# LEARNING OUTCOMES–BASED CURRICULUM FRAMEWORK (LOCF)

**in the**

**POSTGRADUATE PROGRAMME IN MATHEMATICS**

**FOR THE STUDENTS ADMITTED FROM THE**

**ACADEMIC YEAR 2021 - 2022 AND ONWARDS**


**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

## 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:** DISCIPLINARY KNOWLEDGE: Demonstrate in-depth knowledge of Mathematics, both in theory and application.

**PO2:** PROBLEM SOLVING AND ANALYSING: Identify, formulate, and analyze the complex problems using the Principles of Mathematics

**PO3:** ENVIRONMENT SUSTAINABILITY AND ETHICS: Equips students with advanced knowledge and insight in mathematics.

**PO4:** MODERN TOOL USAGE: Solve critical problems by applying the Mathematical Software Tools.

**PO5:** CO-OPERATIVE TEAM WORK & COMMUNICATIVE SKILLS: Work individually or as a team member or leader in uniform and multidisciplinary settings.

**PO6:** SELF DIRECTED / LIFE LONG LEARNING**:** Enhances professional skills in Mathematics and some specialized areas of applied mathematics.

**PO7:** ENHANCING RESEARCH CULTURE: 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 2021-2022 and Onwards)***

**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 |
| | | **Semester – I** | | | | | | | |
| **21MAP01** | DSC | Advanced Algebra with GEOGEBRA | 4 | 5 | | 3 | 40 | 60 | 100 |
| **21MAP02** | DSC | Advanced Real Analysis | 4 | 5 | | 3 | 40 | 60 | 100 |
| **21MAP03** | DSC | Ordinary Differential Equations with SCILAB | 4 | 5 | | 3 | 40 | 60 | 100 |
| **21MAP04** | DSC | Numerical Methods | 4 | 5 | | 3 | 40 | 60 | 100 |
| **21MAP05** | DSC | Mathematical Softwares –I | 4 | 5 | | 3 | 40 | 60 | 100 |
| **21MAP06** | DSC | **Practical I** Mathematical Softwares - Lab I | 2 | - | 4 | 3 | 50 | 50 | 100 |
| **21MAP07** | SEC | Internship / Institutional Training / **Mini-Project** | 2 | - | | 3 | 100 | - | 100 |
| **21MAPE01** | AEE | Open Elective - I | 2 | 3 | | 3 | 100 | | 100 |
| **21MAPV01** | ACC | VAC–I | 1* | 2 | | 2 | 50 | - | 50** |
| **21MAPJ01** | SEC | **Aptitude / Placement Training** | Grade* | 2 | | 2 | 50 | | 50** |
| - | SEC | SDR – Student Development Record | **Assessment will be done in the end of Third semester** | | | | | | |
| | | **Total** | **26** | **32** | **4** | | **450** | **350** | **800** |
| | | **Semester - II** | | | | | | | |
| **21MAP08** | DSC | Advanced Complex Analysis with TABLEAU | 4 | 5 | | 3 | 40 | 60 | 100 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **21MAP09** | DSC | Partial Differential Equations with SCILAB | 4 | 5 | | 3 | 40 | 60 | 100 |
| **21MAP10** | DSC | Mechanics | 4 | 5 | | 3 | 40 | 60 | 100 |
| **21MAP11** | DSC | Optimization Techniques | 4 | 5 | | 3 | 40 | 60 | 100 |
| **21MAP12** | DSC | Mathematical Softwares -II | 4 | 5 | | 3 | 40 | 60 | 100 |
| **21MAP13** | DSC | **Practical II** Mathematical Softwares -Lab II | 2 | - | 4 | 3 | 50 | 50 | 100 |
| **21MAP14** | SEC | Internship / Institutional Training / **Mini-Project /** Extension Activity | 2 | - | | 3 | 100 | - | 100 |
| **21MAPE02** | AEE | Open Elective - II | 2 | 3 | | 3 | 100 | | 100 |
| **21MAPV02** | ACC | VAC–II | 1* | 2 | | 2 | 50 | - | 50** |
| **21MAPJ02** | SEC | **Online Courses** | Grade* | - | | - | - | - | C/NC |
| **21MAPJ03** | SEC | **Aptitude / Placement Training** | Grade* | 2 | | 2 | 50 | | 50** |
| | | **Total** | **26** | **32** | **4** | | **450** | **350** | **800** |
| | | **Semester - III** | | | | | | | |
| **21MAP15** | DSC | Topology | 4 | 5 | | 3 | 40 | 60 | 100 |
| **21MAP16** | DSC | Advanced Topics in Fluid Dynamics | 4 | 4 | | 3 | 40 | 60 | 100 |
| **21MAP17** | DSC | Probability theory and Mathematical statistics | 4 | 5 | | 3 | 40 | 60 | 100 |
| **21MAP18** | DSC | C++ Programming (Theory) | 4 | 5 | | 3 | 40 | 60 | 100 |
| **21MAP19** | DSE | Electives I / **DSE-I** | 3 | 3 | | 3 | 40 | 60 | 100 |
| **21MAP20** | DSE | Electives II/ **DSE-II** | 3 | 3 | | 3 | 40 | 60 | 100 |
| **21MAP21** | DSC | **Practical III** GEOGEBRA, SCI LAB and TABLEAU | 2 | - | 4 | 3 | 50 | 50 | 100 |
| **21MAP22** | SEC | Internship / Institutional Training / **Mini-Project/** Extension Activity | 2 | - | | 2 | 100 | - | 100 |
| **21MAPE03** | AEE | Open Elective-III | 2 | 3 | | 3 | 100 | - | 100 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **21MAPV03** | ACC | VAC–III | 1* | 2 | | 2 | 50 | - | 50** |
| **21MAPJ04** | SEC | **Aptitude / Placement Training** | Grade* | 2 | | 2 | 50 | | 50** |
| **21MAPJ05** | SEC | **Online Courses** | Grade* | - | | - | - | - | C/NC |
| **21MAPJ06** | SEC | SDR – Student Development Record | 2* | - | - | - | - | - | - |
| | | **Total** | **28** | **32** | **4** | | **490** | **410** | **900** |
| | | **Semester - IV** | | | | | | | |
| **21MAP23** | DSE | **Electives III /DSE-III** | 3 | 5 | | | 40 | 60 | 100 |
| **21MAP24** | DSE | **Electives IV /DSE-IV** | 3 | 5 | | | 40 | 60 | 100 |
| **21MAP25** | SEC | **Self-Study Course** | 3 | - | - | | 40 | 60 | 100 |
| **21MAP26** | SEC | **Project Work /Student Research** | 5 | - | | | 50 | 150 | 200 |
| | | **Total** | **14** | **10** | | | **170** | **330** | **500** |

- * 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)
- * 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 |

- Part IV & V not included in total marks and CGPA calculation.
- **I.E**-Internal Exam
- **E.E**-External Exam
- **JOC**-Job Oriented Course

