Syllabus (Regulations 2022)

Master of Science in

MATHEMATICS

For students admitted from academic year 2022-23 onwards

Under Choice Based Credit System

BOARD OF STUDIES - NOVEMBER 2022

SRR & CVR GOVT. DEGREE COLLEGE (A)

(NAAC Accredited B+ Grade (III cycle with CGPA 2.60) Institution & District Identified College)

Vijayawada- 520 004, Andhra Pradesh , INDIA.

SRR & CVR Government Degree College (A)

An Autonomous & ISO 9001: 2015 Certified Institution:: Ranked by NIRF in 101-150 band at NIRF-2020 & 151-200 band in NIRF 2019
NAAC accredited Institution with grade B+ with C.G.P.A 2.6 during March, 2017

Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Mathematics

(Academic Year: 2022-23)

Report on 3rd Board of Studies Meeting for M.Sc. Mathematics Program

The **3rd** Board of Studies Meeting of M. Sc. Mathematics Program (**Code:1603**) was held on **04-11 – 2022** at **3.00** p.m. at Department of Mathematics, SRR & CVR Govt. Degree College (Autonomous), Vijayawada, through online mode for the academic year 2022– 2023.The composition of the BoS of M.Sc.Mathematics as per UGC Guidelines is as given below.

Name of the person	Designation in BoS	Remarks
Dr. G.Lalitha Reddy	Chairman	Nominated with the Proceedings from the Principal vide Rc.No.05/Acad/PGC/2022-2023.Dated 13-09-22.
Dr. K. Jayalakshmi	University Nominee	Nominated with the Proceedings of the Vice Chancellor, Krishna University, MTM, vide KRU/Affil/SRR & CVR GDC (A), VJA / BoS / 2021- 22. Dated 08-01-2021
Dr. B. Satyanarayana	Subject Expert	Nominated with the Proceedings from the Principal vide RC. No: .
Prof. K. Moses	Subject Expert	Nominated with the Proceedings from the Principal vide RC. No: .
Smt. K.V. Nagalakshmi	Member	As per UGC guidelines
Sri. M. Lakshmanadasu	Member	As per UGC guidelines
Dr. K. Rajinikanth	Member	As per UGC guidelines
Dr. Shaik Sajana	Member	As per UGC guidelines
Smt. Shaik Parveen	Member	As per UGC guidelines
Ms. MVL. Sirisha	Member	As per UGC guidelines
Dr. K .V. Rama Rao	Alumni	Nominated with the Proceedings from the Principal vide RC. No:

Counter signed by:

Principal

The Autonomous status of M.Sc. Mathematics has been approved by Krishna University, Machilipatnam. The proceedings are mentioned below.

1. Krishna University, Machilipatnam - Affiliation No. KRU/SRR & CVR Govt. Degree College (A), VJA / Affiliation order 2020-21, dated. 08/01/2021.
2. Nomination of Chairman for BOS for P.G. Courses for the Academic Year 2022-23.Rc.No.05/Acad/PGC/2022-2023.Dated 13-09-22.
3. Nomination of University representatives to BOS for a period of 3 years Order No: KRU / Affil / SRR & CVR Govt. Degree College (A), VJA / BOS / 2020- 21 dated 08-01-2021.

AGENDA

To consider and approve the program structure of M.Sc. Mathematics (Course Code: 1603) for the admitted batch 2022– 2023.

1. To consider and approve the course syllabus for the papers introduced in **I , II, III & IV – Semesters** of M.Sc. Mathematics under CBCS with **L**earning **O**utcomes based **C**urriculum **F**ramework (**LOCF**) for the academic year 2022 onwards.
2. To consider and approve Student Evaluation Policy & Procedure and split up of **CIA** & **SEE.**
3. Preparing model question papers for **I, II, III & IV – Semesters.**
4. Identifying the question paper setters and examiners.
5. To approve other academic activities of the department.
6. To consider and approve Executive Development Programs offered by the department.
7. To consider and approve the student-centered Pedagogy Policy to enrich the curriculum.
8. To give permission to the Chairman for any small changes.

The Chairperson & faculty of the department welcomed the members and had discussion on the Agenda. He apprised members of Krishna University and Acharya Nagarjuna University regarding framing of Curriculum, Syllabus and proposed evaluation ratio for Internal and External Examinations. The following members were present.

Members attended the BoS Meeting

Name & Designation	Designation in BoS	Signature
Dr. Lalitha Reddy Lecturer in Mathematics	Chairman	
Dr. K. Jaya Lakshmi Associate Professor, Head, Dept. of Mathematics Krishna University, Machilipatnam.	University Nominee	
Dr. B. Satyanarayana Associate Professor, Chairman PG BoS & Head Department of Mathematics, Acharya Nagarjuna University	Subject Expert	
Prof. K. Moses Associate Principal, Department of Mathematics, Andhra Christian College, Guntur.	Subject Expert	
Smt. K.V. Nagalakshmi, In-Charge, Department of Mathematics	Member	
Sri. M. Lakshmanadasu Lecturer in Mathematics	Member	
Dr. K. Rajinikanth Lecturer in Mathematics	Member	
Dr. Shaik Sajana Lecturer in Mathematics	Member	
Smt. Shaik Parveen Lecturer in Mathematics	Member	
Ms. M.V.L. Sirisha Lecturer in Mathematics	Member	
Dr. K.V.Rama Rao	Alumni	

Resolutions:

In BOS meeting, the committee has unanimously resolved and approved the following items.

1. To implement the program structure of M. Sc. Mathematics (Program Code: 1603) with effect from the academic year 2022 - 2023.

2. To implement M. Sc. Mathematics Syllabus (Program Code : 1603) for the courses of **Semesters - I, II for 2022-2024 batch & Semesters - III & IV for 2021-2023 batch** under **CBCS** with **L**earning **O**utcomes based **C**urriculum **F**ramework **(LOCF)**.

3. To approve the Student Evaluation Policy and Procedure and split-up (40:60) of **CIA** & **SEE.**

4. To implement **Internal - 40 Marks** and **External - 60 Marks** out of **100 Marks** for each Theory Paper and for each Practical Paper. To pass the examination, candidate has to obtain **40 % in Internal Exam**, and **40 % in External Exam** in each paper and overall **aggregate 50% marks**.

