for which the examination pattern of other theory subjects is followed.
12. Online courses is incorporated as a non-credit skill enhancement course for the III and IV semesters and Grades will be assessed based on the certificates produced by the students. It is compulsory to produce one online course certificate for each semester to avail grades for the students. (2 certificates in any of the online platform is mandatory).
13. SDR – Student Development Report to be received by the department from the students till end of the **Third** semester. (Evidences of Curriculum activities and Co-curriculum activities).
14. Open elective courses:  
Departments can offer list of subjects which teaches moral ethics to the young community for the better future. The topics relevant to Indian ethics, Culture, Women rights, Yoga, Green farming, Indian constitution etc., as an open elective courses. These courses can be offered by the department or other department as inter department courses. Marks earned for the subject will not be included for the CGPA calculation.



## Regulations of Fast Track System (FTS)

- From the academic year 2021-22, our college is offering Fast Track System (FTS) for all UG and PG programmes. In this system, we are offering two courses under the course type of Discipline Specific Elective (DSE) in the sixth semester for all UG programmes and fourth semester for all PG programmes, which are equivalent and related with National Programme on Technology Enhanced Learning/Study Webs of Active-Learning for Young Aspiring Minds (NPTEL/SWAYAM) courses.
- The students have the option of taking two subjects of the sixth semester of their programme through NPTEL/SWAYAM portal from the list given by NPTEL and can complete the online course before fifth semester and submit the received original certificates to the COE office for getting approval. If the student completes these courses before the beginning of the sixth semester (UG)/fourth semester (PG), the candidate can be considered and exempted to write the examination from the assigned DSE courses in the sixth semester/fourth semester. They should complete only the self study course and project work during the VI/IV semester as assigned in the scheme. The candidate who completes the online courses and submits the successful course completion credentials, the credit transfer will be considered as per our Scheme of Examination for qualifying the degree. **The minimum duration of the registered online course must be 12 weeks.** Course duration of less than 12 weeks will not be considered.
- For all PG programmes, the candidates who were admitted during the academic year 2021-2022 under the Fast track system, for the self study course, the internal mark component will be as follows. For others regular internal pattern follows.

TEST	Max. Marks	Mode
CIA I	50 (50x1=50)	Online objective type
Model Exam.	50 (50x1=50)	Online objective type

Out of these two tests, the total marks will be converted into 40 marks as Internal.

- For all UG programmes, the candidates who were admitted during the academic year 2021-2022 under the Fast track system, for the self study course, the internal mark component will be as follows. For others regular internal pattern follows.

TEST	Max. Marks	Mode
CIA I	50 (50x1=50)	Online objective type
CIA II	50 (50x1=50)	Online objective type
Model Exam.	50 (50x1=50)	Online objective type

Out of three tests, the total mark will be converted into 30 marks as Internal.

- For the students admitted in Fast Track System, must enroll their names to the concerned department heads and get approval from the COE office at the beginning of III semester for all UG Programmes and at the beginning of II semester for all PG programmes.
- The students who cleared and got certified for online courses under the fast track system, the grade obtained will be converted into average marks of range. The received certificates must be submitted to the COE office for approval of the Controller and the Principal. The FTS courses will be treated as fully external.



DEPARTMENT OF MATHEMATICS				CLASS: I M.Sc				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours / Week	CIA	Ext	Total
I	DSC	22MAP01	Advanced Algebra with GEOGEBRA	4	5	50	50	100

Nature of Course		
Knowledge and Skill Oriented	Employability Oriented	✓
	Entrepreneurship Oriented	
	Skill Development	✓

### Course Objectives

- To provide deep knowledge about Groups.
- To obtain the Knowledge in Ring theory
- To acquire the knowledge in the field of polynomial roots
- To introduce Galois Theory and to see its application to the solvability of polynomial equations by radicals
- To able to understand the transformation.

Unit	Course Contents	Hours	K Level
I	<b>Group Theory:</b> Another counting principle – Sub group–Cauchy theorem – Sylow’s theorem – Second proof of Sylow’s theorem– Third proof of Sylow’s theorem– Double Coset–Direct products: External and Internal direct Products– <b>Application: Sylow’s theorem– Permutation groups.</b>	13	Upto K5
II	<b>Ring Theory:</b> The field of quotients of an integral domain–Euclidean rings– A particular Euclidean ring – Polynomial rings – Polynomials over the rational field– <b>Applications: Network security– Cryptography.</b>	13	Upto K5
III	<b>Fields:</b> Extension Fields – The Transcendence of e–Roots of polynomials –Construction with straight edge and compass – More about roots– <b>Applications: Particle physics</b>	13	Upto K5
IV	<b>Fields:</b> The elements of Galois theory – Fixed Field–Solvability by Radicals–Finite Fields– <b>Applications: Image processing.</b>	13	Upto K5
V	<b>Linear Transformations:</b> Canonical forms: Triangular form – Nilpotent transformations– Jordan form – Hermitian and Unitary Transformations– <b>Applications : Computer graphics.</b>	13	Upto K5

GEOGEBRA Problems related to ADVANCED ALGEBRA have been included in Practical–III (22MAP21) and questions related to GEOGEBRA excluded in ADVANCED ALGEBRA (22MAP01) in the questions. Questions related to Applications included in internal only and excluded in semester questions.



Note: The Questions should be asked in the ratio of 20% Problems and 80 % for theory

### Book for Study

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

Unit I: Chapter 2: (Sections 2.11 – 2.13)

Unit II: Chapter 3: (Sections 3.6– 3.10)

Unit III: Chapter 5: (Sections 5.1–5.5)

Unit IV: Chapter 5: (Sections 5.6–5.7) Chapter 7: (Sections 7.1)

Unit V: Chapter 6: (Sections 6.4, 6.5, 6.6 and 6.10)

### Books for Reference

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

2. *Serge Lang*, "Algebra", Third Edition, Addison-Wesley, Mass, 1993

3. *M. Artin*, "Algebra", Prentice-Hall of India, New Delhi, 1991.

4. *V. K. Khanna and S.K. Bhambri*, A Course in Abstract Algebra, Vikas Publishing House Pvt Limited, 1993.

5. *J. J. Gallian*, "Contemporary Abstract Algebra", Eighth edition, Cengage; 20

### Web Resources (any two web resources)

1. [Topics in algebra second edition herstein.pdf](#)

2. <https://www.geogebra.org/materials>

### Application Link:

Unit I : <https://www.youtube.com/watch?v=NbNxmYziDts>

Unit II : <https://www.youtube.com/watch?v=Q-HugPvA7GQ&list=PL71FE85723FD414D7>

Unit III : <https://www.youtube.com/watch?v=NOMUnMuxDZY>

Unit IV : <https://www.youtube.com/watch?v=AkPoz5IeK9M>

Unit V : [https://www.youtube.com/watch?v=Zs3XJK\\_OSMU](https://www.youtube.com/watch?v=Zs3XJK_OSMU)

**Pedagogy** : Chalk & Talk, Exercise, Assignments & PPTs.

**Rationale for Nature of the Course:** Can be professionals in solving advanced problems to pursue higher studies.

### Activities to be given

1. Prepare comprehensive advanced problems on Algebra for various fields.
2. Assignment on Ring theory applications of Network and cyber security
3. Preparing the students to do the project by applying the applications of algebra in various fields.

### Course Learning Outcomes

CLOs	On Completion of the Course, the students should be able to	K - Level
CLO1	Understanding Sylows theorem and applying its applications	Upto K5
CLO2	Determining and analyzing some special types of rings and their properties	Upto K5
CLO3	Classifying and applying the extension fields and roots of polynomials.	Upto K5
CLO4	Analyzing the elements of Galois theory and Galois Groups over the rational.	Upto K5
CLO5	Applying the transformation and nilpotent transformation.	Upto K5



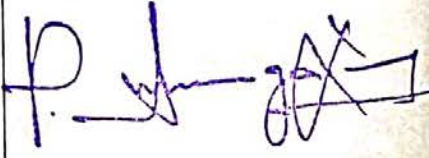
### Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

CLOs	Programme Outcomes						
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CLO 1	3	3	3	3	3	3	2
CLO 2	3	2	3	2	3	3	2
CLO 3	3	3	3	3	3	3	2
CLO 4	3	3	3	3	3	2	3
CLO 5	3	3	3	3	3	2	3

3 – Advance Application

2 – Intermediate Level

1 – Basic Level

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
 Dr. M. Rajarajeswari Name & Signature of the Staff	 Dr. S. Anuradha Name & Signature	 Name & Signature

Dr. S. ANURADHA,  
 M.Sc., M.B.A., M.Phil., PGDCA., Ph.D.,  
 Professor & Head,  
 PG & Research Dept. of Mathematics,  
 Hindusthan College of Arts & Science,  
 Coimbatore - 641 028

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



DEPARTMENT OF MATHEMATICS				CLASS: I M.Sc				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours / Week	CIA	Ext	Total
I	DSC	22MAP02	Advanced Real Analysis	4	5	50	50	100