**PASSING MINIMUM**

Passing Minimum for PG 50%

## *Abstract for Scheme of Examination*

*(For the students admitted during the academic year 2021 - 2022 and onwards)*

| Course | Papers | Credit | Total Credits | Marks | Total Marks |
|---|---|---|---|---|---|
| Core /DSC | 14 | | | 100 | 1400 |
| Self-Study Course / DSC | 1 | 3 | | | 100 |
| Electives/DSE | 4 | | | 100 | 400 |
| Practical/DSC | 3 | | | 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 |
| Value Added Course | 3 | 1* | 3* | 100 | 300** |
| Aptitude / Placement Training/ SEC | 3 | Grade* | Grade* | 100 | 300** |
| Online Courses/ SEC | 2 | Grade* | Grade* | - | - |
| SDR - SEC | 1 | 2* | - | - | - |
| Total | | | 94 + (5 Extra Credits) | | 3000 + (600**) |

| List of Open Elective Papers | |
|---|---|
| **Open Electives** | Yoga for Human Excellence<br>Human Health & Hygiene<br>Indian Culture and Heritage<br>Indian Constitution and Political System<br>Consumer Awareness and Protection<br>Professional Ethics and Human Values<br>Human Rights, Women's Rights& Gender Equality<br>Disaster Management<br>Green Farming<br>Corporate Relations<br>start a Business?<br>Research Methodology and IPR<br>General Studies for Competitive Examinations<br>IIT JAM Examination (for Science only)<br>CUCET Examination |
| **VAC Papers** | |
| **Courses offered by the Departments to other Programmes** | |

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

| List of Elective Papers/ DSE<br>(Can choose any one of the paper as electives) | | |
|---|---|---|
| | Course Code | Title |
| Electives/<br>**DSE-I** | 21MAP19A | **Elective – I:** Graph Theory |
| | 21MAP19B | **Elective – I:** Stochastic Differential Equations |
| Electives/<br>**DSE-II** | 21MAP20A | **Elective - II**: Magneto Hydro Dynamics |
| | 21MAP20B | **Elective - II**: Operator Theory |
| Electives/<br>**DSE-III** | 21MAP23A | Electives **III**<br>Functional Analysis |
| | 21MAP23B | Electives **III**<br>Number Theory & Cryptography |
| Electives/<br>**DSE-IV** | 21MAP24A | Electives **IV**<br>Mathematical Methods |
| | 21MAP24B | Electives **IV**<br>Fuzzy logic and fuzzy set. |

**Syllabus Coordinator**

**BOS-Chairman/Chairperson**

**Academic Council – Member Secretary**

**PRINCIPAL**

Co-ordinator
Academic Audit Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

PRINCIPAL
Hindusthan College of Arts and Science
Hindusthan Gardens, Behind Nava India,
Coimbatore - 641 028.

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

(For the students admitted during the academic year 2021-2022 and onwards)

**1. Internal Marks**

| Components | Marks |
|---|---|
| Test | 10 |
| Model Exam | 10 |
| Internal Assessment components | 20 # |
| **TOTAL** | **40** |

**# List of components for Internal Assessment**

| S.No | Components |
|---|---|
| 1 | Multiple choice questions |
| 2 | Quiz |
| 3 | Video teach |
| 4 | UT – Unannounced test |
| 5 | Co-operative or Collaborative Learning |
| 6 | Mini Project/Assignment |
| 7 | Case study |
| 8 | Seminar |

(Any four components from the above list with five marks each will be calculated .4x5=20 marks)

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

| Components | Marks |
|---|---|
| Test –I | 20 |
| Test - II | 20 |
| Application* | 10 |
| **Total** | **50** |

**b) Components for Practical E.E.**

| Components | Marks |
|---|---|
| Experiments | 40 |
| Record | 5 |
| Viva | 5 |
| **Total** | **50** |

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

| Internships/Industrial Training (I.E) | | Major Project Work | | |
|---|---|---|---|---|
| **Component** | **Marks** | **Component** | **Marks** | **Total Marks** |
| Work diary<br>Report<br>Viva-voce | 25<br>50<br>25 | I.E a)Attendance<br>b)Review | 20<br>30 | 50 |
| **Total** | **100** | E.E* a) Final report<br>b)Viva-voce | 120<br>30 | 150 |
| | | | **Total** | **200** |

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

**4. Value Added Courses / Aptitude/Placement courses:**

| Components | Marks |
|---|---|
| Two Test (each 1 hour) of 25 marks each<br>QP is objective pattern (25x1=25) | 50 |
| **Total** | **50** |

**5. Guidelines for Open Elective**

| No of Activities | Marks |
|---|---|
| Two Tests (each 3 hours) of 50 marks each<br>[5 out of 8 descriptive type questions 5 x 10 = 50 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* *(2021-2022Regulations)*

**QUESTION PAPER PATTERN FOR CIA EXAM**

**Reg.No:----------** **Q.P.CODE:**

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

**PG/MBA/MCA DEGREE CIA EXAMINATIONS ----------20---------**

**(----------Semester)**

**BRANCH: ----------**

**Subject Name: ----------**

**Time: Two Hours** **Maximum: 50 Marks**

**Section-A (3 x 4=12 Marks)**

Answer **ALL** Questions

**ALL** questions carry **EQUAL** Marks

**(Q.No: 1 to 3 Either Or type)**

**Section-B (2 x 12=24 Marks)**

Answer any **TWO** Questions out of **THREE** Questions

**ALL** questions carry **EQUAL** Marks

**(Q.No: 4 to 6)**

**Section-C (1 x 14=14 Marks)**

**(Compulsory Question: It should be a Case study/Application oriented/Critical analysis from any of the units)**

**(Q.No: 7)**

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

**Reg.No:----------** **Q.P.CODE:**

**HINDUSTHAN COLLEGE OF ARTS AND 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)**

| Course Code: | 21MAP01 | Course Title | | | | | | Batch: | 2021–2022 and Onwards |
|---|---|---|---|---|---|---|---|---|---|
| | | ADVANCED ALGEBRA WITH GEOGEBRA | | | | | | Semester: | I |
| Hrs/Week: | 5 | L | 5 | T | – | P | – | Credits: | 4 |

**COURSE OBJECTIVE:**

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

**COURSE OUTCOMES (CO)**

| S.No | COURSE OUTCOME | BLOOMS LEVEL |
|---|---|---|
| CO1 | Understand Sylows theorem and evaluate its applications | K2 & K5 |
| CO2 | Determine some special types of rings and their properties | K5 |
| CO3 | Classify the extension fields and determine the roots of polynomials. | K4 & K5 |
| CO4 | Analyze the elements of Galois theory and Galois Groups over the rational and estimate the straight edges | K4 &K5 |
| CO5 | Apply the transformation , nilpotent transformation and explain Jordan forms | K3 & K5 |
| **K1– Remember, K2– Understand, K3– Apply, K4–Analyze, K5– Evaluate** | | |

**SYLLABUS**

| 21MAP01 | ADVANCED ALGEBRA WITH GEOGEBRA | Sem: I |
|---|---|---|
| **Unit No.** | **Topics** | **Hours** |
| **I** | **Group Theory:**<br>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–**Application: Sylow's theorem– Permutation groups.** | **13** |
| **II** | **Ring Theory:**<br>The field of quotients of an integral domain–Euclidean rings–A particular Euclidean ring – Polynomial rings – Polynomials over the rational field–**Applications: Network security–Cryptography.** | **13** |
| **III** | **Fields:**<br>Extension Fields – The Transcendence of e–Roots of polynomials –Construction with straight edge and compass – More about roots–**Applications: Particle physics** | **13** |
| **IV** | **Fields:**<br>The elements of Galois theory – Fixed Field–Solvability by Radicals–Finite Fields–**Applications: Image processing.** | **13** |
| **V** | **Linear Transformations:**<br>Canonical forms: Triangular form – Nilpotent transformations– Jordan form – Hermitian and Unitary Transformations–**Applications : Computer graphics.** | **13** |
| GEOGEBRA Problems related to ADVANCED ALGEBRA have been included in Practical–III (21MAP21) and **questions related to GEOGEBRA excluded in ADVANCED ALGEBRA (21MAP01) in the questions.**<br>**Questions related to Applications included in internal only and excluded in semester questions.** | | |