5. To adopt the Students Centered Pedagogy Policy to enrich the curriculum.

6. To approve the list of Question paper setters and Examiners.

7. To approve the Departmental Activities Calendar.

8. To implement the pattern of model question paper enclosed here with.

9. To follow the recommended syllabus and evaluation procedure for the next **Two years.**

10. Committee approved the panel of External Examiners in Theory and Practicals for the **I, II, III & IV** - Semesters (list enclosed).

11. The Chairman has empowered to do any small changes.

12. The Controller of Examinations is empowered to do any changes in selecting paper setter, in case of non- availability of examiners in the approved list.

1)

2)

3)

The committee recommended the following subject papers with titles for theory and practicals in M.Sc. Mathematics with effect from 2022-2023 admitted batches.

Semester – I

S. No.	Paper No.	Title of the paper
1.	Paper-I	Ordinary Differential equations
2.	Paper-II	Real Analysis-I
3.	Paper-III	Probability and Statistics
4.	Paper-IV	Linear Algebra
5.	Paper-V	C-programming
6.	Paper-VI	Personality Development through Life Enlightenment Skills
7.	Paper-VII	C-programming Lab

Semester – II

S. No.	Paper No.	Title of the paper
1.	Paper-I	Complex Analysis
2.	Paper-II	Partial Differential Equations
3.	Paper-III	Numerical Analysis
4.	Paper-IV	Algebra
5.	Paper – V	Research Methodology & IPR
6.	Paper-VI	Domain Specific Elective (**Discrete Mathematical Structures**)
7.	Paper-VII	Numerical Methods LAB

Domain Specific Electives

22MATDSE201	**Discrete Mathematical Structures**
22MATDSE202	Galios Theory
22MATDSE203	Algebraic Coding Theory

At the end of II semester, every student must undergo summer Internship/Apprenticeship Project work/Industrial training/Research based Project work for Six weeks and must prepare a report concerned as per approved project guidelines, and submit the same to the University 14 days before the commencement of third semester end examinations.

1)
2)
3)

Semester – III

S. No.	Paper No.	Title of the paper
1.	Paper-I	Topology
2.	Paper-II	Probability and Statistics
3.	Paper-III	Galois Theory
4.	Paper-IV	Mathematical Methods
5.	Paper-V	Analytical Number Theory
6.	Paper –VI	Open Elective-II
7.	Paper –VII	User Friendly Software Development / MATLAB/ Python Lab

Semester – IV

S. No.	Paper No.	Title of the paper
1.	Paper – I	MOOCS
2.	Paper – II	Elective – I(**Integral Transforms**)
3.	Paper – III	Elective – II (:**Linear Programming**)
4.	Paper – IV	Functional Analysis
5.	Paper – V	Measure and Integration
6.	Paper – VI	Seminar

Elective – I	**Elective – II**
20 ET MAT 402A: Mathematical Modeling	20 ET MAT 403 A: Algebraic Coding Theory
20 ET MAT 402 B: **Integral Transforms**	20 ET MAT 403 B:**Linear Programming**
20 ET MAT 402C: Lebesgue Theory	20 ET MAT 403 C: Discrete Mathematical Structures
20 ET MAT 402E: Any other relevant subject approved by BOS	20 ET MAT 403E: Any other relevant subject approved by BOS

1)

2)

3)

SEMINAR

The student will be given seminar topics at the beginning of the IV semester by faculty In-charge and the student has to present the topics, submit the hard copy of seminar topic report at the end of the IV semester. Out of a total of **100** marks, for the Seminar Evaluation, **50** marks shall be for Seminar report/record and **50** marks for the End Semester Examination (Viva - Voce). The Viva - Voce shall be conducted by a committee consisting of HOD, faculty in charge and a senior faculty member/external examiner nominated by the university.

Open Elective - II for Sem III:

Open Elective - II is offered by other departments. The student (Min. 50% Students) may opt from the list of Open Electives approved by the University.

Open Elective - II offered by the Department:

Course Code	Name of the course
20 OE MAT306	**NUMERICAL METHODS**

1. University Nominee **2. Subject Expert** **3. Subject Expert**

Program Structure of M. Sc. Mathematics: 1603

1	**Title of the course**	M. Sc. (Mathematics)
2	**Duration of the course**	2 years (Four Semesters)
3	**Eligibility criteria for admission**	Any candidate who passed B.Sc. or B.A. with Mathematics as one of the Three equal subjects or as main or ancillary subject.
4	**Level of the course**	Post – Graduation
5	**Mode of admission**	The mode of admission is through **AP PG CET** conducted by Krishna University.
6	**Objectives of the course**	The Objective of M.Sc. Mathematics course is to impart knowledge and skill - oriented training in the recent advancements in Mathematics with an aim to develop research and innovations.
7	**Course requirement**	The course shall include Theory papers, Labs, Assignments, Tests, Seminars and Project Work.
8	**Number of working days**	In each semester at least ninety working days must be dedicated for theory classes, practical classes and seminars.

PROGRAM STRUCTURE:: SEMESTER – I

Course code	Name of the Subject	Hours		Credits	
		Lecture	Practical	Theory	Practical
22 MAT 101	Ordinary Differential Equations	4	-	4	-
22 MAT 102	Real Analysis-I	4	-	4	-
22 MAT 103	Probability and Statistics	4	-	4	-
22 MAT 104	Linear Algebra	4	-	4	-
22 MAT 105	C-programming	4	-	4	-
22 MAT 106	Personality Development through Life Enlightenment Skills	3	1	-	3
22 MATLAB 101	C-programming Lab	—	6	-	3
	Sub Total	23	7	20	6
	Total	30 Hours per week		26 Credits per semester	

PROGRAM STRUCTURE :: SEMESTER - II

Course code	Name of the Subject	Hours		Credits	
		Lecture	Practical	Theory	Practical
22 MAT 201	Complex Analysis	4	-	4	-
22 MAT 202	Partial Differential Equations	4	-	4	-
22 MAT 203	Numerical Analysis	4	-	4	-
22 MAT 204	Algebra	4	-	4	-
22 MAT 205	Research Methodology & IPR	3	1	3	-
22 MAT DSE 201	Domain Specific Elective Course (Discrete Mathematical Structures)	4	-	4	-
22 MATLAB 201	Numerical Methods LAB	-	6	-	3
	Sub Total	23	7	23	3
	Total	30 Hours per week		26 Credits per semester	