Nature of Course		
Knowledge and Skill Oriented	Employability Oriented	✓
	Entrepreneurship Oriented	
	Skill Development	✓

Course Objectives			
<ul style="list-style-type: none"> <li>To evaluate integral of a function of a real variable in the sense of Riemann Stieltjes integral and gain its properties.</li> <li>To acquire Knowledge and demonstrate understanding the statement and proof of convergence theorems and its applications.</li> <li>To obtain the knowledge about linear transformation.</li> <li>To solve the requirement and concept of Lebesgue measure, Measurable functions and Lebesgue integral.</li> <li>To evaluate the Lebesgue measure and Lebesgue integral with related problems.</li> </ul>			
Unit	Course Contents	Hours	K Level
I	<b>Riemann Stieltjes Integral</b> Definition and Existence of the Integral – Properties of the integral – Integration and differentiation – Integration of vector valued function – rectifiable curves– <b>Applications: Calculate the area, Distance travelled by some object.</b>	13	Upto K5
II	<b>Sequences and Series of Functions</b> Uniform convergence and continuity – Uniform convergence and integration –Uniform convergence and differentiation – Equi continuous families of functions – The Stone – Weierstrass theorem– <b>Application: Calculating the continuous function</b>	13	Upto K5
III	<b>Functions of Several Variables</b> Linear transformation – contraction principle – Inverse function theorem – Implicit function theorem– <b>Applications: Computer graphics– Matrix exploring</b>	13	Upto K5
IV	<b>Lebesgue Measure</b> Outer measure – Measurable sets and Lebesgue measure – Measurable functions –Littlewood’s Theorem– <b>Application: Calculating the Outer measure.</b>	13	Upto K5
V	<b>Lebesgue Integral</b> The Lebesgue integral of bounded functions over a set of finite measure – integral of a non – negative function – General Lebesgue Integral– <b>Application: Apply to integrals.</b>	13	Upto K5
<b>Questions related to Applications included in internal only and excluded in semester questions.</b>			

Note: The Questions should be asked in the ratio of 20% Problems and 80 % for theory

Book for Study

1. **Walter Rudin**, "Principles of Mathematical Analysis", McGraw Hill New York, 1976.

Unit I & II: Chapter 6 & 7.

Unit III: Chapter 9 (Pages 204 to 227)

2. **H.L. Royden**, "Real Analysis", Third Edition, Macmillan New York, 1988.

Unit IV: Chapter 3 (except Section – 4)

Unit V: Chapter 4 (Sections 2, 3 & 4 only)

### Books for Reference

1. **R.G. Bartle**, "Elements of Real Analysis", 2<sup>nd</sup> Edition, John Wiley and Sons, New York, 1976.

2. **W. Rudin**, "Real and Complex Analysis", 3<sup>rd</sup> Edition, McGraw-Hill, New York, 1986.

3. **Anthony W. Knapp**, "Advanced Real Analysis"

4. **N.L. Carothers**, "Real Analysis"

5. **Bernard R. Gelbaum, John M.H. Oimsted**, "Counter examples in Analysis"

### Web Resources

1. [https://ufsj.edu.br/portal-repositorio/File/nepomuceno/slides\(2\).pdf](https://ufsj.edu.br/portal-repositorio/File/nepomuceno/slides(2).pdf)

2. [http://sv.20file.org/up1/1399\\_0.pdf](http://sv.20file.org/up1/1399_0.pdf)

### Application Link:

Unit I: <https://www.youtube.com/watch?v=hNOnzg-TcVs>

Unit II: <https://www.youtube.com/watch?v=ckZplsizm0I>

Unit III : <https://www.youtube.com/watch?v=dv4cjQZrRp8&t=1223s>

Unit IV : <https://www.youtube.com/watch?v=lgZJohjjs10>

Unit V: <https://www.youtube.com/watch?v=pX70A6ntauE>

**Pedagogy:** Chalk & Talk, Exercise, Assignments & PPTs.

**Rationale for Nature of the Course:** Can be professionals in solving advanced problems to pursue higher studies.

### Activities to be given

1. Prepare comprehensive advanced problems on Calculating the areas and distance travelled by some object.
2. Assignment on Lebesgue Measure.
3. Preparing the students to do the project by applying Lebesgue Integral.



## Course Learning Outcomes

CLOs	On Completion of the Course, the students should be able to	K - Level
CLO1	Applying the Riemann Stieltjes integral of real valued functions on intervals and its properties.	Upto K5
CLO2	Classifying the sequences and series along with its properties.	Upto K5
CLO3	Analyzing the concept of linear transformation and find the extreme values of implicit functions.	Upto K5
CLO4	Understanding the fundamental concept of Lebesgue measure.	Upto K5
CLO5	Evaluating the complex integration and the benefits of Lebesgue Integral	Upto K5


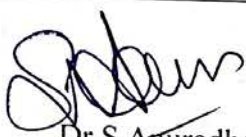
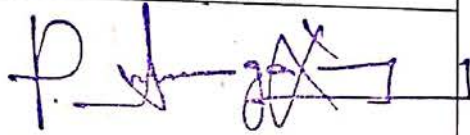
## Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

CLOs	Programme Outcomes						
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CLO 1	3	3	2	3	2	2	3
CLO 2	3	3	3	2	2	2	3
CLO 3	3	3	3	3	3	3	2
CLO 4	2	3	3	3	2	3	2
CLO 5	2	3	3	2	2	2	2

3 – Advance Application

2 – Intermediate Level

1 – Basic Level

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
 Dr.M.Rajarajeswari Name & Signature of the Staff	 Dr.S.Anuradha Name & Signature	 Name & Signature

Dr. S. ANURADHA,  
 M.Sc.,M.B.A.,M.Phil.,PGDCA.,Ph.D.,  
 Professor & Head,  
 PG & Research Dept. of Mathematics,  
 Hindusthan College of Arts & Science,  
 Coimbatore - 641 028

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

DEPARTMENT OF MATHEMATICS				CLASS: I M.Sc				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours / Week	CIA	Ext	Total
I	DSC	22MAP03	Ordinary Differential Equations with SCILAB	4	5	50	50	100

Nature of Course		
Knowledge and Skill Oriented	Employability Oriented	✓
	Entrepreneurship Oriented	
	Skill Development	✓

### Course Objectives

- To study solutions of linear differential equations with constant and variable coefficients.
- To apply various theoretical ideas that underlined in existence and uniqueness theorems.
- To enables the students to develop the strong background in Linear independence and dependence, Wronskian etc.,
- To acquire the knowledge in Euler equations, the Bessel's equation.
- To identify the research problems.

Unit	Course Contents	Hours	K Level
I	<b>Linear Equations with Constant Coefficients</b> Introduction – Second order homogenous equations – Initial value problem for second order equations – Linear dependence and independence – A formula for Wronskian.	13	Upto K5
II	<b>Linear Equations with Constant Coefficients (Contd.)</b> The Non- homogenous equations of order two- homogenous and Non - homogenous equations of order n – Initial value problems for n <sup>th</sup> order equations- Annihilator method to solve non- Homogenous equation- <b>Applications: Transformation between two images.</b>	13	Upto K5
III	<b>Linear Equations with Variable Coefficients</b> Initial value problem – Existence and uniqueness theorem – The Wronskian and linear independence – Reduction of the order of a homogenous equation – The non- Homogenous equation – Homogenous equations with analytic coefficients – The Legendre equations- <b>Applications: Solving Mechanical system of equations.</b>	13	Upto K5
IV	<b>Linear Equations with Regular Singular Points</b> The Euler equations – Second order equations with regular singular points – Exceptional cases – The Bessel equation – The Bessel equation (contd.)- <b>Applications: Derivative and concepts in Economics.</b>	13	Upto K5



V	<b>Existence and Uniqueness of Solutions to First Order Equations</b> Equations with variable separated – Exact equations – The method of successive approximation – The Lipschitz Condition – Convergence of the successive approximation – Non-local existence of solutions – Approximations and uniqueness of solutions– <b>Applications: Simple harmonic motion in spring mass system.</b>	13	Upto K5
	SCILAB Problems related to ORDINARY DIFFERENTIAL EQUATIONS have been included in Practical–III (22MAP21) and <b>questions related to SCILAB excluded in ORDINARY DIFFERENTIAL EQUATIONS (22MAP03) in the questions.</b> <b>Questions related to Applications included in internal only and excluded in semester questions.</b>		

Note: The Questions should be asked in the ratio of 20% Problems and 80 % for theory

### Book for Study

1. *Earl A. Coddington*, “An Introduction to Ordinary Differential Equations”, Prentice–Hall of India Private Limited, New Delhi 2008.

UNIT I: Chapter 2 : Sections 2.1 – 2.5.

UNIT II: Chapter 2 : Sections 2.6 – 2.8, 2.10, 2.11.

UNIT III: Chapter 3 : Sections 3.1 – 3.8

UNIT IV: Chapter 4 : Sections 4.1 – 4.4, 4.6 – 4.8

UNIT V: Chapter 5 : Sections 5.1 – 5.8

### Books for Reference

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

2. *Williams E. Boyce and Richard C. DiPrima*, “Elementary Differential Equations and Boundary Value Problems”, 10th edition, John Wiley and Sons, New York 2012.