*Note: Distribution of marks: Problems 20%, Theory 80%*

**Teaching Methods:** Power Point Projection through LCD, Assignment, Discussion and Activity.

## TEXT BOOK

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)

## REFERENCE BOOKS

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

**Web Link:**

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

## MAPPING WITH PROGRAM OUTCOMES

| CO \ PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| **CO1** | S | S | S | S | S | S | M |
| **CO2** | S | M | S | M | S | S | M |
| **CO3** | S | S | S | S | S | S | M |
| **CO4** | S | S | S | S | S | M | M |
| **CO5** | S | S | S | S | S | M | S |

S–Strong, M– Medium, L – Low

## ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

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

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

| Course Code: | 21MAP02 | Course Title | | | | | | Batch: | 2021–2022 and Onwards |
|---|---|---|---|---|---|---|---|---|---|
| | | ADVANCED REAL ANALYSIS | | | | | | Semester: | I |
| Hrs/Week: | 5 | L | 5 | T | – | P | – | Credits: | 4 |

**COURSE OBJECTIVE:**

1. To evaluate integral of a function of a real variable in the sense of Riemann Stieltjes integral and gain its properties.
2. To acquire Knowledge and demonstrate understanding the statement and proof of convergence theorems and its applications.
3. To obtain the knowledge about linear transformation.
4. To understand the requirement and concept of Lebesgue measure, Measurable functions and Lebesgue integral.
5. To evaluate advanced the Lebesgue measure and Lebesgue integral with related problems.

**COURSE OUTCOMES (CO)**

| S.No | COURSE OUTCOME | BLOOMS LEVEL |
|---|---|---|
| CO1 | Apply the Riemann Stieltjes integral of real valued functions on intervals and its properties and evaluate vector valued function | K3 & K5 |
| CO2 | Classify and determine the sequences and series along with its properties. | K2 & K5 |
| CO3 | Analyze the concept of linear transformation and explain the extreme values of implicit functions. | K4 & K5 |
| CO4 | Understand the fundamental concept of Lebesgue measure and evaluate the applications | K2 & K5 |
| CO5 | Evaluate the complex integration and the benefits of Lebesgue Integral | K5 |

**K1– Remember, K2– Understand, K3– Apply, K4–Analyze, K5– Evaluate**

**SYLLABUS**

| 21MAP02 | ADVANCED REAL ANALYSIS | Sem: I |
|---|---|---|
| **Unit No.** | **Topics** | **Hours** |
| **I** | **Riemann Stieltjes Integral**<br>Definition and Existence of the Integral – Properties of the integral – Integration and differentiation – Integration of vector valued function – rectifiable curves–**Applications: Calculate the area, Distance travelled by some object**. | 13 |
| **II** | **Sequences and Series of Functions**<br>Uniform convergence and continuity – Uniform convergence and integration –Uniform convergence and differentiation – Equicontinuous families of functions – The Stone–Weierstrass theorem–**Application: Calculating the continuous function** | 13 |
| **III** | **Functions of Several Variables**<br>Linear transformation – contraction principle – Inverse function theorem – Implicit function theorem–**Applications: Computer graphics– Matrix exploring** | 13 |
| **IV** | **Lebesgue Measure**<br>Outer measure – Measurable sets and Lebesgue measure – Measurable functions –Littlewood's Theorem–**Application: Calculating the Outer measure.** | 13 |
| **V** | **Lebesgue Integral**<br>The Lebesgue integral of bounded functions over a set of finite measure – integral of a non – negative function – General Lebesgue Integral– **Application: Apply to integrals**. | 13 |
| **Questions related to Applications included in internal only and excluded in semester questions.** | | |

*Note: Distribution of marks: Problems20 %, Theory 80 %*

**Teaching methods:** PowerPoint Projection through LCD, Assignment, Discussion and Activity.

## TEXT BOOKS

***1.WalterRudin, "****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)

## 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.*

## WEB RESOURCES

**Web Link:** *https://ufsj.edu.br/portal–repositorio/File/nepomuceno/slides(2).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=ckZpIsjzm0I
Unit III : https://www.youtube.com/watch?v=dv4cjQZrRp8&t=1223s
Unit IV: https://www.youtube.com/watch?v=lgZJohjjs10&list=PLgMDNELGJ1CYKDzKdGcM1–kuH_a1NCfQA
Unit V: https://www.youtube.com/watch?v=pX70A6ntauE

## MAPPING WITH PROGRAM OUTCOMES

| CO \ PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| **CO1** | S | S | M | S | M | M | S |
| **CO2** | S | S | S | M | M | M | S |
| **CO3** | S | S | S | S | S | S | M |
| **CO4** | M | S | S | S | M | S | S |
| **CO5** | M | S | S | M | M | M | S |

S–Strong, M– Medium, L – Low

## ASSESSMENT PATTERN

Follows common pattern of Internal and External assessment, suggested in the Regulations.

| Course Designed by | Verified by HOD | Approved by CDC Co–ordinator |
|---|---|---|
| Dr.M.Rajarajeswari<br>Name & Signature of the Staff | Dr.S.Anuradha<br>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,
Coimbatore - 641 028

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

| Course Code: | 21MAP03 | Course Title | | | | | | Batch: | 2021–2022 and Onwards |
|---|---|---|---|---|---|---|---|---|---|
| | | ORDINARY DIFFERENTIAL EQUATIONS WITH SCILAB | | | | | | Semester: | I |
| Hrs/Week: | 5 | L | 5 | T | – | P | – | Credits: | 4 |

**COURSE OBJECTIVE:**

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

**COURSE OUTCOMES (CO)**

| S.No | COURSE OUTCOME | BLOOMS LEVEL |
|---|---|---|
| CO1 | Describe the mathematical methods to solve higher order differential equations and determine the equations. | K2 & K5 |
| CO2 | Analyze and evaluate non–homogeneous ODE using the method of undermined coefficients and annihilator method | K2 &K5 |
| CO3 | Understand, Apply and determine the theorems on Initial value problem to ordinary differential equations. | K2, K3&K5 |
| CO4 | Compare the Euler equations, the Bessel's equation and Regular, singular points at infinity and to evaluate | K5 |
| CO5 | Categorize and estimate the research problem where differential equation can be used to model the problem. | K4 & K5 |