PROGRAM STRUCTURE:: SEMESTER – III

Course code	Name of the Subject	Hours		Credits	
		Lecture	Practical	Theory	Practical
20 MAT 301	Topology	4	-	4	-
20 MAT 302	Probability and Statistics	4	-	4	-
20 MAT 303	Galois Theory	4	-	4	-
20 MAT 304	Mathematical Methods	4	-	4	-
20 MAT 305	Analytical Number Theory	4	-	4	-
20 OE MAT 306	Open Elective – II	4	-	4	-
20 L MAT 307	Python Interpreter Practice Lab	-	3	-	-
	Sub Total	24	03	24	--
	Total	27 Hours per week		24 Credits per semester	

PROGRAM STRUCTURE :: SEMESTER - IV

Course code	Name of the Subject	Hours		Credits	
		Lecture	Practical	Theory	Practical
20 MO MAT 401	MOOCS	4	-	4	-
20 ET MAT 402	Elective – I(Integral Transforms)	4	-	4	-
20 ET MAT 403	Elective – II(Linear Programing)	4	-	4	-
20 MAT 404	Functional Analysis	4	-	4	-
20 MAT 405	Measure and Integration	4	-	4	-
20 SM MAT 406	Seminar	6	-	3	-
	Sub Total	26	-	23	-
	Total	26 Hours per week		23 Credits per semester	

Domain Specific Electives, Open Electives ,Electives & MOOCS offered by the Department

Course Code	Name of the course	Semester	Hours	Credits
22MAT DSE 201	Domain Specific Elective	II	4	4
20 OE MAT 306	Open Elective –II	III	4	4
20 MO MAT 401	MOOCS	IV	4	4
20 ET MAT 402 B	Elective – I	IV	4	4
20 ET MAT 403 B	Elective – II	IV	4	4
20 SM MAT 406	SEMINAR	IV	6	3

Theory Internal Assessment:

(i) Internal Exams (Two)	-	10 Marks
(ii) Assignments (Two)	-	10 Marks
(iii) Project	-	10 Marks
(iv) Attendance	-	05 Marks
(v) Seminar	-	05 Marks
Total	=	**40 Marks**

Theory External Assessment:

Syllabus divided into **5** Units, equal weightage to all Units. Theory Paper consists of Two Sections namely Section – **A** & Section – **B.**

Section – A: Candidate has to answer **Any 5 Questions out of 10 Questions.**
5Q x 2Marks = 10 Marks

Section – B: Candidate has to answer **All 5 Questions out of 5 Questions**, each Question having Internal Choice.
5Q x 10Marks = 50 Marks

Practical :

Continuous assessment / Day to day work	Semester end exam	Total
40 marks	**60 Marks**	**100 Marks**

Internal Practical Assessment:

(i)	Internal Exams (Two)	-	20 Marks
(ii)	Assignments (Two)	-	10 Marks
(iii)	Seminar	-	05 Marks
(iv)	Attendance	-	05 Marks
	Total	=	**40 Marks**

External Practical Assessment:

(i) Record : **10** Marks

(ii) Student has to answer **4** Questions out of **8** Questions, (Two Questions will be given from each theory paper). Question Paper will be set from the **16** Practical problems done by the student in the Record.

4Q x 10 M = **40** Marks

(iii) Viva-Voce Examination: **10** Marks

Total Marks = **60** Marks.

S. No.	SEMESTER – I	MARKS
1.	**Six Theory Papers (**6 x 100M)	**600**
2.	**C – Programing Lab**	**100**
	Total	**700**

S. No.	SEMESTER – II	MARKS
1.	**Six Theory Papers (**6 x 100M)	**600**
2.	**Numerical Methods Lab**	**100**
	Total	**700**

S. No.	SEMESTER – III	MARKS
1.	**Five Theory Papers (**5 x 100M)	**500**
2.	**MAT LAB/PYTHON LAB**	**100**
	Total	**600**

S. No.	SEMESTER – IV	MARKS
1.	**Five Theory Papers (**5 x 100M)	**500**
2.	**SEMINAR**	**100**
	Total	**600**

Summary of Program Structure:

Semester – I

S. No	Paper No.	Title of the paper	Paper Code	Internal Marks	External Marks	Total Marks
1.	Paper-I	**Ordinary Differential Equations**	**22 MAT 101**	40	60	100
2.	Paper-II	**Real Analysis-I**	**22 MAT 102**	40	60	100
3.	Paper-III	**Probability and Statistics**	**22 MAT 103**	40	60	100
4.	Paper-IV	**Linear Algebra**	**22 MAT 104**	40	60	100
5.	Paper-V	**C-programming**	**22 MAT 105**	40	60	100
6.	Paper-VI	**Personality Development through Life Enlightenment Skills**	**22 MAT 106**	40	60	100
7.	Paper-VII	**C-programming Lab**	**22 MATLAB 101**	40	60	100

Semester – II

S. No	Paper No.	Title of the paper	Paper Code	Internal Marks	External Marks	Total Marks
1.	Paper-I	**Complex Analysis**	**22 MAT 201**	40	60	100
2.	Paper-II	**Partial Differential Equations**	**22 MAT 202**	40	60	100
3.	Paper-III	**Numerical Analysis**	**22 MAT 203**	40	60	100
4.	Paper-IV	**Algebra**	**22 MAT 204**	40	60	100
5.	Paper-V	**Research Methodology & IPR**	**22 MAT 205**	40	60	100
6	Paper- VI	**Domain Specific Elective Course**	**22 MAT DSE 201**	40	60	100
7.	Paper-VII	**Numerical Methods LAB**	**22 MATLAB 201**	40	60	100