3. *S. G. Deo and V. Raghavendra*, “Ordinary Differential Equations and Stability Theory”, Tata McGraw-Hill, New Delhi 1980.

4. *George F. Simmons*, “Differential Equations with Application and Historical Notes”, Tata McGraw Hill, New Delhi 1974

5. *Shair Ahmad, Antonio Ambrosetti*, “A Textbook on Ordinary Differential Equations”

### Web Resources

1. <https://ptvtpqa.files.wordpress.com/2013/12/coddington-e-levinson-n-theory-of-ordinary-differential-equations.pdf>

2. [https://books.google.co.in/books?id=uzymjXGIhxsC&printsec=frontcover&source=gbs\\_ge\\_summary\\_r&cad=0#v=onepage&q&f=false](https://books.google.co.in/books?id=uzymjXGIhxsC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false)

Applications Link:

Unit II : <https://www.youtube.com/watch?v=K-j704F6F7Q>

Unit III : <https://www.youtube.com/watch?v=blspnBv50ts>

Unit IV : <https://www.youtube.com/watch?v=QRPa-twGsUk>

Unit V : <https://www.youtube.com/watch?v=zI0Qgq5x1ok>

**Pedagogy:** Chalk & Talk, Exercise, Assignments & PPTs.

**Rationale for Nature of the Course:** Can be professionals in solving advanced problems to pursue higher studies.

**Activities to be given**

1. Prepare comprehensive advanced problems on Ordinary differential equations object.
2. Assignment on Transformation between two images
3. Preparing the students to do the project by Solving Mechanical system of equations.

**Course Learning Outcomes**




CLOs	On Completion of the Course, the students should be able to	K - Level
CLO1	Describing the mathematical methods and solving higher order differential equations.	Upto K5
CLO2	Analyzing non-homogeneous ODE using the method of undermined coefficients and annihilator method	Upto K5
CLO3	Applying the theorems on Initial value problem to ordinary differential equations.	Upto K5
CLO4	Comparing and evaluating the Euler equations, the Bessel's equation and Regular, singular points at infinity	Upto K5
CLO5	Analyzing the research problem where differential equation can be used to model the problem.	Upto K5

**Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)**

CLOs	Programme Outcomes						
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO
CLO 1	3	3	3				
CLO 2	3	3	3	3	2	2	2
CLO 3	3	3	2	3	2	3	2
CLO 4	3	3	3	2	3	3	3
CLO 5	2	3	3	2	2	2	2
				2	2	2	2

3 – Advance Application      2 – Intermediate Level      1 – Basic Level



Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
 Dr.M.Rajarajeswari Name & Signature of the Staff	 Dr.S.Anuradha Name & Signature	 Name & Signature

Dr. S. ANURADHA,  
 M.Sc.,M.B.A.,M.Phil.,PGDCA.,Ph.D.,  
 Professor & Head,  
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 Coimbatore-641 028.

DEPARTMENT OF MATHEMATICS				CLASS: I M.Sc				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours / Week	CIA	Ext	Total
I	DSC	22MAP04	Numerical Methods	4	5	50	50	100

### Nature of Course

Knowledge and Skill Oriented	Employability Oriented	✓
	Entrepreneurship Oriented	
	Skill Development	✓

### Course Objectives

- To make the students understand solving Algebraic and Transcendental equations.
- To solve the system of equations.
- To evaluate the methods of finding solution to the differential equations of various orders.
- To apply the methods for solving Partial differential equations.
- To solve characteristics value problems.

Unit	Course Contents	Hours	K Level
I	<b>Solution of nonlinear equations:</b> Initial approximation for an Iterative procedures- Regula Falsi method - Newton's method -Convergence of Newton's method. <b>Numerical differentiation and integration:</b> Derivatives from Differences tables -Higher order derivatives - Divided difference, Central - Difference formulas -Composite formula of Trapezoidal rule -Romberg integration- Simpson's rules- <b>Applications: Calculating the areas, and solutions</b>	13	Upto K5
II	<b>Solution of system of equations:</b> Gauss Elimination method - Gauss Jordan methods -LU Decomposition method -Matrix inversion by Gauss-Jordan method - Methods of Iteration -Jacobi and Gauss Seidal Iteration - <b>Applications : Traffic flow.</b>	13	Upto K5
III	<b>Solution of ordinary differential equations:</b> Taylor series method -Euler and Modified Euler methods -Rungekutta methods (4 <sup>th</sup> order & 6 <sup>th</sup> order)-Milne's method - Adams Moulton method - <b>Applications: Evaluations of integrals, limits and series</b>	13	Upto K5
IV	<b>Numerical solution of partial differential equations:</b> 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 - Solving the wave equation by Finite Differences - <b>Applications: Electro magneto field.</b>	13	Upto K5
V	<b>Characteristic value problems :</b> Iterative method for Eigen values of a matrix by Iteration - The power method - Jacobi method for finding Eigen value - extension to higher order symmetric Matrices - <b>Applications: Laplace transforms.</b>	13	Upto K5
	Questions related to Applications included in internal only and excluded in semester questions.		



Note: The Questions should be asked in the ratio of 80% Problems and 20 % for theory

### Book for Study

#### For Units I to III

1. **M.K.Jain, S.R.K.Iyengar and R.K.Jain**, "Numerical Methods for Scientific and Engineering Computation", New Age International Publishers, Fourth Edition, 20

Unit I : Chapter1 : Sections : 1.1.2 – 1.1.4, 1.1.6, Chapter3 : Sections : 3.1 , 3.2 , 3.3.1, 3.3.2

Unit II : Chapter1 : Sections : 1.2.1 – 1.2.3,

Unit III : Chapter4 : Sections : 4.3, 4.4, 4.6

#### For Units IV & V :

2. **Kandasamy.P, Thilagavathi.K and Gunavathi.K**– "Numerical methods", S. Chand and Company Ltd, New Delhi – Revised Edition 2007.

Unit IV : Chapter12 : Section : 12.1 –12.10

Unit V : Chapter 13

### Books for Reference

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.
3. **S.S. Sastry**: " Introductory methods of Numerical Analysis", Prentice Hall of India, New Delhi,
4. **Ravendra Kumar, Professor B. R. Sharma** , "Numerical Methods", Mahaveer Publications.
5. **5. Curtis F. Gerald, Patrick O. Wheatley**, Applied Numerical Analysis, Fifth Edition, Addison Wesley, (1998).

### Web Resources

1. [https://www.academia.edu/8565134/Numerical\\_Methods\\_For\\_Scientific\\_And\\_Engineering\\_Computation\\_M\\_K\\_Jain\\_S\\_R\\_K\\_Iyengar\\_And\\_R\\_K\\_Jain?auto=download](https://www.academia.edu/8565134/Numerical_Methods_For_Scientific_And_Engineering_Computation_M_K_Jain_S_R_K_Iyengar_And_R_K_Jain?auto=download)
2. [https://www.abebooks.com/servlet/BookDetailsPL?bi=30715571896&searchurl=an%3Dgunavathi%2Bk%2Bkandasamy%2Bp%2Bthilagavathi%2Bk%26sortby%3D17&cm\\_sp=snippet--srp1--title2](https://www.abebooks.com/servlet/BookDetailsPL?bi=30715571896&searchurl=an%3Dgunavathi%2Bk%2Bkandasamy%2Bp%2Bthilagavathi%2Bk%26sortby%3D17&cm_sp=snippet--srp1--title2)

### Application Link:

- Unit I : <https://www.youtube.com/watch?v=boHowdyT-Bc>  
Unit II : <https://www.youtube.com/watch?v=Wa6kaCwyYRk&t=216s>  
Unit III : <https://www.youtube.com/watch?v=EYjBnnUJTP8>  
Unit IV : [https://www.youtube.com/watch?v=OiLhX\\_OBhm8](https://www.youtube.com/watch?v=OiLhX_OBhm8)  
Unit V : <https://www.youtube.com/watch?v=B7KkaTwiSPs>

Pedagogy: Chalk & Talk, Exercise, Assignments & PPTs.

Rationale for Nature of the Course: Can be professionals in solving advanced problems to pursue higher studies.

Activities to be given

1. Prepare comprehensive advanced problems on solving Differential equations and Integral equations
2. Assignment on Numerical solution of partial differential equations.
3. Preparing the students to do the project by solving boundary value problems.