**K1– Remember, K2– Understand, K3– Apply, K4–Analyze, K5– Evaluate**

**SYLLABUS**

| 21MAP03 | ORDINARY DIFFERENTIAL EQUATIONS WITH SCILAB | Sem: I |
|---|---|---|
| **Unit No.** | **Topics** | **Hours** |
| **I** | **Linear Equations with Constant Coefficients**<br>Introduction – Second order homogenous equations – Initial value problem for second order equations – Linear dependence and independence – A formula for Wronskian. | **13** |
| **II** | **Linear Equations with Constant Coefficients (Contd.)**<br>The Non– homogenous equations of order two–homogenous and Non – homogenous equations of order n – Initial value problems for $n^{th}$ order equations– Annihilator method to solve non– Homogenous equation–<br>**Applications: Transformation between two images.** | **13** |
| **III** | **Linear Equations with Variable Coefficients**<br>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–<br>**Applications: Solving Mechanical system of equations.** | **13** |
| **IV** | **Linear Equations with Regular Singular Points**<br>The Euler equations – Second order equations with regular singular points – Exceptional cases – The Bessel equation – The Bessel equation (contd.)–<br>**Applications: Derivative and concepts in Economics.** | **13** |
| **V** | **Existence and Uniqueness of Solutions to First Order Equations**<br>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–**Applications: Simple harmonic motion in spring mass system.** | **13** |
| SCILAB Problems related to ORDINARY DIFFERENTIAL EQUATIONS have been included in Practical–III (21MAP21) and **questions related to SCILAB excluded in ORDINARY DIFFERENTIAL EQUATIONS (21MAP03) in the questions.**<br>**Questions related to Applications included in internal only and excluded in semester questions.** | | |

*Note: Distribution of marks: Problems 80 %, Theory 20 %*

**Teaching methods:** PowerPoint Projection through LCD, Assignment, Discussion and Activity.

## TEXT BOOK

***Earl A. Coddington***, "*An Introduction to Ordinary Differential Equations", Prentice–Hall of India Private Limited, New Delhi2008.*

UNIT I: Chapter2 : Sections 2.1 –2.5.
UNIT II: Chapter2 : Sections 2.6 – 2.8,2.10,2.11.
UNIT III: Chapter3 : Sections 3.1 –3.8
UNIT IV: Chapter4 : Sections 4.1 – 4.4, 4.6 –4.8
UNIT V: Chapter5 : Sections 5.1 – 5.8

## REFERENCE BOOKS

***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.*

## WEB RESOURCES

**Web Link*:*** *https://ptvtpqa.files.wordpress.com/2013/12/coddington–e–levinson–n–theory–of–ordinary–differential–equations.pdf*

*https://books.google.co.in/books?id=uzymjXGIhxsC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false*

**ApplicationsLink:**

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

## MAPPING WITH PROGRAM OUTCOMES

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | S | S | S | S | M | M | S |
| CO2 | S | S | S | S | M | S | S |
| CO3 | S | S | M | S | S | S | S |
| CO4 | S | S | S | M | M | M | S |
| CO5 | M | S | S | M | M | M | S |

S–Strong, M– Medium, L – Low

## ASSESSMENT PATTERN

Follows common pattern of Internal and External assessment, suggested in the Regulations.

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

Dr. S. ANURADHA,
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Coimbatore - 641 028

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

| Course Code: | 21MAP04 | Course Title | | | | | | Batch: | 2021–2022 and Onwards |
|---|---|---|---|---|---|---|---|---|---|
| | | NUMERICAL METHODS | | | | | | Semester: | I |
| Hrs/Week: | 5 | L | 5 | T | – | P | – | Credits: | 4 |

**COURSE OBJECTIVE:**

1. To make the students understand solving Algebraic and Transcendental equations.
2. To able to solve the system of equations.
3. To understand the methods of finding solution to the differential equations of various orders.
4. To apply the methods for solving Partial differential equations.
5. To solve characteristics value problems.

**COURSE OUTCOMES (CO)**

| S.No | COURSE OUTCOME | BLOOMS LEVEL |
|---|---|---|
| CO1 | Explain and evaluate the various tools in solving numerical problems. | K2& K5 |
| CO2 | Identify and determine the system of equations using various methods. | K3 & K5 |
| CO3 | Apply and evaluate various methods to find numerical solution of first and second order ordinary differential equations. | K3 & K5 |
| CO4 | Understand & determine the Explicit method and the Crank Nicolson method for solving partial differential equations. | K2 & K5 |
| CO5 | Classify and estimate the various methods for solving Characteristic Value Problems. | K4 & K5 |

**K1– Remember, K2– Understand, K3– Apply, K4–Analyze, K5– Evaluate**

**SYLLABUS**

| 21MAP04 | NUMERICAL METHODS | Sem: I |
|---|---|---|
| **Unit No.** | **Topics** | **Hours** |
| **I** | **Solution of nonlinear equations:**<br>Initial approximation for an Iterative procedures– Regula Falsi method – Newton's method –Convergence of Newton's method.<br>**Numerical differentiation and integration:**<br>Derivatives from Differences tables –Higher order derivatives –Divided difference, Central – Difference formulas –Composite formula of Trapezoidal rule –Romberg integration– Simpson's rules–**Applications: Calculating the areas, and solutions** | **13** |
| **II** | **Solution of system of equations:**<br>Gauss Elimination method – Gauss Jordan methods –LU Decomposition method –Matrix inversion by Gauss–Jordan method – Methods of Iteration –Jacobi and Gauss Seidal Iteration –**Applications : Traffic flow.** | **13** |
| **III** | **Solution of ordinary differential equations:**<br>Taylor series method –Euler and Modified Euler methods –Rungekutta methods ($4^{th}$ order & $6^{th}$ order)–Milne's method – Adams Moulton method – **Applications: Evaluations of integrals, limits and series.** | **13** |
| **IV** | **Numerical solution of partial differential equations**:<br>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 –**Applications: Electro magneto field.** | **13** |
| **V** | **Characteristic value problems** :<br>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 – **Applications: Laplace transforms.** | **13** |
| **Questions related to Applications included in internal only and excluded in semester questions.** | | |

*Note: Distribution of marks: Problems 80 %, Theory 20 %*

**Teaching methods:** Power Point Projection through LCD, Assignment and Discussion and Activity.

## TEXT BOOKS

***For Units I to III :***

1. ***Iyengar.S.R.K and Jain.R.K***– *"Numerical Methods", New Age International Publishers.*

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

## 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), FourthEdition.*


## WEB RESOURCES

**Web Link:**

*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.abebooks.com/servlet/BookDetailsPL?bi=30715571896&searchurl=an%3Dgunavathi%2Bk%2Bkandasamy%2Bp%2Bthilagavathi%2Bk%26sortby%3D17&cm_sp=snippet–_–srp1–_–title2*

*https://fac.ksu.edu.sa/sites/default/files/numerical_analysis_9th.pdf*

**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
Unit V: https://www.youtube.com/watch?v=B7KkaTwiSPs

## MAPPING WITH PROGRAM OUTCOMES

| CO \ PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | S | S | S | S | M | M | M |
| CO2 | S | S | S | M | S | M | M |
| CO3 | S | S | M | S | M | M | M |
| CO4 | S | S | S | S | S | S | M |
| CO5 | S | S | M | S | M | S | M |

S–Strong, M– Medium, L – Low

## ASSESSMENT PATTERN

Follows common pattern of Internal and External assessment, suggested in the Regulations.

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

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

| Course Code: | 21MAP05 | Course Title | | | | | | Batch: | 2021–2022 and Onwards |
|---|---|---|---|---|---|---|---|---|---|
| | | MATHEMATICAL SOFTWARES – I | | | | | | Semester: | I |
| Hrs/Week: | 5 | L | 5 | T | – | P | – | Credits: | 4 |

**COURSE OBJECTIVE:**

1. To obtain the knowledge about the foundations of LATEX
2. To create mathematical models and problems in LATEX.
3. To acquire the knowledge about variables, Matrices, vectors and array.
4. To able to model the mathematical program in MATLAB.
5. To solve various linear and nonlinear algebraic equations.