Semester – III

S. No	Paper No.	Title of the paper	Paper Code	Internal Marks	External Marks	Total Marks
1.	Paper-I	Topology	20 MAT 301	40	60	100
2.	Paper-II	Probability and Statistics	20 MAT 302	40	60	100
3.	Paper-III	Galois Theory	20 MAT 303	40	60	100
4.	Paper-IV	Mathematical Methods	20 MAT 304	40	60	100
5.	Paper-V	Analytical Number Theory	20 MAT 305	40	60	100
6.	Paper - VI	Open Elective-II	20 OE MAT 306	40	60	100
7.	Paper -VII	User Friendly Software Development / MATLAB/ Python Lab	20 L MAT 307	40	60	100

Semester – IV

S. No	Paper No.	Title of the paper	Paper Code	Internal Marks	External Marks	Total Marks
1.	Paper – I	MOOCS	20 MO MAT 401	40	60	100
2.	Paper - II	Elective – I	20 ET MAT 402 B	40	60	100
3.	Paper - III	Elective – II	20 ET MAT 403 B	40	60	100
4.	Paper – IV	Functional Analysis	20 MAT 404	40	60	100
5.	Paper - V	Measure and Integration	20 MAT 405	40	60	100
6.	Paper - VI	Seminar	20 SM MAT 407	50	50	100

Total Number of Hours, Credits and Marks at the end of the Program:

S. No.	Semester	HOURS	CREDITS	MARKS
1.	**I (2022-2024)**	**30**	**26**	**700**
2.	**I I (2022-2024)**	**30**	**26**	**700**
3.	**I I I (2021-2023)**	**27**	**24**	**600**
4.	**IV (2021-2023**	**26**	**23**	**600**
TOTAL		**113**	**99**	**2600**

SRR & CVR Govt. Degree College (A), Vijayawada
Department of Mathematics

M.Sc. Mathematics

Program Outcomes:

On successful completion of M.Sc. Mathematics Program, students will be able:

PO–1. To interpret the concepts of Analyticity, Cauchy-Riemann relations by solving problems and also discuss about zeros of a complex function and represent complex function in Mobius transformation and power series.

PO-2. To know the usage of theory of Partial Differential Equations, used in formulating many fundamental laws of Physics and Chemistry.

PO-3. To demonstrate knowledge and understanding of numerical methods to solve Systems of linear equations, to compute quadrature and to solve Ordinary and Partial Differential Equations.

PO-4. To solve Mathematical Problems that arise in Science and Engineering, by using Numerical Methods and learn how to apply Numerical Methods for various Mathematical Operations such as Interpolation, Differentiation, and Integration, Solutions of Differential equations, analyzing and evaluating the accuracy of common Numerical Methods.

PO-5. To learn to implement the Algorithms and draw flow charts for solving Mathematical Problems. Also to obtain the complete knowledge of Development User Friendly Software / MATLAB/ Python Lab.

PO-6. To learn the fundamental concept of Algebra and their role in Mathematics and Applied Sciences.

PO-7. Evaluate Complex Integrals and expanding Complex function in PowerSeries.

PO-8. Know the advantages of Residues and the application of Linear Transformation.

Program Specific Outcomes:

On successful completion of M.Sc. Mathematics Program, students will be able:

PSO – 1. To provide systematic understanding of the concepts and theories of Mathematics and their application in the real world - to an advanced level, and enhance career prospects in a huge array of fields.

PSO – 2. Apply knowledge of Mathematics, in all the fields of learning including higher research and its extensions.

PSO –3. Solve complex problems by critical understanding, analysis and synthesis.

PSO –4. Communicate effectively by oral, written, computing and graphical means.

PSO –5. Critically interpret data, write reports and apply the basis of rules of evidence.

PSO –6. Develop proficiency in the analysis of complex Physical problems and the use of Mathematical or other appropriate techniques to solve them.

PSO –7. Demonstrate engagement with reports and apply the basics of rules of evidence.

PSO –8. Innovate, invent and solve complex Mathematical problems using the knowledge of pure and applied Mathematics.

PSO –9. Explain the knowledge of contemporary issues in the field of Mathematics and applied sciences.

PSO–10. Crack Lectureship and fellowship exams approved by UGC like CSIR – NET and SET.

BOS APPROVED THE FLLOWING LIST OF PAPER SETTERS/EXAMINERS

S. No.	Name	Designation	College/ University
1.	Prof. Shobha Latha	Professor	Sri Krishna Devaraya University, Ananthapur.
2.	Prof. Anuradha Kameswari	Professor	Andhra University, Visakhapatnam.
3.	Prof. K. K. M. Sharma	Professor	Andhra University, Visakhapatnam.
4.	Prof. G. V. R. Babu	Professor	Andhra University, Visakhapatnam.
5.	Dr. Venkata Lakshmi	Associate Professor	Sri Padmavathi Mahila University, Tirupathi.
6.	Dr. J. L. Rama Prasad	Associate Professor	P.B. Siddhartha College of Arts & Science, Vijayawada
7.	Dr. L. Madhavi,	Associate Professor	Yogi Vemana University, Kadapa.
8.	Dr. Nanaji Rao	Associate Professor	Andhra University, Visakhapatnam.
9.	Dr. C. Jayasubba Reddy	Associate Professor	S.V. University, Tirupathi.
10.	Prof. Siva Parvathi	Associate Professor	Sri Padmavathi Mahila University, Tirupathi.
11.	Dr. Ch. Srinivasulu	Lecturer in Mathematics	GDC, Rajamundry.
12.	Dr. U. Bindu Madhavi	Assistant Professor	Dr. MRAR College of PG Studies, Nuzvid.
13	Dr. Bharathi	Professor	S V University, Tirupathi.

S.R.R & C.V.R GOVT DEGREE COLLEGE (A), VJA

M.Sc. MATHEMATICS SYLLABUS

SEMESTER-I PAPER-I

ORDINARY DIFFERENTIAL EQUATIONS-22 MAT 101

No. of Hours: 04 Total credits: 04
Total Marks: 100 (Internal: 40 M & External: 60 M)

Course Learning Objectives:

The goal of this course is to provide the students with an understanding of the solutions of first order and second order linear ordinary differential equations and applications of ordinary differential equations.