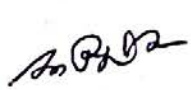


### Course Learning Outcomes

CLOs	On Completion of the Course, the students should be able to	K - Level
CLO1	Applying the various tools and solving numerical problems.	Upto K5
CLO2	Solving the system of equations using various methods.	Upto K5
CLO3	Applying various methods to find numerical solution of first and second order ordinary differential equations.	Upto K5
CLO4	Applying the Explicit method and the Crank Nicolson method for solving partial differential equations.	Upto K5
CLO5	Classifying and solving the various methods for Characteristic Value Problems.	Upto K5

### Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

CLOs	Programme Outcomes						
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CLO 1	3	3	3	3	2	2	2
CLO 2	3	3	3	2	3	2	2
CLO 3	3	3	2	3	2	2	2
CLO 4	3	3	3	3	3	3	3
CLO 5	3	3	3	3	2	3	3

3 – Advance Application      2 – Intermediate Level      1 – Basic Level

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
 Dr.M.Rajarajeswari Name & Signature of the Staff	 Dr.S.Anuradha Name & Signature	 Name & Signature

Dr. S. ANURADHA,  
 M.Sc., M.B.A., M.Phil., PGDCA., Ph.D.,  
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 Hindusthan College of Arts & Science,  
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DEPARTMENT OF MATHEMATICS				CLASS: I M.Sc				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours / Week	CIA	Ext	Total
I	DSC	22MAP05	Mathematical Software – I- MATLAB	4	5	50	50	100

Nature of Course		
Knowledge and Skill Oriented	Employability Oriented	✓
	Entrepreneurship Oriented	
	Skill Development	✓

### Course Objectives

- To obtain the knowledge about the foundations of MATLAB
- To create mathematical models and problems in MATLAB.
- To acquire the knowledge about variables, Matrices, vectors and array in MATLAB.
- To able to model the mathematical program in MATLAB.
- To solve various linear and nonlinear algebraic equations using MATLAB.

Unit	Course Contents	Hours	K Level
I	<p><b>Starting with MATLAB:</b> Starting MATLAB, MATLAB Windows – working in the command Window – Arithmetic operations with scalars – Display formats – Elementary Math Built – In Functions – Defining Scalar variables – Useful commands for managing variables-Script Files.</p> <p><b>Creating Arrays:</b> Creating A One – Dimensional Array(Vector) – Creating A Two – Dimensional Array (Matrix) – The Transpose Operator.</p> <p><b>Applications: Communication and publication of scientific document</b></p>	13	Upto K5
II	<p><b>Creating Arrays (Continued):</b> Array Addressing - Using a Colon in Addressing Arrays – Adding Elements to Existing Variables – Deleting Elements – Built – In Functions for Handling Arrays – Strings and Stings as Variables.</p> <p><b>Mathematical Operations with Arrays:</b> Addition and Subtraction – Array Multiplication – Array Division – Element by Element Operations – Using Arrays in MATLAB Built – In Math functions – Built – In Functions for Analyzing Arrays.</p> <p><b>Applications: Writing the research papers professionally</b></p>	13	Upto K5
III	<p><b>Using Script Files and Managing Datas:</b> Input to a Script File – Output Commands- The Save AND load commands-Importing and Exporting Data.</p> <p><b>Applications: Programming for numerical computation</b></p>	13	Upto K5
IV	<p><b>Two – Dimensional Plots</b> The Plot Command – The fplot Command – Plotting Multiple Graphs in the same plot-Formatting a plot -Plots with Logarithmic Axes – - Plots with Error Bars- Plots with Special Graphics – Histograms – Polar plots <b>Applications: Mathematical modelling</b></p>	13	Upto K5

V	<b>Programming in MATLAB:</b> Relational and Logical Operators – Conditional Statements – The switch – case Statement – Loops – Nested Loops and Nested Conditional Statements – The break and continue Commands. <b>Applications: Solving word problems involving Loops in MATLAB</b>	13	Upto Ke
	<b>Questions related to Applications included in internal only and excluded in semester questions.</b>		

Note: The Questions should be asked in the ratio of 20% Problems and 80 % for theory

### Book for Study

1. *AMOS GILAT*, "MATLAB – An Introduction with Applications", Department of Mechanical Engineering. The Ohio State University.

Unit I: Chapter 1: Sections 1.1 to 1.8

Chapter 2: Sections 2.1, 2.2, 2.4

Unit II: Chapter 2: Sections 2.5 to 2.10

Chapter 3: Sections 3.1 to 3.6

Unit III: Chapter 4: Sections 4.2 to 4.5

Unit IV : Chapter 5: Sections 5.1 to 5.9

Unit V : Chapter 6: Sections 6.1 to 6.6

### Books for Reference

1. *W.J. Palm* Introduction to MATLAB 7 for Engineers" McGraw–Hill Education, New York, 2005.
2. *S.S. Alam S.N. Alam*, " Understanding MATLAB", A Text Book for Beginners.
3. *Shailendra Jain*, " Modelling and Simulation Using MATLAB" 2<sup>nd</sup> Edition.
4. *Svein Linge and Hans Petter Langtangen*, " Programming for Computations- MATLAB".
5. *Delores Etter*, "Introduction to MATLAB| Third Edition" By Pearson Aug 2020.

### Web Resources

1. [https://www.maths.ox.ac.uk/system/files/legacy/2875/TexLaTeX\\_Intro2012MT-Ver2\\_1.pdf](https://www.maths.ox.ac.uk/system/files/legacy/2875/TexLaTeX_Intro2012MT-Ver2_1.pdf)
2. <https://lpuguidecom.files.wordpress.com/2017/05/p1-11385-scripts-and-matrix-operations.pdf>

### Applications Link:

Unit I: <https://www.youtube.com/watch?v=0ivLZh9xK1Q>

Unit II: <https://www.youtube.com/watch?v=teBZ21ar-yU>

Unit III: <https://www.youtube.com/watch?v=O41BWhXFu8E>

Unit IV: <https://www.youtube.com/watch?v=BxbBfChcThQ>

Unit V: <https://www.youtube.com/watch?v=F7YzS59h1r4>

**Pedagogy:** Chalk & Talk, Exercise, Assignments & PPTs.

**Rationale for Nature of the Course:** Can be professionals in modeling advanced problems using MATLAB

### Activities to be given

1. Prepare comprehensive advanced problems on modeling
2. Assignment on Numerical Computation
3. Preparing the students to do the project by Mathematical modeling.



## Course Learning Outcomes

CLOs	On Completion of the Course, the students should be able to	K - Level
CLO1	Acquire knowledge of the software MATLAB.	Upto K5
CLO2	Acquire knowledge of array addressing by using MATLAB built	Upto K5
CLO3	Acquire knowledge of script files	Upto K5
CLO4	Acquire knowledge of two dimensional plots	Upto K5
CLO5	Acquire knowledge to Programming in MATLAB	Upto K5


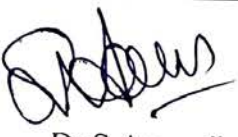

## Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

CLOs	Programme Outcomes						
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CLO 1	3	3	2	3	3	2	3
CLO 2	3	3	3	3	2	3	2
CLO 3	3	3	3	3	3	3	2
CLO 4	2	3	3	2	2	2	2
CLO 5	3	2	3	2	2	3	3

3 – Advance Application

2 – Intermediate Level

1 – Basic Level

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
 Dr.M.Rajarajeswari Name & Signature of the Staff	 Dr.S.Anuradha Name & Signature	 Name & Signature

Dr. S. ANURADHA,  
 M.Sc.,M.B.A.,M.Phil.,PGDCA.,Ph.D.,  
 Professor & Head,  
 PG & Research Dept. of Mathematics,  
 Hindusthan College of Arts & Science,  
 Coimbatore - 641 028

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

DEPARTMENT OF MATHEMATICS				CLASS: I M.Sc				Total
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours / Week	CIA	Ext	
I	DSC	22MAP06	Practical I : Mathematical Software – I- MATLAB	2	4	50	50	100

Nature of Course		
Knowledge and Skill Oriented	Employability Oriented	✓
	Entrepreneurship Oriented	
	Skill Development	✓

### Course Objectives

- To obtain the knowledge to create matrix using MATLAB
- To create the conversions of Independent variables using MATLAB.
- To acquire the knowledge about functions, mesh in MATLAB.
- To create numerical analysis through mathematical program in MATLAB.
- To solve various linear and nonlinear algebraic equations using MATLAB.

<u>MATLAB – List of Practical Problems</u>		Hours	K Level
1.	Write a program to create a matrix with zeros, eye and ones and find their eigen and eigen vector.	52	Upto K5
2.	Write a program to fit a straight line,		
3.	Write a program to convert the temperature from Fahrenheit to Celsius.		
4.	Write a program to plot $r^2 = 2 \sin 5t$ , $0 \leq t \leq 2$ , $x = r \cos t$ , $y = r \sin t$ using the function polar, fill and bar		
5.	Write a program to plot $Z = -5 / (1+x^2 + y^2)$ $ x  \leq 3$ , $ y  \leq 3$ using the functions mesh, mesh z and waterfall.		
6.	Write a program to find x and y values of the given function by using Euler's method.		
7.	Write a program to find multiplication and division of a matrix.		
8.	Write a program to find x and y values of the given function using Runge-kutta 2 <sup>nd</sup> order method.		
9.	Write a program to find the interval value of the given function using simpon's 1/3 <sup>rd</sup> rule.		
10.	Write a program to find the integral value of the given function using Trapezoidal rule.		