**COURSE OUTCOMES (CO)**

| S.No | COURSE OUTCOME | BLOOMS LEVEL |
|---|---|---|
| CO1 | Illustrate the foundations of LATEX and determine the programming in MATLAB. | K2 & K5 |
| CO2 | Construct and explain mathematical Modeling in MATLAB. | K3& K5 |
| CO3 | Understand, apply and explained the concepts of Variables, arrays, conditional statements, loops, functions, and plots . | K2, K3 &K5 |
| CO4 | Determine the program in MATLAB | K5 |
| CO5 | Classify and evaluate ordinary differential equations using MATLAB. | K2 , K4 & K5 |

**K1– Remember, K2– Understand, K3– Apply, K4–Analyze, K5– Evaluate**

**SYLLABUS**

| 21MAP05 | MATHEMATICAL SOFTWARES – I | Sem: I |
|---|---|---|
| **Unit No.** | **Topics** | **Hours** |
| **I** | **Basics of a Latex file:**<br>Special Characters, Document layout and organization: Document class, Page style, Parts of the document.<br>**Displayed Text**: Centering and indenting, Lists Theorem–like declarations, Boxes, Tables, Footnotes and marginal notes.<br>**Applications: Communication and publication of scientific document** | **13** |
| **II** | **Mathematical formulas:**<br>Mathematical environments, Main elements of math mode, Mathematical symbols, Additional elements, Fine–tuning mathematics– The Graphics packages –**Applications: Writing the research papers professionally** | **13** |
| **III** | **Basics of MATLAB:**<br>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–**Applications: Programming for numerical computation** | **13** |
| **IV** | **Programming in MATLAB**:<br>Script files – Functions and function files– Loops– Language specific Features–Advanced data objects–**Applications: Mathematical modelling** | **13** |
| **V** | **Linear and Nonlinear Algebra:**<br>Linear Algebra – Data Analysis and Statistics – Ordinary Differential Equations–Nonlinear Algebraic Equations – Basic 2D and 3D Plots (Syntax only)–**Applications: Solving word problems involving relationships** | **13** |
| **Questions related to Applications included in internal only and excluded in semester questions.** | | |

*Note: Distribution of marks: Problems 20 %, Theory80%*

**Teaching methods:** PowerPoint Projection through LCD, Assignment and Discussion and Activity.

## TEXT BOOKS

***For Units I and II***

1. ***H. Kopka and P.W. Daly,*** *"A Guide to LATEX", Third Edition, Addison – Wesley, London,1999.*
   Unit I : Chapter2 : Section : 2.5 ,Chapter 3 : Sections : 3.1 – 3.3 ,
   Chapter 4 : Sections : 4.2,4.3,4.5,4.7,4.8,4.10
   Unit II: Chapter 5: Sections : 5.1 – 5.5,Chapter 6:Section : 6.1

***For Units III, IV and V***

***2.RudraPratap,*** *"Getting Started with MATLAB" Indian Edition, Oxford University Press*
Unit III : Chapter 1 : Sections : 1.6.1, 1.6.2, Chapter 3 : Sections : 3.1, 3.2,3.5.1,3.6 – 3.8
Unit IV : Chapter 4 : Sections : 4.1 – 4.4
Unit V : Chapter 5 : Sections :5.1, 5.3,5.5,5.6, Chapter 6 : Sections : 6.1, 6.3

## 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.*


## WEB RESOURCES

**WebLink:** *https://www.maths.ox.ac.uk/system/files/legacy/2875/TexLaTeX_Intro2012MT–Ver2_1.pdf*

*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

## MAPPING WITH PROGRAM OUTCOMES

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | S | S | S | S | S | M | S |
| CO2 | S | S | S | S | M | S | M |
| CO3 | S | S | S | S | S | S | M |
| CO4 | M | S | S | M | M | M | S |
| CO5 | S | M | S | M | M | S | M |

S–Strong, M– Medium, L – Low

## ASSESSMENT PATTERN

Follows common pattern of Internal and External assessment, suggested in the Regulations.

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

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

| Course Code: | 21MAP06 | Course Title | | | | | | Batch: | 2021–2022 and Onwards |
|---|---|---|---|---|---|---|---|---|---|
| | | PRACTICAL I : MATHEMATICAL SOFTWARES – I | | | | | | Semester: | I |
| Hrs/Week: | 4 | L | – | T | – | P | 4 | Credits: | 2 |

**COURSE OBJECTIVE:**

1.To gain the knowledge about basic concept of LATEX.
2. To able to apply curve fitting in LATEX
3. To perform various programs using MATLAB
4. To solve Mathematical equations in MATLAB.
5. To achieve Mathematical Modelling.

**COURSE OUTCOMES (CO)**

| S.No | COURSE OUTCOME | BLOOMSLEVEL |
|---|---|---|
| CO1 | Understand the concept of LATEX and evaluate the program. | K2 & K5 |
| CO2 | Determine various applications of MATLAB in curve fitting, statistics and integration. | K5 |
| CO3 | Analyze and Evaluate programs and plot results in MATLAB | K4&K5 |
| CO4 | Identify and evaluate various types of equations | K3 & K5 |
| CO5 | Build and determine mathematical Modeling in MATLAB. | K3 & K5 |
| **KI– Remember, K2– Understand, K3– Apply, K4–Analyze, K5– Evaluate** | | |

**SYLLABUS**

| 21MAP06 | PRACTICAL I : MATHEMATICAL SOFTWARES LAB–I | Sem: I |
|---|---|---|
| **Unit No.** | **Topics** | **Hours** |

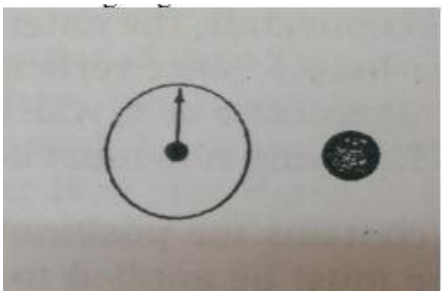
## LaTex and MATLAB – List of Practical Problems

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 footnotes.

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. Plotting a function by using MATLAB,.

6. Polar plot by using MATLAB

,

7. Find the Addition of two matrices by using MATLAB,.

8. Find the determinant of a matrix by using MATLAB,.

9. 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 5155

***Note: IE 50 Marks and EE 50 Marks***

**Teaching methods:** PowerPoint Projection through LCD, Discussion and Activity.

## WEB RESOURCES

**WebLink:**

***https://www.maths.ox.ac.uk/system/files/legacy/2875/TexLaTeX_Intro2012MT–Ver2_1.pdf***

## MAPPING WITH PROGRAM OUTCOMES

| CO / PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | S | S | S | S | S | M | S |
| CO2 | S | S | S | S | S | S | M |
| CO3 | S | S | S | S | M | S | M |
| CO4 | M | S | S | M | S | M | S |
| CO5 | S | M | M | S | M | S | M |

S–Strong, M– Medium, L – Low

## ASSESSMENT PATTERN

Follows common pattern of Internal and External assessment, suggested in the Regulations.