UNIT-I:

Linear Differential Equation of higher order: Higher order equations - A modeling Problem-Linear independence-Equations with Constant Coefficients-Equations with variable coefficients - Wronskian -Variation of parameters.
[Topics from Chapter 2 of Text book]

UNIT-II:

Solutions of Differential Equations in Power series: Preliminaries – Second order Linear Equations with Ordinary points – Legendre equations with Legendre Polynomials
[Topics from Chapter 3 of Text book(2)]

UNIT-III:

Second Order equations with regular singular points – Bessel functions-Recurrence relations-Generating function-Orthogonality property.
[Topics from Chapter 3 of Text Book (2)]

UNIT-IV:

Systems of Linear Differential Equations: Preliminaries - Systems of first order equations - Model of arms competitions between two nations - Existence and uniqueness theorem - Fundamental Matrix - Non homogeneous linear systems - Linear systems with constant coefficients. [Topics from Chapter 4 of Text Book (2)]

UNIT-V:

Existence and Uniqueness of solutions: Preliminaries – Successive approximations – Picard's theorem
[Chapter 5.1 to 5.4 of Text Book (2)]

Course Learning Outcome(s):

From this course students will be able to learn the study of differential focuses on the existence and uniqueness of solutions and the theory of differential equations is widely used in formulating many fundamental laws of physics and chemistry.

Text Book:

1. An introduction to Ordinary Differential Equations by E.A. Codington
2. S.G. Deo, V. Lakshmi kantham and V. Raghavendra: Text Book of Ordinary Differential Equations, second edition, Tata McGraw – Hill Publishing company Limited, New Delhi, 1997.

Reference Books:

1. Differential Equations with applications and Historical notes by George F. Simmons.
2. Theory of Ordinary Differential Equations by Samsundaram – Narosa Publications.

S.R.R & C.V.R GOVT DEGREE COLLEGE (A), VJA

M.Sc. MATHEMATICS

SEMESTER – I PAPER - I

[Question paper pattern for semester end (External) examination]

ORDINARY DIFFERENTIAL EQUATIONS - 22 MAT 101

Time: 3 Hours Max Marks: 60M

`

I. Answer any 5 questions out of 10 short answer questions **5X4=20M**

1 a). Define linear dependence and independence.

b).Define the I.V.P. $x''+x=0$, $x(0)=1$, $x'(0)=0$, $x''(0)=1$.

c). Define Analytic function.

d). Show that $P_n(1)=1$ and $P_n(-1)=(-1)^n$.

e).Find the singular points of the following equations and determine regular singular points $x^2y''+(x+x^2)y'-y=0$

f).Define Bessel's equation.

g).Define Fundamental matrix of the system of Linear Differential Equations.

.h). Solve the IVP $x'=x$, $x(0)=1$ by the method of successive approximations.

Answer any Five questions choosing **One** question from **each unit.**

All questions carry equal marks **5 X 8= 40M**

UNIT-I

2.a) Let a_1, a_2 be constants and consider the equation $L(y) = y''-a_1y+a_2y = 0$. If r_1, r_2 are distinct roots of the characteristic polynomial 'P' where $P(r) = r^2+a_1r+a_2=0$ then the function $\Phi_1(x) = e^{r_1x}$, $\Phi_2(x) = e^{r_2x}$ are solutions of $L(y)=0$. If r_1 is a repeated root of P then the functions $\Phi_1(x)$, $\Phi_2(x)$ defined by $\Phi_1(x) = e^{r_1x}$, $\Phi_2(x) = xe^{r_2x}$ are solutions of $L(y)=0$.

(OR)

b) Consider the equation $y''' - 4y' = 0$. Compute three Linearly Independent solutions and Wronskian of the solutions, find Φ satisfying $\Phi(0) = 0$, $\Phi'(0) = 1$, $\Phi''(0) = 0$.

UNIT-II

3.a) Compute the solution of non-homogeneous equation $y''' + y'' + y' + y = 1$,
Satisfying $\psi(0) = 0$, $\psi'(0) = 1$, $\psi''(0) = 0$.

(OR)

b) Show that the Legendre polynomials are given by $P_n(t) = 12n\ n!dndtn(n^2 - 1)^n$.

UNIT-III

4.a) Find a solution Φ for the following equation $L(y) = x^2 y'' + 32\, xy' - x\, y = 0$

(OR)

b) Show that $\frac{d}{dt}[t^p J_p(t)] = t^p J_{p-1}(t)$ and $\frac{d}{dt}[t^{-p} J_p(t)] = -t^{-p} J_{p+1}(t)$

UNIT-IV

5. a) Find the fundamental matrix for $x' = Ax$ where $A = \begin{matrix} 3 & -2 \\ -2 & 3 \end{matrix}$

(OR)

b) Determine exponential eAt for the system $x' = Ax$ where $A = \begin{matrix} 1 & 1 & 1 \\ 0 & -2 & 3 \\ 0 & 1 & 0 \end{matrix}$

UNIT-V

6. a) State and prove Picard's theorem.

(OR)

b) State and Prove Gronwall inequality theorem.

SRR & CVR GOVT.DEGREE COLLEGE (A), NAAC B^{+}

Department of Mathematics

M.Sc. MATHEMATICS SYLLABUS

SEMESTER-I PAPER-II

REAL ANALYSIS-I 22 MAT 102

No. of Hours: 04 Total credits: 04
Total Marks: 100 (Internal: 40 M & External: 60 M)

Course Learning Objectives:
This Course is intended to expose the ideas of Real Analysis by Learning Continuity, Differentiation, Riemann Integral, Improper Integral of functions.