## Web Resources 1.

1. <https://lpuguidecom.files.wordpress.com/2017/05/p1-11385-scripts-and-matrix-operations.pdf>

**Pedagogy:** Power Point Projection through LCD, Discussion and Activity.

**Rationale for Nature of the Course:** Can be professionals in solving advanced problems.

### Activities to be given

1. Prepare comprehensive advanced problems on MATLAB.
2. Assignment on functions in MATLAB.
3. Preparing the students to do the project by applying solving the equations using MATLAB.

### Course Learning Outcomes

CLOs	On Completion of the Course, the students should be able to	K - Level
CLO1	Perceptive the concept of MATLAB	Upto K5
CLO2	Detecting and solving various applications of MATLAB in curve fitting, statistics and integration.	Upto K5
CLO3	Analyzing and Evaluating programs and plot results in MATLAB	Upto K5
CLO4	Solving various types of equations	Upto K5
CLO5	Building the mathematical Modeling in MATLAB.	Upto K5

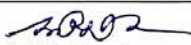

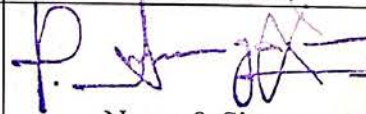
### Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

CLOs	Programme Outcomes						
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
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CLO 4	3 2	3	3	2	3	2	2
CLO 5	3	2	2	3	2	3	3

3 – Advance Application

2 – Intermediate Level

1 – Basic Level

Course Designed by	Verified by HOD	Approved by CDC Co-Ordinator
 Dr.M.Rajarajeswari Name & Signature of the Staff	 Dr.S.Anuradha Name & Signature	 Name & Signature  Co-ordinator

Dr. S. ANURADHA,  
M.Sc.,M.B.A.,M.Phil.,PGDCA.,Ph.D.,  
Professor & Head,  
PG & Research Dept. of Mathematics,  
Hindusthan College of Arts & Science,  
Coimbatore - 641 028

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

DEPARTMENT OF MATHEMATICS				CLASS: I M.Sc				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours / Week	CIA	Ext	Total
II	DSC	22MAP08	Advanced Complex Analysis with TABLEAU	4	5	50	50	100

Nature of Course		
Knowledge and Skill Oriented	Employability Oriented	✓
	Entrepreneurship Oriented	
	Skill Development	✓

### Course Objectives

- To define and recognize the basic properties of the complex numbers
- To study Cauchy's integral formula, local properties of analytic functions
- To solve the of residues problems.
- To study the Taylor and Laurent series and apply to the problems.
- To enable to understand conformal mapping and study The Schwarz-Christoffel Formula.

Unit	Course Contents	Hours	K Level
I	<b>Introduction to the concept of analytic function:</b> Limits and continuity –Analytic functions, Polynomials – Rational functions– Conformality: Arcs and closed curves – Analytic functions in regions – Conformal Mapping –Length and Area. Linear Transformations: The Linear group – The Cross ratio – Elementary Riemann Surfaces– <b>Applications : Physics Quantum applications.</b>	13	Upto K5
II	<b>Complex Integration:</b> 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 –The Integral formula – Higher derivatives – Removable singularity– Taylor's Theorem –Zeros and Poles –The Local Mapping – The Maximum principle – chains and cycles– <b>Applications: Derivative of Analytic function.</b>	13	Upto K5
III	<b>The Calculus of Residues:</b> The Residue theorem –The Argument principle –Evaluation of definite integrals. Harmonic functions: The Definitions and basic Properties – Mean value property –Poisson's Formula– <b>Applications: Evaluate line integrals of analytic functions over closed curves.</b>	13	Upto K5
IV	<b>Series and Product Developments:</b> Weierstrass Theorem–The Taylor Series The Laurent Series– Partial fractions and Factorization: Partial Fractions–Infinite	13	Upto K5



	Products – Canonical products – <b>Applications : Using to solve non analytic functions</b>		
V	<b>The Riemann Mapping Theorem:</b> 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 – <b>Applications: Surface comparison in Medical field</b>	13	Upto K5
	TABLEAU Problems related to ADVANCED COMPLEX ANALYSIS have been included in Practical–III (22MAP21) and questions related to TABLEAU excluded in ADVANCED COMPLEX ANALYSIS (22MAP08) in the questions. Questions related to Applications included in internal only and excluded in semester questions.		

Note: The Questions should be asked in the ratio of 20% Problems and 80 % for theory

### Book for Study

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

Unit I : Chapter 2 : Sections : 1.1 – 1.4 Chapter 3 : Sections 2.1 – 2.4, 3.1, 3.2, 3.4 , 4.3

Unit II : Chapter 4 : Sections : 1.1 – 1.5 ,2.1–2.3,3.1–3.4 , 4.1

Unit III : Chapter 4 : Sections : 5.1 – 5.3,6.1–6.3

Unit IV : Chapter 5 : Sections : 1.1 – 1.3,2.1–2.3

Unit V : Chapter 6 : Sections : 1.1,1.3,1.4,2.1–2.3

### Books for Reference

1. *T.W.Gamelin, "Complex Analysis", Springer, New York, 2001.*

2. *Joseph Bak, Donald J Newman, "Complex Analysis", Springer, New York, 2010.*

3. *S. Ponnusamy and H. Silverman, "A Complex Variable with applications", Birkhauser, Boston, 2006.*

4. *Karunakaran V, "Complex Analysis", Narosa Publishing House Pvt. Ltd, Second Edition, New Delhi, 2006.*

5. *Roopkumar R, "Complex Analysis", Dorling Kinderley Pvt. Ltd, New Delhi, 2015*

### Web Resources

1. <http://people.math.gatech.edu/~mccuan/courses/6321/lars-ahlfors-complex-analysis-third-edition-mcgraw-hill-science-engineering-math-1979.pdf>

2. <https://nptel.ac.in/courses/111/103/111103070/>

### Application Link:

Unit I: [https://www.youtube.com/watch?v=0Won5Vs\\_65E](https://www.youtube.com/watch?v=0Won5Vs_65E)

Unit II: <https://www.youtube.com/watch?v=0jtWezz2ekE>

Unit III: <https://www.youtube.com/watch?v=hsBfQMEQb-A>

Unit IV: <https://www.youtube.com/watch?v=zFncaqiXgr4>

Unit V: <https://www.youtube.com/watch?v=gvCdXMU2SAI>

**Pedagogy:** Chalk & Talk, Exercise, Assignments & PPTs.

**Rationale for Nature of the Course:** Can be professionals in solving advanced problems to pursue higher studies.

**Activities to be given**

1. Prepare comprehensive advanced problems on Analytic functions
2. Assignment on Riemann mapping
3. Preparing the students to do the project by applying Riemann mapping in surface comparison in medical field

**Course Learning Outcomes**

CLOs	On Completion of the Course, the students should be able to	K - Level
CLO1	Perceptive fundamental theorems usage in complex analysis.	Upto K5
CLO2	Applying the Cauchy's integral formula in residue theorems and in evaluation of definite integrals.	Upto K5
CLO3	Comparing and applying the concept of residues with Poisson's formula.	Upto K5
CLO4	Examining and solving the elliptic functions using Taylor series, Laurent series	Upto K5
CLO5	Analyzing and applying conformal mapping.	Upto K5



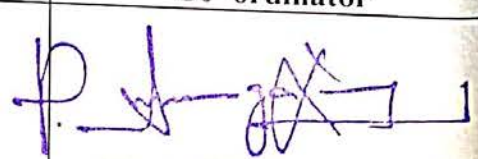
**Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)**

CLOs	Programme Outcomes						
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CLO 3	3	3	2	3	3	2	3
CLO 4	3	3	3	3	2	3	3
CLO 5	3	3	2	3	3	3	3

3 – Advance Application

2 – Intermediate Level

1 – Basic Level

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
 Dr.M.Rajarajeswari Name & Signature of the Staff	 Dr.S.Anuradha Name & Signature	 Name & Signature

Co-ordinator

Dr. S. ANURADHA,  
 M.Sc.,M.B.A.,M.Phil.,PGDCA.,Ph.D.,  
 Professor & Head,  
 PG & Research Dept. of Mathematics,  
 Hindusthan College of Arts & Science,  
 Coimbatore - 641 028

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



DEPARTMENT OF MATHEMATICS				CLASS: I M.Sc				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours / Week	CIA	Ext	Total
II	DSC	22MAP09	Partial Differential Equations with SCILAB	4	5	50	50	100

Nature of Course		
Knowledge and Skill Oriented	Employability Oriented	✓
	Entrepreneurship Oriented	
	Skill Development	✓

### Course Objectives

- To introduce different methods to solve partial differential equation.
- To acquire knowledge in classification of partial differential equations and the methods to solve.
- To study and apply Laplace equations.
- To solve wave equations.
- To enable the students to find the solution of Green's function.