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

Dr. S. ANURADHA,
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Coimbatore - 641 028

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

| Course Code: | 21MAP08 | Course Title | | | | | | Batch: | 2021–2022 and Onwards |
|---|---|---|---|---|---|---|---|---|---|
| Hrs/Week: | 5 | ADVANCED COMPLEX ANALYSIS WITH TABLEAU | | | | | | Semester: | II |
| | | L | 5 | T | – | P | – | Credits: | 4 |

**COURSE OBJECTIVE:**

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

**COURSE OUTCOMES (CO)**

| S. No | COURSE OUTCOME | BLOOMSLEVEL |
|---|---|---|
| CO1 | Understand and explain fundamental theorems used in complex analysis. | K2 & K5 |
| CO2 | Apply the Cauchy's integral formula in residue theorems and explanation of definite integrals. | K3& K5 |
| CO3 | Compare the concept of residues with Poisson's formula and formulate the problems | K4 &K5 |
| CO4 | Examine and determine the Taylor series, Laurent series and elliptic functions. | K4 & K5 |
| CO5 | Analyze , apply and evaluate conformal mapping. | K4 , K3 &K5 |

**K1– Remember, K2– Understand, K3– Apply, K4–Analyze, K5– Evaluate**

**SYLLABUS**

| 21MAP08 | ADVANCED COMPLEX ANALYSIS WITH TABLEAU | Sem: II |
|---|---|---|
| **Unit No.** | **Topics** | **Hours** |
| **I** | **Introduction to the concept of analytic function**:<br>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–**Applications : Physics Quantum applications.** | **13** |
| **II** | **Complex Integration**:<br>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–**Applications: Derivative of Analytic function.** | **13** |
| **III** | **The Calculus of Residues:**<br>The Residue theorem –The Argument principle –Evaluation of definite integrals. Harmonic functions: The Definitions and basic Properties – Mean value property –Poisson's Formula–**Applications: Evaluate line integrals of analytic functions over closed curves.** | **13** |
| **IV** | **Series and Product Developments:**<br>Weierstrass Theorem–The Taylor Series The Laurent Series–Partial fractions and Factorization: Partial Fractions–Infinite Products – Canonical products –**Applications : Using to solve non analytic functions** | **13** |
| **V** | **The Riemann Mapping Theorem:**<br>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– **Applications: Surface comparison in Medical field** | **13** |

TABLEAU Problems related to ADVANCED COMPLEX ANALYSIS have been included in Practical–III (21MAP21) and **questions related to TABLEAU excluded in ADVANCED COMPLEX ANALYSIS (21MAP08) in the questions.**

**Questions related to Applications included in internal only and excluded in semester questions.**

***Note:*** *Distribution of marks: Problems 20 %, Theory 80 %*

**Teaching methods:** PowerPoint Projection through LCD, Assignment and Discussion and Activity.

## TEXT BOOK

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

## REFERENCE BOOKS


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

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


## WEB RESOURCES

**WebLink:** *http://people.math.gatech.edu/~mccuan/courses/6321/lars–ahlfors–complex–analysis–third–edition–mcgraw–hill–science_engineering_math–1979.pdf*

**Application Link:**

Unit I: 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

## MAPPING WITH PROGRAM OUTCOMES

| PO / CO | PO1 | P O2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| **CO1** | S | S | S | S | S | M | M |
| **CO2** | S | S | S | M | S | M | M |
| **CO3** | S | S | M | S | M | M | S |
| **CO4** | S | S | S | M | S | S | S |
| **CO5** | S | S | M | S | M | S | S |

S–Strong, M– Medium, L – Low

## ASSESSMENT PATTERN

Follows common pattern of Internal and External assessment, suggested in the Regulations.

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

| Course Code: | 21MAP09 | Course Title | | | | | | Batch: | 2021–2022 and Onwards |
|---|---|---|---|---|---|---|---|---|---|
| | | PARTIAL DIFFERENTIAL EQUATIONS WITH SCILAB | | | | | | Semester: | II |
| Hrs/Week: | 5 | L | 5 | T | – | P | – | Credits: | 4 |

**COURSE OBJECTIVE:**

1. To introduce different methods to solve partial differential equation.
2. To acquire knowledge in classification of partial differential equations and the methods to solve.
3. To study and apply Laplace equations.
4. To solve wave equations.
5. To enables the students to find the solution of Green's function.

**COURSE OUTCOMES (CO)**

| S.No | COURSE OUTCOME | BLOOMS LEVEL |
|---|---|---|
| CO1 | Understand various methods of Partial differential equations and determine different kinds of Partial differential equations. | K2 & K5 |
| CO2 | Analyze and formulate the type of partial differential equations. | K4 & K5 |
| CO3 | Evaluate Laplace equation and analyze its applications. | K4& K5 |
| CO4 | Apply and explain variable separable method to solve Laplace and Diffusion equation. | K3 & K5 |
| CO5 | Examine appropriate method to solve and construct the diffusion equations. | K4 & K5 |

**K1– Remember, K2– Understand, K3– Apply, K4–Analyze K5– Evaluate**

**SYLLABUS**

| 21MAP09 | PARTIAL DIFFERENTIAL EQUATIONS WITH SCILAB | Sem: II |
|---|---|---|
| **Unit No.** | **Topics** | **Hours** |
| **I** | **Partial Differential Equations of the First Order**<br>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 – Solutions satisfying Given Condition, Jacobi's method.<br>**Applications: Solving Heat, Wave and Thermal equations.** | **13** |
| **II** | **Partial Differential Equations of the Second Order**<br>The Origin of Second Order Equations – Linear partial Differential Equations with constant coefficients – Equations with variable coefficients – Separation of variables – The method of Integral Transforms – Non - linear equations of the second order–**Applications: Solving one dimensional equations– Vibrations of string**. | **13** |
| **III** | **Laplace's Equation**<br>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–**Applications: Solving Heat equations.** | **13** |
| **IV** | **The Wave Equation**<br>The Occurrence of the wave equation in Physics – Elementary Solutions of the One-dimensional Wave equations – Vibrating membrane, Application of the calculus of variations – Three dimensional problem – General solutions of the Wave equation.<br>**Applications: Solving Laplace equations** | **13** |
| **V** | **The Diffusion Equation**<br>Elementary Solutions of the Diffusion Equation – Separation of variables – The use of Integral Transforms – The use of Green's functions.<br>**Applications: Solving non–homogeneous boundary value problems**. | **13** |

SCILAB Problems related to PARTIAL DIFFERENTIAL EQUATIONS have been included in Practical–III (21MAP21) and **questions related to SCILAB excluded in PARTIAL DIFFERENTIAL EQUATIONS (21MAP09) in the questions.**

**Questions related to Applications included in internal only and excluded in semester questions.**

*Note: Distribution of marks: Problems 80 %, Theory 20 %*

**Teaching methods:** PowerPoint Projection through LCD, Assignment and Discussion and Activity.

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## TEXT BOOKS

1. ***Ian Sneddon***, "Elements of Partial Differential Equations", McGraw Hill International Book Company, New Delhi, 1983.
   Unit I : Chapter 2 (Sections 1–4, 7–9,12,13)
   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)

## REFERENCE BOOKS


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.