UNIT-I
Continuity & Differentiation: Limits of functions, continuous functions, Continuity and Compactness, Continuity and Connectedness, Discontinuities, Derivative of a Real Function, Mean value theorems, The Continuity of Derivatives, L' Hospital's rule, Derivatives of higher Order, Taylor's theorem.
[4.1 to 4.34 of chapter4 & 5.1 to 5.19 of chapter5 of Text Book1]

UNIT-II
The Riemann - Stieltjes Integral: Definition and Existence of Integral-Properties of the integral -Integration and Differentiation –Integration of vector-valued function - Rectifiable Curves.[Chapter-6 of Text Book-1]

UNIT-III
Sequences and series of functions: Discussion of main problem - Uniform convergence – Uniform convergence and continuity – Uniform Convergence and Integration – Uniform Convergence and Differentiation – Equicontinuous Families of functions – The Stone - Weierstrass Theorem. [7.1 to 7.26 of Text Book 1]

UNIT-IV
Improper Integrals: Introduction – Integration of unbounded Functions with Finite limits of Integrations – Comparison Tests for Convergence at "**a**" of Infinite Range of $\int_a^b f \, dx$ Integration – Integrand as a Product of Functions.
[Chapter-11 of Text Book-2]

UNIT-V

Functions of several variables: Explicit and Implicit Functions - Continuity - Partial Derivatives – Differentiability – Partial Derivatives of Higher Order - Functions of Functions – Change of variables – Taylor's Theorem – Extreme Values - Maxima and Minima – Functions of Several Variables. [Chapter-15 of Text Book-2]

course Learning Outcome(s):

This Course able to helps the student how to apply the concepts of Real Analysis and understand the Improper Integrals concept and to construct the Mathematical proofs of basic Results in Real Analysis.

Prescribed Text books:

1. **Principles of Mathematical Analysis**, Walter Rudin, Student Edition 1976 Mc Graw - Hill International.
2. **Mathematical Analysis** by S.C. Malik and Savita Aurora, Fourth edition, New Age International Publishers.

Reference Book:

1. **Mathematical Analysis** by Tom. M. Apostol, second Edition, Addison Wesley Publishing Company.

S.R.R & C.V.R GOVT DEGREE COLLEGE (A), VJA

M.Sc. MATHEMATICS

SEMESTER – I PAPER - II

[Question paper pattern for semester end (External) examination]

REAL ANALYSIS-I 22 MAT 102

Time: 3 Hours Max. Marks: 60 M

I. Answer any 5 questions out of 10 short answer questions 5X4 =20M

1. Define $f(x) = \text{Sin}\left(\frac{1}{x}\right)$, $x \neq 0$

$= \quad 0 \quad , \; x = 0$

Discuss the continuity of this function on **R**.

2.Let **f** be a differentiable function on **(a, b)** Then prove that '**f** ' is continuous on **(a, b).**

3.If '**f** is continuous on **[a, b]** then show that **f** ∈ **R(*α*)** on **[a, b].**

4.State Fundamental theorem of Calculus.

5.Define Uniform convergence.

6.Discuss the uniform convergence of the series $\sum_{n=1}^{\infty} \frac{1}{1+n^2 x}$.

7.Define Beta function.

8. Examine the convergence of $\int_0^1 \frac{dx}{\sqrt{1-x}}$.

9. Define Explicit and Implicit functions.

10. Define Maxima and Minima value of extreme values.

II. Answer any 5 questions out of the 10 internal choice essay questions 5X8=40M

UNIT-I

11. If **f** is a continuous mapping of a compact metric space **X** into a metric space **Y**, then show that **f** is uniformly continuous on **X.**

(OR)

12. State and Prove Taylor's theorem.

UNIT-II

13. If f is monotonic on **[a, b]** and if **α** is continuous on **[a, b]** then show that **f** ∈ **R(*α*)** (Assume that **α** is monotonic).

(OR)

14. If $\boldsymbol{\gamma^1}$ is continuous on **[a, b]** then show that $\boldsymbol{'\gamma'}$ is rectifiable and $\wedge(\gamma) = \int_a^b \left|\gamma^1(t)\right| dt$

UNIT-III

15. If **{f_n }** is sequence of continuous functions on **E** and if **f_n -> f** uniformly on **E**, then show that **f** is continuous on **E**

(OR)

16. State and prove Stone – Weierstrass theorem.

UNIT – IV

17. State and prove Abel's test.

(OR)

18. Show that $\int_0^\infty \frac{sinx}{x}\ dx$ is convergent but not absolutely.

UNIT – V

19. State and prove Taylor's theorem.

(OR)

20. Show that **$f(x,y,z)= (x + y + z)^3 - 3(x + y + z) - 24xyz+a^3$** has a Minima at (1,1,1) and Has a Maxima at (-1, -1, -1)

SRR & CVR GOVT. DEGREE COLLEGE(A), NAAC B^{+}

Department of Mathematics

M.Sc. MATHEMATICS SYLLABUS

SEMESTER-I PAPER-III

PROBABILITY& STATISTICS - 22 MAT 103

No. of Hours: 04 Total credits : 04
Total Marks: 100 (Internal: 40M &External:60M)

Course Learning Objectives:
The objective of this course is to introduce the basic concepts of statistics like probability theory, distributions, correlation and regression techniques and sampling distributions.

UNIT-I:
Sample Space & Events - Axioms of probability - Some theorems on probability - Boole's Inequality- probability - Multiplication theorem on probability - Independent events - Multiplication theorem on probability for independent Events - Extension of Multiplication theorem on Probability to n Events - Baye's theorem.
[3.2 to 3.95 of Chapter3 & 4.2 of Chapter4]

UNIT-II:
Distribution functions: Discrete random variable - Continuous random variable - Two-Dimensional Random variables - Mathematical expectation - Moments of a distribution function - Moment generating functions - Characteristic functions and their properties – Chebychev inequality - Probability generating functions.
[5.2 to 5.5(up to 5.5.5.) of Chapter - 5, Chapter 6 except 6.7 and 7.1, 7.2, 7.3, 7.5 and 7.9 of Chapter 7]

UNIT-III:
Distributions: Discrete Distributions Binomial - Poisson distributions and their properties - Continuous distributions - Normal and Rectangular distributions and their properties.
[8.1 to 8.5 of Chapter 8 and 9.1 to 9.3 of Chapter 9]

UNIT-IV:
Correlation and Regression: Correlation - Karl Pearson's coefficient of correlation - Calculation of correlation coefficient for bivariant frequency distribution – Spearman's rank correlation coefficient - Linear regression - Regression coefficients and their properties - Angle between regression lines.
[10.1 to 10.5 and 10.7.1 of Chapter 10 and Chapter 11 (up to 11.2.3)]

UNIT-V:

Sampling distribution: Sampling and Large sample tests, Exact sampling distributions - χ^2, '**t**' and **F**- distributions.