Unit	Course Contents	Hours	K Level
I	<b>Partial Differential Equations of the First Order</b> Partial Differential Equations – Origins of First Order Differential Equations – Cauchy's Problem for first order equations – Linear Equations of the first order – Nonlinear partial differential equations of the first order – Cauchy's method of characteristics – Compatible system of First order Equations – Charpit's method - <b>Applications: Solving Heat, Wave and Thermal equations.</b>	13	Upto K5
II	<b>Partial Differential Equations of the Second Order</b> The Origin of Second Order Equations – Linear partial Differential Equations with constant coefficients – Equations with variable coefficients – Separation of variables – Non - linear equations of the second order– <b>Applications: Solving one dimensional equations– Vibrations of string.</b>	13	Upto K5
III	<b>Laplace's Equation</b> Elementary solutions of Laplace equation – Families of Equipotential Surfaces – Boundary value problems Separation of variables – Problems with Axial Symmetry – The Theory of Green's Function for Laplace Equation– <b>Applications: Solving Heat equations.</b>	13	Upto K5
IV	<b>The Wave Equation</b> The Occurrence of the wave equation in Physics – Elementary Solutions of the One-dimensional Wave equations – Vibrating membrane, Application of the calculus of variations –General	13	Upto K5

	solutions of the Wave equation. <b>Applications: Solving Laplace equations</b>		
V	<b>The Diffusion Equation</b> Elementary Solutions of the Diffusion Equation – Separation of variables – The use of Integral Transforms – The use of Green's functions. <b>Applications: Solving non-homogeneous boundary value problems.</b>	13	Upto K5
	SCILAB Problems related to PARTIAL DIFFERENTIAL EQUATIONS have been included in Practical-III (22MAP21) and questions related to SCILAB excluded in PARTIAL DIFFERENTIAL EQUATIONS(22MAP09) in the questions. <b>Questions related to Applications included in internal only and excluded in semester questions.</b>		

Note: The Questions should be asked in the ratio of 20% Problems and 80 % for theory

### Book for Study

*Ian Sneddon*, "Elements of Partial Differential Equations", McGraw Hill International Book Company, New Delhi, 1983.

Unit I : Chapter 2 (Sections 1–4, 7–10)

Unit II: Chapter 3 (Sections 1, 4, 5,9,10, 11)

Unit III: Chapter 4 (Sections 2–6, 8)

Unit IV: Chapter 5 (Sections 1,2, 4–6)

Unit V: Chapter 6 (Sections 3–6)

### Books for Reference

1. *K. Sankara Rao*, "Introduction to Partial Differential Equations", Second edition, Prentice-Hall of India, New Delhi, 2006.
2. *F. John*, "Partial Differential Equations", 3rd Edition, Narosa, 1979.
3. *M. D. Raisinghanian*, "Advanced Differential Equations", S. Chand and Company Ltd., New Delhi, 2001
4. *J. N. Sharma and K. Singh*, "Partial Differential Equations for Engineers and Scientists," Narosa Publishing House, 2001.
5. *Tynmyint-U and Lokenath Debnath*, "Partial Differential Equations for Scientists and Engineers" (Third Edition). North Holland , New yark, 1987.

### Web Resources

1. <https://accessfreevpn.com/>
2. <https://pdf.wecabrio.com/partial-differential-equations-ian-sneddon.pdf>

### Applications Link:

Unit I: <https://www.youtube.com/watch?v=RtVE2Gt-KQ4>



Unit II: <https://www.youtube.com/watch?v=tfNZBQbAg0I>

Unit III: <https://www.youtube.com/watch?v=VBnldiQCykQ>

Unit IV: [https://www.youtube.com/watch?v=ik2\\_5QVVLLA](https://www.youtube.com/watch?v=ik2_5QVVLLA)

Unit V: <https://www.youtube.com/watch?v=5OTw6sBAYB8>

**Pedagogy:** Chalk & Talk, Exercise, Assignments & PPTs.

**Rationale for Nature of the Course:** Can be professionals in solving advanced problems to pursue higher studies.

**Activities to be given**

1. Prepare comprehensive advanced problems on solving Heat and Wave equations
2. Assignment on one dimensional equation.
3. Preparing the students to do the project by applying calculus variation to solve Laplace equation.

**Course Learning Outcomes**

CLOs	On Completion of the Course, the students should be able to	K - Level
CLO1	Solving the different kinds of Partial differential equations.	Upto K5
CLO2	Analyzing and solving the different type of partial differential equations.	Upto K5
CLO3	Evaluating the Laplace equation and applying to problems.	Upto K5
CLO4	Applying the variable separable method to solve Laplace and Diffusion equation	Upto K5
CLO5	Examining appropriate method to solve the diffusion equations.	Upto K5

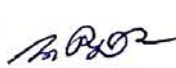
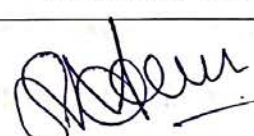
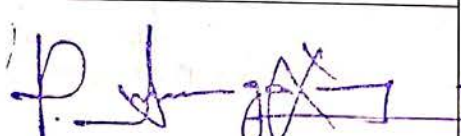
**Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)**

CLOs	Programme Outcomes						
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CLO 1	3	3	2	3	2	2	3
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CLO 3	3	3	3	2	2	3	2
CLO 4	2	2	2	3	3	3	3
CLO 5	3	3	3	2	2	3	2

3 – Advance Application

2 – Intermediate Level

1 – Basic Level

Course Designed by	Verified by HOD	Approved by CDC Co-Ordinator
 Dr.M.Rajarajeswari Name & Signature of the Staff	 Dr.S.Anuradha Name & Signature	 Name & Signature

Dr. S. ANURADHA,  
M.Sc.,M.B.A.,M.Phil.,PGDCA.,Ph.D.,  
Professor & Head,  
PG & Research Dept. of Mathematics,  
Hindusthan College of Arts & Science,  
Coimbatore - 641 028

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

DEPARTMENT OF MATHEMATICS				CLASS: I M.Sc				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours / Week	CIA	Ext	Total
II	DSC	22MAP10	Mechanics	4	5	50	50	100

Nature of Course		
Knowledge and Skill Oriented	Employability Oriented	✓
	Entrepreneurship Oriented	✓
	Skill Development	✓

### Course Objectives

- To solve the generalized coordinates, virtual work,
- To acquire the knowledge about Lagrange's equations.
- To study the concept of Hamilton's Principle.
- To gain the knowledge about Hamilton's equation and Hamilton – Jacobi theory.
- To obtain knowledge about canonical transformations, Lagrange and Poisson brackets.

Unit	Course Contents	Hours	K Level
I	<b>Introductory concepts:</b> Mechanical system – Generalized Coordinates – Coplanar Motion – Constraints – Virtual Work – Energy and Momentum – <b>Applications: Calculating the force, work done of several objects.</b>	13	Upto K5
II	<b>Lagrange's equations:</b> Introduction to Lagrange's equations – Derivations of Lagrange's Equations – Examples – Integrals of Motion – <b>Applications: Finding the equation of motion.</b>	13	Upto K5
III	<b>Hamilton's equations:</b> Introduction to Hamilton's equations – Hamilton's methods – Action and Hamilton's Principle – Hamilton's Equations – <b>Applications: Calculating the oscillation of simple pendulum.</b>	13	Upto K5
IV	<b>Hamilton – Jacobi theory:</b> Hamilton's Principle function – Hamilton – Jacobi Equation and waves of constant action – Separability – <b>Applications: Solving Kepler problems.</b>	13	Upto K5
V	<b>Canonical transformations:</b> Differential forms and Generating Functions – Special transformation – Lagrange and Poisson Brackets – <b>Applications: Determining the canonical nature of transformation of Phase space variables.</b>	13	Upto K5
	<b>Questions related to Applications included in internal only and excluded in semester questions.</b>		

Note: The Questions should be asked in the ratio of 20% Problems and 80 % for theory



### Book for Study

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

Unit I: Chapter 1 ( Sections 1.1 –1.5)

Unit II: Chapter2 (Sections 2.1 -2.3)

Unit III:Chapter 4 ( Sections 4.1 -4.2)

Unit IV: Chapter 5: (Sections 5.1 - 5.3)

Unit V: Chapter 6: (Sections 6.1 - 6.3)

### Books for Reference

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

2.*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.*

4. *D.Rutherford, “Classical Mechanics”, Oliver and Boyd, 1987*

5.*John R. Taylor, “ Classical Mechanics”.*

### Web Resources

1. <https://www.scribd.com/doc/295198601/Greenwood-D-T-principles-of-Dynamics-Prentice-Hall-1987>

2.<http://math.ucr.edu/home/baez/classical/texfiles/2005/book/classical.pdf>.

### Application Link:

Unit I: [https://www.youtube.com/watch?v=tJw\\_gx-i-0](https://www.youtube.com/watch?v=tJw_gx-i-0)

Unit II: <https://www.youtube.com/watch?v=hwyhYtlU5vo>

Unit III: <https://www.youtube.com/watch?v=3VRAYeeL9m4>

Unit IV: <https://www.youtube.com/watch?v=PJQRAZzbhgA>

Unit V: <https://www.youtube.com/watch?v=tD8npSv9gwA>

**Pedagogy:** Chalk & Talk, Exercise, Assignments & PPTs.

**Rationale for Nature of the Course:** Can be professionals in solving advanced problems to pursue higher studies.

### Activities to be given

1. Prepare comprehensive advanced problems on calculating the force and work done of several objects
2. Assignment on oscillation of simple pendulum
3. Preparing the students to do the project by determining canonical transformation of several variables.