## WEB RESOURCES

**WebLink:** *https://accessfreevpn.com/*
*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=VBn1diQCykQ
Unit IV: https://www.youtube.com/watch?v=ik2_5QVVLLA
Unit V:https://www.youtube.com/watch?v=5OTw6sBAYB8

## MAPPING WITH PROGRAM OUTCOMES

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| **CO1** | S | S | M | S | M | M | M |
| **CO2** | S | S | M | S | S | S | S |
| **CO3** | S | S | S | M | M | S | M |
| **CO4** | M | M | M | S | S | S | S |
| **CO5** | S | S | S | M | M | S | M |

S–Strong, M– Medium, L – Low

## ASSESSMENT PATTERN

Follows common pattern of Internal and External assessment, suggested in the Regulations.

| Course Designed by | Verified by HOD | Approved by CDC Co–ordinator |
|---|---|---|
| Dr.M.Rajarajeswari<br>Name & Signature of the Staff | Dr.S.Anuradha<br>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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Coimbatore - 641 028

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

| Course Code: | 21MAP10 | Course Title | | | | | | Batch: | 2021–2022 and Onwards |
|---|---|---|---|---|---|---|---|---|---|
| | | MECHANICS | | | | | | Semester: | II |
| Hrs/Week: | 5 | L | 5 | T | – | P | – | Credits: | 4 |

**COURSE OBJECTIVE:**

1. To understand the concepts of generalized coordinates, virtual work,
2. To acquire the knowledge about Lagrange's equations.
3. To study the concept of Hamilton's Principle.
4. To gain the knowledge about Hamilton's equation and Hamilton – Jacobi theory.
5. To obtain knowledge about canonical transformations, Lagrange and Poisson brackets

**COURSE OUTCOMES (CO)**

| S.No | COURSE OUTCOME | BLOOMS LEVEL |
|---|---|---|
| CO1 | Understand and explain the basic concepts of the mechanical system, generalized Coordinates, work, energy and momentum | K2 & K5 |
| CO2 | Apply and determine the Lagrange's equations and integrals of motion with examples. | K3 & K5 |
| CO3 | Analyze the Hamilton's Principle and other variational principles in the problems and deduct in practical situations | K4 &K5 |
| CO4 | Determine the Hamilton Jacobi equation. | K5 |
| CO5 | Illustrate and evaluate canonical transformations, conditions of canonicity of a transformation in terms of Lagrange and Poisson brackets. | K2 &K5 |

**K1– Remember, K2– Understand, K3– Apply, K4–Analyze, K5– Evaluate**

| 21MAP10 | MECHANICS | Sem: II |
|---|---|---|
| **Unit No.** | **Topics** | **Hours** |
| **I** | **Introductory concepts:**<br>Mechanical system –Generalized Coordinates – Coplanar Motion – Constraints –Virtual Work –Energy and Momentum–**Applications: Calculating the force, work done of several objects.** | **13** |
| **II** | **Lagrange's equations:**<br>Introduction to Lagrange's equations– Derivations of Lagrange's Equations –Examples –Integrals of Motion–**Applications: Finding the equation of motion.** | **13** |
| **III** | **Hamilton's equations:**<br>Introduction to Hamilton's equations–Hamilton's methods– Action and Hamilton's Principle –Hamilton's Equations–**Applications: Calculating the oscillation of simple pendulum.** | **13** |
| **IV** | **Hamilton –Jacobi theory:**<br>Hamilton's Principle function –Hamilton –Jacobi Equation and waves of constant action –Separability–**Applications: Solving Kepler problems.** | **13** |
| **V** | **Canonical transformations:**<br>Differential forms and Generating Functions – Special transformation– Lagrange and Poisson Brackets–**Applications: Determining the canonical nature of transformation of Phase space variables.** | **13** |
| **Questions related to Applications included in internal only and excluded in semester questions.** | | |

*Note: Distribution of marks: Problems 20 %, Theory 80 %*

**Teaching methods:** Power Point Projection through LCD, Assignment and Discussion and Activity.

## TEXT BOOK

***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)

## 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.*

## WEB RESOURCES

**WebLink:** *https://www.scribd.com/doc/295198601/Greenwood–D–T–principles–of–Dynamics–Prentice–Hall–1987*

**Application Link:**
Unit I: 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

## MAPPING WITH PROGRAM OUTCOMES

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | S | S | S | S | M | M | S |
| CO2 | S | S | S | S | M | S | M |
| CO3 | S | S | S | S | M | M | S |
| CO4 | M | M | S | S | M | M | M |
| CO5 | M | M | M | S | M | M | M |

S–Strong, M– Medium, L – Low

## ASSESSMENT PATTERN

Follows common pattern of Internal and External assessment, suggested in the Regulations.

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

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

| Course Code: | 21MAP11 | Course Title | | | | | | Batch: | 2021–2022 and Onwards |
|---|---|---|---|---|---|---|---|---|---|
| | | OPTIMIZATION TECHNIQUES | | | | | | Semester: | II |
| Hrs/Week: | 5 | L | 5 | T | – | P | – | Credits: | 4 |

**COURSE OBJECTIVE:**

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

**COURSE OUTCOMES (CO)**

| S.No | COURSE OUTCOME | BLOOMS LEVEL |
|---|---|---|
| CO1 | Explain and evaluate various techniques to solve real life problems expressed in terms of LPP. | K2 &K5 |
| CO2 | Construct and determine LPP through Dynamic Programming | K3&K5 |
| CO3 | Apply and explain the fundamental concept of Inventory control. | K3&K5 |
| CO4 | Understand and evaluate the queuing theory and classification of queue models | K2 &K5 |
| CO5 | Apply and evaluate Simulation problems. | K3&K5 |
| | **KI– Remember, K2– Understand, K3– Apply, K4–Analyze, K5– Evaluate** | |

**SYLLABUS**

| 21MAP11 | OPTIMIZATION TECHNIQUES | Sem: II |
|---|---|---|
| **Unit No.** | **Topics** | **Hours** |
| **I** | **Integer Programming**<br>Introduction – Integer Programming Formulations – Gomory's construction–Fractional cut method (all integer)–The Cutting – Plane Algorithm – Branch–and–Bound Technique – Zero– One Implicit Enumeration Algorithm–**Applications: Formulating the real type word problems** | **13** |
| **II** | **Dynamic Programming**<br>Introduction – The Recursive Equation Approach-Characteristic of Dynamic Programming-Dynamic Programming Algorithm – Solution of Discrete D.P.P – Some Applications- Solution of Linear Programming Problem by Dynamic Programming-**Applications: Flight management problems in airline company** | **13** |
| **III** | **Inventory Models:**<br>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–Multi Item Deterministic problems–Inventory Problems with Uncertain Demand– **Applications: Production management and control of purchasing** | **13** |
| **IV** | **Queuing Theory**<br>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–**Applications: structuring computer networks** | **13** |
| **V** | **Simulation Modeling:**<br>Monte Carlo simulation – Types of simulation – Elements of discrete event simulation – Generation of random numbers. **Applications: Financial applications** | **13** |
| **Questions related to Applications included in internal only and excluded in semester questions.** | | |

*Note: Distribution of marks: Problems 80 %, Theory 20%*

**Teaching methods:** PowerPoint Projection through LCD, Assignment and Discussion and Activity.

## TEXT BOOK

*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 : 13.1-13.7
Unit III: Chapter 19 : Sections :19.1,19.4-19.13
Unit IV: Chapter 21 : Sections : 21.1 -21.9
Unit V: Chapter 22 : Sections : 22.1 -22.7

## REFERENCE BOOKS


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.