[Chapter-14, Chapter 15 up to 15.6.4 and Chapter 16 up to 16.6 except 16.4]

Course Learning Outcome(s):

From this course students will be able to learn the fundamental concept of statistics and techniques required for data analysis which is widely used in practical analysis of any data.

Text Book:

Fundamentals of Mathematical Statistics by S.C. Gupta and V.K. Kapoor , 11th Edition,Sultan Chand & Sons, New Delhi.

Reference Book:

Probability and Statistics for Engineers and Scientists, 9th edition, Walpole Myers, KeyingYe Pearson Publications.

SRR & CVR GOVT.DEGREE COLLEGE (A), NAAC B^{+}

M.Sc. MATHEMATICS

SEMESTER-I PAPER-III

PROBABILITY & STATISTICS - 22 MAT 103

Time: 3 Hours **Max. Marks: 60M**

1. Answer any 5 Questions out of 10 Short Answer Questions. **5 X4=20M**

a) Define equally likely event
b) Definition of Axiomatic probability.
c) Define Correlation.
d) Define random variable.
e) Define moment generating function.
f) Define Normal distribution.
g) Define characteristic function.
h) Write Application of Normal distribution.
i) Define chi-square distribution of goodness of fit.
j) Write properties of F- distribution.

Answer Five Questions. Choose One Question from each Unit.
ALL Questions carry equal Marks **5X8=40M**

UNIT - I

2. (a) State and prove multiplication theorem in probability

(OR)

(b) State and prove Baye's theorem.

UNIT - II

3. (a) prove that $\mathbf{M(X_1+X_2+X_3+X_4+\ldots\ldots+X_n) = MX_1+MX_2+MX_3+MX_4+------+MX_n}$

(OR)

(b) Write properties of Characteristic function.

UNIT - III

4. (a) Using MGF derive mean and variance of Binomial distribution

(OR)

(b) Write properties of Normal distribution

UNIT - IV

5. (a) Calculate Karl-Pearson's coefficient of correlation between expenditure advertising and sales from the data given below advertising.

Expenses (000's)	39	65	62	90	82	75	25	98	36	78
Sales (Lakhs Rs.)	47	53	58	86	62	68	60	91	51	84

(OR)

(b) What is linear regression? State and prove angle between two regression lines.

UNIT – V

6 (a) The number of scooter accidents per month in a certain town were as follows.

12 8 20 2 14 10 15 6 9 4

Are there frequencies in agreement with the belief that accident conditions were the same during this 10 month period?

(OR)

(b) Ten cartons are taken at random from an automatic filling machine. The mean net weight of the **10** cartons is 11.8 and **S.D.** is **0.15**. Does the sample mean differ significantly from the intended weight of **12.02**? You are given that for **v** = 9 and **t0.05=2.20**

SRR & CVR GOVT. DEGREE COLLEGE(A), NAAC B+

Department of Mathematics

M.Sc. MATHEMATICS SYLLABUS

SEMESTER-I PAPER-IV

LINEAR ALGEBRA - 22 MAT 104

No. of Hours: 04 Total credits : 04
Total Marks: 100 (Internal: 40M &External:60M)

The course provides the knowledge about the consistency of the system of linear algebraic equations and the concepts of linear transformations. The course serves the purpose of providing knowledge about the vector spaces, projected to the concepts of the orthogonal properties in the spectral theory, bilinear forms and its nature.

Course Objectives:

The goal of this course is to make students capable of understanding the consistency of system of linear algebraic equations and the concepts of linear transformations.Also projected to the concepts of orthogonal property in the spectral theory, bilinear form and its nature.

Course Learning Outcomes:

Student will be able to solve linear system of equations. Provides knowledge of vector spaces and linear transformations. • Able to diagonalize matrices and learn concepts of inner product spaces.

Course Content:

Unit-I:
System of linear equations: Matrices and elementary row operations, uniqueness of echelon forms, Moore-Penrose generalized inverse, solutions of homogeneous and non homogeneous linear system of equations.

Unit-II:
Vector spaces: vector spaces, sub spaces, bases and dimension, coordinate

Unit-III:
linear transformations: linear transformations, algebra and representation by matrices, algebra of polynomials
.

Unit-IV:
Diagonalization of matrices: elementary canonical forms, characteristic values and characteristic vectors, Cayley-Hamilton theorem, annihilating polynomial, invariant subspaces, simultaneous triangularization, simultaneous diagonalization, Jordan form

. **Unit-V:**
Inner product spaces: inner product spaces, unitary and normal operators, bilinear forms.

Text books:

1. Linear algebra K. Hoffman and R. Kunze, prentice hall of India, New Delhi, 2003. 2. Linear algebra done right, Sheldon Axier, springer nature, 2015, third edition.

Reference books:

1. First course in linear algebra, P. G. Bhattacharya, S. K. Jain and S. R. Nagpaul, Wiley eastern ltd. New Delhi, 1991.
2. Matrix and linear algebra, K. B. Datta, prentice hall of India, New Delhi, 2006.

SRR & CVR GOVT.DEGREE COLLEGE (A), NAAC B^{+}

M.Sc. Mathematics

SEMESTER - I

{w.e.f. 2022 – 23 Admitted Batch }

[Question paper pattern for semester end (External) examination]

LINEAR ALGEBRA 22 MAT 104

Time: 3 Hours Max. Marks: 60

Section-A

Answer **Any Five** Questions (5x4= 20 Marks)

1.

a. Let A be a nxn matrix over F, If A is invertible; so is A^{-1} and $(A^{-1})^{-1} = A$

b. If $e_1 = (1,0,0, \ldots, 0)$, $e_2 = (0,1,0, \ldots, 0)$, ..., $e_n = (0,0,0, \ldots 0,1)$ then show that $S = \{e_1, e_2, \ldots . e_n\}$ is a basis of $V_n(F)$.

c. Let V and W be vector spaces over the field F. Let T and U be linear transformations from V into W. The function (T+U) defined by (T+U)(α) = T(α) + $U(\alpha)$

d. Prove that any two bases of a finite dimensional vector space have same length.

e. Let F be a subfield of complex numbers and let $A = \begin{bmatrix} 2 & 1 \\ -1 & 3 \end{bmatrix}$ be a 2x2 matrix over F. Compute $f(A)$, where $f = x^2 - x + 2$.

f. Let A be a 3x3 matrix $A = \begin{bmatrix} 3 & 1 & -1 \\ 2 & 2 & -1 \\ 2 & 2 & 0 \end{bmatrix}$ find the eigen values of A.

g. Let V(F) be an inner product space. $0 \neq \alpha \in V$ then $\left\{\frac{\alpha}{\|\alpha\|}\right\}$ is an orthonormal set.

h. Find the unit vector corresponding to $(2,1,2)$ in $V_3(\mathbb{R})$ with respect to the standard inner product.