### Course Learning Outcomes

CLOs	On Completion of the Course, the students should be able to	K - Level
CLO1	Analyzing the basic concepts of the mechanical system, generalized Coordinates, work, energy and momentum.	Upto K5
CLO2	Solving the Lagrange's equations and integrals of motion with examples.	Upto K5
CLO3	Analyze the Hamilton's Principle and other variational principles in the problems and applying in practical situations	Upto K5
CLO4	Determining and solving the Hamilton Jacobi equation.	Upto K5
CLO5	Solving canonical transformations, conditions of canonicity of a transformation in terms of Lagrange and Poisson brackets.	Upto K5



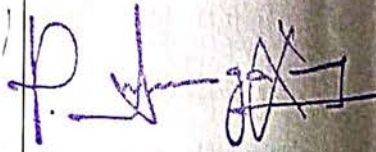
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CLO 3	3	3	3	3	2	3	3
CLO 4	2	2	3	3	2	2	3
CLO 5	2	2	2	3	2	2	2

3 – Advance Application

2 – Intermediate Level

1 – Basic Level

Course Designed by	Verified by HOD	Approved by CDC Co- Ordinator
 Dr.M.Rajarajeswari Name & Signature of the Staff	 Dr.S.Anuradha Name & Signature	 Name & Signature

Dr. S. ANURADHA,  
 M.Sc.,M.B.A.,M.Phil.,PGDCA.,Ph.D.,  
 Professor & Head,  
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 Hindusthan College of Arts & Science,  
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 Coimbatore-641 028.



DEPARTMENT OF MATHEMATICS				CLASS: I M.Sc				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours / Week	CIA	Ext	Total
II	DSC	22MAP11	Optimization Techniques	4	5	50	50	100

Nature of Course		
Knowledge and Skill Oriented	Employability Oriented	✓
	Entrepreneurship Oriented	✓
	Skill Development	✓

### Course Objectives

- To solve LPP using various methods.
- To define and use optimization terminology in Dynamic problems.
- To calculate shortest route and shortest distance algorithms, Inventory models.
- To identify the application of queuing theory in real life situation and methods of solving related problems.
- To apply Monte Carlo simulations and generate random numbers.

Unit	Course Contents	Hours	K Level
I	<b>Integer Programming</b> Introduction – Integer Programming Formulations – Gomory's construction–Fractional cut method(all integer)–The Cutting – Plane Algorithm – Branch–and–Bound Technique – <b>Applications: Formulating the real type word problems</b>	13	Upto K5
II	<b>Dynamic Programming</b> Introduction – The Recursive Equation Approach–Characteristic of Dynamic Programming–Dynamic Programming Algorithm – Solution of Discrete D.P.P – Some Applications- <b>Applications: Flight management problems in airline company</b>	13	Upto K5
III	<b>Inventory Models:</b> Introduction–Inventory Decisions–Cost Associated– with Inventories – Factors Affecting inventory – Economic Order Quantity–Deterministic Inventory Problems with No Shortages–Deterministic inventory Models with shortages–EOQ with Price Breaks– <b>Applications: Production management and control of purchasing</b>	13	Upto K5
IV	<b>Queuing Theory</b> Introduction – Queuing System–Elements of Queuing System – Operating Characteristics of Queuing System – Classification of Queuing Models– Model–I (M/M/1):(∞/FIFO), Model–II (M/M/1) : (N/FIFO), Model–III (M/M/C):(∞/FIFO), Model–IV (M/M/C):(N/FIFO). Problems in above four models– <b>Applications: structuring computer networks</b>	13	Upto K5

V	<b>Simulation Modeling:</b> Monte Carlo simulation – Types of simulation – Elements of discrete event simulation – Generation of random numbers. <b>Applications: Financial applications</b>	13	Upto K5
	<b>Questions related to Applications included in internal only and excluded in semester questions.</b>		

Note: The Questions should be asked in the ratio of 80% Problems and 20 % for theory

### Book for Study

1. *Kanti Swarup, P. K. Gupta, Man Mohan*, “Operations Research”, Sultan Chand & Sons, Publishers, New Delhi.

Unit I: Chapter 7: Sections :7.1 -7.8

Unit II: Chapter 13 : Sections : 13.1-13.6

Unit III: Chapter 19 : Sections :19.1,19.4-19.12

Unit IV: Chapter 21 : Sections : 21.1 -21.9

Unit V: Chapter 22 : Sections : 22.1 -22.7

### Books for Reference

1. *Prem Kumar Gupta, D. S. Hira* , “Operations Research”, Seventh Edition, S. Chand & Company Pvt. Ltd, 2014.
2. *R. Panneerselvam*, “Operations Research”, Second Edition, PHI Learning Private Limited, Delhi, 2015.
3. *Hamdy A. Taha*, “ Operations Research, Sixth edition, Prentice–Hall of India private Limited, New Delhi, 199
4. *F.S. Hiller and G.J.Lieberman*, “An introduction to operations research”, Holden Day , Inc. San Fransisco, 1973
5. *L. Cooper and D. Steiberg*, “Introduction to methods of optimization”, W.B. Saunders company, Philedelphia, 1970

### Web Resources

1. [https://www.academia.edu/35271588/Operation\\_Research\\_An\\_Introduction\\_8th\\_Edition\\_H\\_A\\_Taha](https://www.academia.edu/35271588/Operation_Research_An_Introduction_8th_Edition_H_A_Taha)

2. <https://www.youtube.com/watch?v=WmeUT0jQdw>

### Application Link:

Unit I: <https://www.youtube.com/watch?v=a2QgdDk4Xjw>

Unit II: <https://www.youtube.com/watch?v=gPINoJ4YPt4>

Unit III: <https://www.youtube.com/watch?v=vMSARPybFyg>

Unit IV: <https://www.youtube.com/watch?v=lnU-Zw3NEEQ>

Unit V: <https://www.youtube.com/watch?v=rds2eYcFbZY>

**Pedagogy:** Chalk & Talk, Exercise, Assignments & PPTs.

**Rationale for Nature of the Course:** Can be professionals in solving advanced problems to pursue higher studies.

**Activities to be given**



1. Prepare comprehensive advanced problems on Calculating the Inventory Models object.
2. Assignment on Queueing Theory
3. Preparing the students to do the project by Structuring computer networks.

### Course Learning Outcomes

CLOs	On Completion of the Course, the students should be able to	K - Level
CLO1	Explaining and solving various techniques to real life problems expressed in terms of LPP.	Upto K5
CLO2	Solving LPP through Dynamic Programming	Upto K5
CLO3	Applying the fundamental concept of Inventory control. Game theory concepts and Queueing Models.	Upto K5
CLO4	Perceptive the queueing theory and solving the queue models	Upto K5
CLO5	Applying and evaluating Simulation problems.	Upto K5



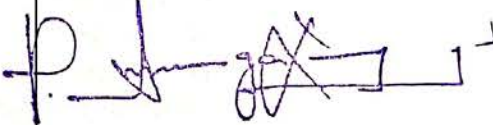
### Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

CLOs	Programme Outcomes						
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CLO 1	3	3	2	3	3	3	2
CLO 2	3	3	3	3	2	3	2
CLO 3	3	3	3	3	3	3	3
CLO 4	3	3	3	2	2	3	2
CLO 5	3	3	3	2	3	3	3

3 – Advance Application

2 – Intermediate Level

1 – Basic Level

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
 Dr.M.Rajarajeswari Name & Signature of the Staff	 Dr.S.Anuradha Name & Signature	 Name & Signature

Dr. S. ANURADHA,  
 M.Sc.,M.B.A.,M.Phil.,PGDCA.,Ph.D.,  
 Professor & Head,  
 PG & Research Dept. of Mathematics,  
 Hindusthan College of Arts & Science,  
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 Coimbatore-641 028.

DEPARTMENT OF MATHEMATICS				CLASS: I M.Sc				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours / Week	CIA	Ext	Total
II	DSC	22MAP12	Mathematical Software – II – MATHEMATICA	4	5	50	50	100

Nature of Course		
Knowledge and Skill Oriented	Employability Oriented	✓
	Entrepreneurship Oriented	
	Skill Development	✓

### Course Objectives

- To know the foundation for matrix manipulation, plotting functions
- To carry out numerical computations and analysis.
- To acquire the knowledge about the graphics and able to solve two dimensional expressions.
- To calculate linear equations Eigen values and Eigen vectors.
- To solve Numerical differentiation and Integration.