## WEB RESOURCES

**Web Link:**
*https://www.academia.edu/35271588/Operation_Research_An_Introduction_8th_Edition_H_A_Taha*

**Application Link**:
Unit I: https://www.youtube.com/watch?v=a2QgdDk4Xjw
Unit II: https://www.youtube.com/watch?v=gPlNoJ4YPt4
Unit III: https://www.youtube.com/watch?v=vMSARPybFxg
Unit IV: https://www.youtube.com/watch?v=lnU–Zw3NEEQ
Unit V: https://www.youtube.com/watch?v=rds2eYcFbZY

## MAPPING WITH PROGRAM OUTCOMES

| PO / CO | PO1 | P02 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | S | S | M | S | S | S | S |
| CO2 | S | S | S | S | M | S | M |
| CO3 | S | S | S | S | S | S | M |
| CO4 | S | S | S | M | M | S | S |
| CO5 | S | S | S | M | S | S | M |

S–Strong, M– Medium, L – Low

## ASSESSMENT PATTERN

Follows common pattern of Internal and External assessment, suggested in the Regulations.

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

| Course Code: | 21MAP12 | Course Title | | | | | | Batch: | 2021–2022 and Onwards |
|---|---|---|---|---|---|---|---|---|---|
| | | MATHEMATICAL SOFTWARES –II | | | | | | Semester: | II |
| Hrs/Week: | 5 | L | 5 | T | – | P | – | Credits: | 4 |

**COURSE OBJECTIVE:**

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

**COURSE OUTCOMES (CO)**

| S.No | COURSE OUTCOME | BLOOMS LEVEL |
|---|---|---|
| CO1 | Understand and explain the foundation for doing matrix manipulations, plotting of functions and data, implementation of algorithms, and creation of user interfaces. | K2 &K5 |
| CO2 | Apply and determine the numerical sum and product concepts in problems. | K3 & K5 |
| CO3 | Evaluate Two dimensional expressions. | K5 |
| CO4 | Identify and determine the matrices, Scalars and vectors and solve Linear system | K3 & K5 |
| CO5 | Construct and evaluate Numerical operations on functions and Numerical integration. | K3 &K5 |
| **K1– Remember, K2– Understand, K3– Apply, K4–Analyze, K5– Evaluate** | | |

**SYLLABUS**

| 21MAP12 | MATHEMATICAL SOFTWARES –II | Sem: II |
|---|---|---|
| **Unit No.** | **Topics** | **Hours** |
| **I** | **Introduction to Mathematica:**<br>Running Mathematica–Numerical calculations–Building up calculations–Using the Mathematica system–Algebraic calculations–Symbolic mathematics – **Applications: Converting symbolic mathematics in computer program.** | **13** |
| **II** | **Numerical Mathematics:**<br>Basic operations – Numerical sums, product and integrals –Numerical equation solving – Numerical differential equations – Numerical optimization – Manipulating numerical data – Statistics.<br>**Functions And Programs:**<br>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– **Applications: Solving Linear equations.** | **13** |
| **III** | **Graphics:**<br>Basic plotting – options– Redrawing and Combining plots–Manipulating options– Three dimensional surface–Plots–Converting between types of Graphics.<br>**Input And Output In Notebooks:**<br>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–**Applications: Converting geometrical objects by simple and symbolic construction.** | **13** |
| **IV** | **Linear Algebra :**<br>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–**Applications: Solving Functions, Vectors and Matrices** | **13** |
| **V** | **Numerical Operations On Data :**<br>Curve fitting – Approximate functions and Interpolation – Fourier Transforms.<br>**Numerical Operations On Functions :**<br>Numerical Integration – Numerical evaluation of sums and products – Numerical Solution of Polynomial equations – Numerical root finding –<br>Numerical solution of Differential equations –**Applications: Solving differentiation and Integral equations.** | **13** |
| **Questions related to Applications included in internal only and excluded in semester questions.** | | |

*Note: Distribution of marks: Problems 20 %, Theory 80 %*

**Teaching methods:** PowerPoint Projection through LCD, Assignment and Discussion and Activity.

## TEXT BOOKS

***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)

***2.Pragati Gautam, Swapnil Verma, "****Practical Mathematica",*

## REFERENCE BOOKS

1. ***Eugene Don***, "Mathematica " (Schaum's outline) " Mc.Graw Hill.
2. ***.PaulWellin****,"programming with Mathematica"Cambredge University press.*

## WEB RESOURCES

**WebLink:**

*https://www.wolfram.com/mathematica/online/?src=google&420&gclid=Cj0KCQjw2NyFBhDoARIsAMtHtZ4mW07Z5gQQtvHzNPuhBvGte1unPuHHlS9UYyrbTMv–NBcm44LqCDsaAikOEALw_wcB*

*http://deptche.ccu.edu.tw/Chemistry/Chem_Math/Mathematica_V5_Book.pdf*

**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

## MAPPING WITH PROGRAM OUTCOMES

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| **CO1** | S | S | S | S | S | S | S |
| **CO2** | S | M | S | M | M | S | M |
| **CO3** | S | S | S | S | S | S | M |
| **CO4** | S | S | S | S | S | M | S |
| **CO5** | S | S | S | S | S | S | S |

S–Strong, M– Medium, L – Low

## ASSESSMENT PATTERN

Follows common pattern of Internal and External assessment, suggested in the Regulations.

| Course Designed by | Verified by HOD | Approved by CDC Co–ordinator |
|---|---|---|
| Dr.M.Rajarajeswari<br>Name & Signature of the Staff | Dr.S.Anuradha<br>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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Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

| Course Code: | 21MAP13 | Course Title | | | | | | Batch: | 2021–2022 and Onwards |
|---|---|---|---|---|---|---|---|---|---|
| | | PRACTICAL–II MATHEMATICAL SOFTWARES LAB– II | | | | | | Semester: | II |
| Hrs/Week: | 4 | L | – | T | – | P | 5 | Credits: | 2 |

**COURSE OBJECTIVE:**

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

**COURSE OUTCOMES (CO)**

| S.No | COURSE OUTCOME | BLOOMS LEVEL |
|---|---|---|
| CO1 | Understand the foundations of MATHEMATICA and evaluate equations using MATHEMATICA. | K2 & K5 |
| CO2 | Examine and evaluate programs in MATHEMATICA. Evaluate, Analyze and plot results. | K4 & K5 |
| CO3 | Evaluate Numerical Calculations | K5 |
| CO4 | Identify and determine the Mathematical functions and Algebraic calculations. | K3 &K5 |
| CO5 | Construct and evaluate Two dimensional and three–dimensional plots. | K3&K5 |

**K1– Remember, K2– Understand, K3– Apply, K4–Analyze, K5– Evaluate**

**SYLLABUS**

1. Using MATHEMATICA to compute the area bounded by the curves f(x) = 1–x2 and g(x) = x2–3x2.
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 : $d^2 y/dx^2 + 0.3\, dy/dx + \sin y = 0$ with $0 \le x \le 30$ and using initial conditions $y'(0)=0, y(0)= -2, -1, 0, 1$ and 2.
4. Solve the differential equation $dy/dx = 1 + 1/2\, y^2$, $y(0)=1$, $0 \le x \le 1$ 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 Notebooks

*Note: IE 50 Marks and EE 50 Marks*

**Teaching Methods**: PowerPoint Projection through LCD, Assignment and Discussion and Activity.

## WEB RESOURCES

**Web link:**

1. 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

## MAPPING WITH PROGRAM OUTCOMES

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | S | S | S | S | S | S | S |
| CO2 | S | M | S | M | S | S | M |
| CO3 | M | S | S | S | M | S | S |
| CO4 | S | S | M | S | S | M | M |
| CO5 | S | S | S | M | S | S | M |

**S– Strong; M–Medium; L–Low.**

## ASSESSMENT PATTERN

Follows common pattern of Internal and External assessment, suggested in the Regulations.

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

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