Unit	Course Contents	Hours	K Level
I	<b>Introduction to MATHEMATICA:</b> Running MATHEMATICA–Numerical calculations–Building up calculations–Using the MATHEMATICA system–Algebraic calculations–Symbolic mathematics – <b>Applications:</b> <b>Converting symbolic mathematics in computer program.</b>	13	Upto K5
II	<b>Numerical Mathematics:</b> Basic operations – Numerical sums, product and integrals – Numerical equation solving – Numerical differential equations – Numerical optimization –Manipulating numerical data – Statistics. <b>Functions And Programs:</b> 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– <b>Applications: Solving Linear equations.</b>	13	Upto K5
III	<b>Graphics:</b> Basic plotting – options– Redrawing and Combining plots– Manipulating options– Three dimensional surface–Plots– Converting between types of Graphics. <b>Input And Output In Notebooks:</b> Entering Greek letters – Two dimensional inputs – Editing and evaluating two – Dimensional expressions – Entering formulas – Entering tables and matrices – subscripts, bars and other	13	Upto K5



	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– <b>Applications: Converting geometrical objects by simple and symbolic construction.</b>		
IV	<b>Linear Algebra :</b> 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– <b>Applications: Solving Functions, Vectors and Matrices</b>	13	Upto K5
V	<b>Numerical Operations On Data :</b> Curve fitting – Approximate functions and Interpolation – Fourier Transforms. <b>Numerical Operations On Functions :</b> Numerical Integration – Numerical evaluation of sums and products – Numerical Solution of Polynomial equations – Numerical root finding – Numerical solution of Differential equations – <b>Applications: Solving differentiation and Integral equations.</b>	13	Upto K5
	<b>Questions related to Applications included in internal only and excluded in semester questions.</b>		

Note: The Questions should be asked in the ratio of 20% Problems and 80 % for theory

### Book for Study

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

Unit I: Chapter 1: (Sections 1.0.1 – 1.5.16)

Unit II: Chapter 1 (Sections 1.6.1-1.8.11)

Unit III: Chapter1 (Sections 1.10.1 -1.10.11)

Unit IV: Chapter 3 (Sections 3.7.1- 3.7.9)

Unit V: Chapter 3 (Sections 3.8.2 - 3.8.4, 3.9.3-3.9.7)

### Books for Reference

1. *Eugene Don, "Mathematica " (Schaum's outline) " Mc.Graw Hill.*
2. *Paul Wellin, "programming with Mathematica" Cambridge University press.*
3. *Bruce F. Torrence and Eve Torrence, "The Student's Introduction to Mathematica and Wolfram Language".*
4. *Pragati Gautam, Swapanil Verma, "Practical Mathematica" January 2019*
5. *Dr. Ananta kumar, " Mathematica" A Research book of Mathematics*

### Web Resources

1. [https://www.wolfram.com/mathematica/online/?src=google&420&gclid=Cj0KCOjw2NyFBhDoARIsAMtHtZ4mW07Z5gOOtvHzNPuhBvGte1unPuHHIS9UYyrbTMv-NBcm44LqCDsaAikOEALw\\_wcB](https://www.wolfram.com/mathematica/online/?src=google&420&gclid=Cj0KCOjw2NyFBhDoARIsAMtHtZ4mW07Z5gOOtvHzNPuhBvGte1unPuHHIS9UYyrbTMv-NBcm44LqCDsaAikOEALw_wcB)

**Applications Link:**

Unit I : <https://www.youtube.com/watch?v=mXFDAz3S9Uk>

Unit II: <https://www.youtube.com/watch?v=HDpgtSINY1k>

Unit III: <https://www.youtube.com/watch?v=SrT2tPP2f84>

Unit IV: <https://www.youtube.com/watch?v=-y46bavPZ-c>

Unit V: <https://www.youtube.com/watch?v=7d7pN5dd6sk>

**Pedagogy:** Chalk & Talk, Exercise, Assignments & PPTs.

**Rationale for Nature of the Course:** Can be professionals in solving advanced problems to pursue higher studies.

**Activities to be given**

1. Prepare comprehensive advanced problems on solving Linear equations.
2. Assignment on Eigen Values and Eigen Vectors
3. Preparing the students to do the project by solving differential and integral equations.

**Course Learning Outcomes**

CLOs	On Completion of the Course, the students should be able to	K - Level
CLO1	Comprehend the foundation and applying the matrix manipulations, plotting of functions and data, implementation of algorithms, and creation of user interfaces.	Upto K5
CLO2	Applying numerical concepts in problems.	Upto K5
CLO3	Evaluating Two dimensional expressions.	Upto K5
CLO4	Constructing and solving the matrices, Scalars and vectors using Linear system.	Upto K5
CLO5	Solving Numerical functions and Numerical integration.	Upto K5

**Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)**




CLOs	Programme Outcomes						
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CLO 1	3	3	3	3	3	3	3
CLO 2	3	2	3	3	3	3	3
CLO 3	3	3	3	2	3	2	2
CLO 4	3	3	3	3	3	2	2
CLO 5	3	3	3	3	2	3	2
	3	3	3	3	3	3	3

3 – Advance Application

2 – Intermediate Level

1 – Basic Level



Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
 Dr.M.Rajarajeswari Name & Signature of the Staff	 Dr.S.Anuradha Name & Signature	 Name & Signature

Dr. S. ANURADHA,  
 M.Sc.,M.B.A.,M.Phil.,PGDCA.,Ph.D.,  
 Professor & Head,  
 PG & Research Dept. of Mathematics,  
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DEPARTMENT OF MATHEMATICS				CLASS: I M.Sc				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours / Week	CIA	Ext	Total
II	DSC	22MAP13	Practical-II Mathematical Softwares II- MATHEMATICA	2	4	50	50	100

Nature of Course		
Knowledge and Skill Oriented	Employability Oriented	✓
	Entrepreneurship Oriented	
	Skill Development	✓

### Course Objectives

- To enable the students to solve problems in MATHEMATICA using different numerical methods
- To make the mathematical calculations simpler
- To variability applications using MATHEMATICA programs.
- To able to model the problems in MATHEMATICA
- To solve the concept of Graphics, Two dimensional and Three-dimensional Plots.

Course Contents	Hours	K Level
Using MATHEMATICA to compute the area bounded by the curves $f(x) = 1-x^2$ and $g(x) = x^2-3x^2$ . 2. Sketch the Sphere $x^2 + y^2 + z^2 = 14$ and its tangent plane at the point (1, 2, 3) by using MATHEMATICA 3. Using MATHEMATICA, plot the (five) solutions for $:\frac{d^2y}{dx^2} + 0.3 \frac{dy}{dx} + \sin y = 0$ with $0 \leq x \leq 30$ and using initial conditions $y'(0)=0, y(0) = -2, -1, 0, 1$ and 2. 4. Solve the differential equation $dy/dx = 1+1/2 y^2, y(0)=1, 0 \leq x \leq 1$ with D Solve and ND Solve and compare the results. 5. Find the Numerical Calculations by using MATHEMATICA 6. Find the Mathematical Functions by using MATHEMATICA 7. Do Algebraic Calculations by using MATHEMATICA 8. Find the Symbolic Mathematics by using MATHEMATICA 9. Evaluate Lists by using MATHEMATICA 10. Using MATHEMATICA, Graphics-Two Dimensional Plots 11. Using MATHEMATICA, Graphics - Three Dimensional Plots 12. Using MATHEMATICA, Input and Output in Note books	52	Upto K5



## Web Resources

1. [http://deptche.ccu.edu.tw/Chemistry/Chem\\_Math/Mathematica\\_V5\\_Book.pdf](http://deptche.ccu.edu.tw/Chemistry/Chem_Math/Mathematica_V5_Book.pdf)
2. <http://dsc.du.ac.in/wp-content/uploads/2020/04/CAS-Theory-SEC-.pdf>

**Pedagogy:** Chalk & Talk, Exercise, Assignments & PPTs.

**Rationale for Nature of the Course:** Can be professionals in solving advanced problems to pursue higher studies.

### Activities to be given

1. Prepare comprehensive advanced problems using MATHEMATICA
2. Assignment on sketching the shapes using MATHEMATICA.
3. Preparing the students to do the project by applying MATHEMATICA and find the Mathematical calculations.




### Course Learning Outcomes

CLOs	On Completion of the Course, the students should be able to	K - Level
CLO1	Comprehend the foundations of MATHEMATICA and solving equations using MATHEMATICA.	Upto K5
CLO2	Developing programs in MATHEMATICA.	
CLO3	Evaluating Numerical Calculations	Upto K5
CLO4	Solving Mathematical functions and Algebraic calculations.	Upto K5
CLO5	Constructing Two dimensional and three-dimensional plots.	Upto K5

### Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

CLOs	Programme Outcomes						
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CLO 1	3	3	3	3	3	3	2
CLO 2	3	2	3	2	3	3	3
CLO 3	2	3	3	3	2	3	2
CLO 4	3	3	2	3	3	3	2
CLO 5	3	3	3	2	3	3	3

3 – Advance Application      2 – Intermediate Level      1 – Basic Level

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
 Dr. M. Rajarajeswari Name & Signature of the Staff	 Dr. S. Anuradha Name & Signature	 Name & Signature

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