Section-B

Answer any Five Questions choosing **One** question from **each unit.**

All questions carry equal marks (5 X 8 =40M)

UNIT-I

2. Every mxn matrix A is row-equivalent to a row reduced echelon matrix

(OR)

3. If A is a nxn (square) matrix, then A is row-equivalent to the nxn identity matrix if and only if the system of equations AX=0 has only the trivial solution.

UNIT-II

4. If W_1 *and* W_2 are finite- dimensional subspaces of a vector space V, then $W_1 + W_2$ is finite - dimensional and $dimW_1 + dimW_2 = dim(W_1 \cap W_2) + dim(W_1 + W_2)$

(OR)

5. Show that the vectors $\alpha_1 = (1,1,0,0), \alpha_2 = (0,0,1,1), \alpha_3 = (1,0,0,4), \alpha_4 = (0,0,0,2)$ form a basis for R^4. Find the coordinates of each of the standard basis vectors in the ordered basis$\{\alpha_1, \alpha_2, \alpha_3, \alpha_4\}$.

UNIT-III

6. Let V be a vector space over the field F ; let U, T_1, T_2 be linear operators on V; let c be an element of F.

a. $IU = UI = U$;

b. $U(T_1 + T_2) = UT_1 + UT_2$; $(T_1 + T_2)U = T_1U + T_2U$;

c. $c(UT_1) = (cU)T_1 = U(cT_1)$.

(OR)

7. Let V and W be finite dimensional vector spaces over the field F such that dimV=dimW. If T is a linear transformation from V into W, the following are equivalent

i. T is invertible.

ii. T is non-singular.

iii. T is onto, that is, the range of T is W.

UNIT-IV

8. State and prove Cayley Hamilton theorem

(OR)

9. Find the Jordan Canonical form of $A = \begin{pmatrix} 10 & -6 & -12 \\ -2 & 2 & -4 \\ 7 & -5 & -6 \end{pmatrix}$

UNIT-V

10. If V is an innerproduct space, then for any vectors α, β in V and any scalar c

i. $\|c\alpha\| = |c|\|\alpha\|$;

ii. $\|\alpha\| > 0 \; for \; \alpha \neq 0$;

iii. $|(\alpha, \beta)| \leq \|\alpha\|\|\beta\|$

iv. $\|\alpha + \beta\| \leq \|\alpha\| + \|\beta\|$

(OR)

11. Every finite dimensional inner product space has an orthonormal basis.

SRR & CVR GOVT.DEGREE COLLEGE (A), NAAC B^{+}

Department of Mathematics

M.Sc. MATHEMATICS SYLLABUS

SEMESTER-I PAPER-V

C - PROGRAMMING – 22 MAT 105

No. of Hours: 04 Total credits: 04

Total Marks: 100 (Internal: 40 M & External: 60 M)

Course Learning Objectives:

This course is designed to provide complete knowledge of C-language and able to develop the logics which will help them to create programs, applications in C.

UNIT-I

Over view of C - Constants - variables - Data types - operators and expressions.

[Chapters 2, 3&4 of the Text Book]

UNIT-II

Managing Input and output operations - Decision making – branching - decision making and looping.

[Chapters 5, 6& 7 of the Text Book]

UNIT-III

Arrays–one dimensional, two dimensional and multi-dimensional- Handling of character strings.

[Chapters 8 & 9 of the Text Book]

UNIT-IV

Functions- user defined functions-. Pointers-Pointers and arrays –Pointers and functions

[Chapters 10&11 of the Text Book]

UNIT-V

Structures and Unions-file management in C [Chapter 12 and 13 of the Text Book]

Course Learning Outcome(s):

From this course students will be learn to implement the algorithms and draw flow charts for solving mathematical problems and understanding the concepts of computer programming language.

Prescribed Text Book:

1. **C Programming and Data Structures** – E. Balaguruswamy, Second Edition, Tata McGraw- Hill Publishing Company (We should verify 4th edition).

Reference Books:

1. **Fundamental of C Programming** by E. Balaguruswamy
2. **Programming in C** by D. Ravichandran, 1998, New Age International.
3. **C and Data Structures** by Ashok N. Karthane, Pearson Education.

S.R.R & C.V.R GOVT DEGREE COLLEGE (A), VJA.

M.Sc. MATHEMATICS

SEMESTER – I PAPER - V

C PROGRAMMING 22 MAT 105

Time: 3 Hours Max.Marks:60M

I. Answer any 5 questions out of the 10 short answer questions 5X4=20M

1. Explain history of **C** programming language.
2. Write the Advantages of **C** programming languages.
3. Explain increment and decrement operators with examples.
4. What is algorithm and explain key features of algorithm.
5. What is array explain types of arrays with syntax.
6. What is string? Explain any two string functions with examples.
7. What is function? Uses of functions.
8. What is pointer? Uses of pointer.
9. Write a program to print **1** to **n** numbers using for loop.
10. Explain data types.

II. Answer any 5 questions out of 10 internal choice essay questions 5X8=40M

UNIT-I

11. Briefly explain structure of C program with example.

(OR)

12. Explain C Tokens.

UNIT-II

13. Write a program for calculator operations using switch case.

(OR)

14. Explain simple if, if-else, nested if, if else ladder with example programs.

UNIT-III

15. Write a program addition of two matrices using arrays.

(OR)

16. Explain the following with example programs

i.Strupr ii. Strlen iii. Strlwr

UNIT-IV

17. Explain types of functions and its features?

(OR)

18. Explain call by reference.

UNIT-V

19. Difference between structure and union.

(OR)

20. What is file and write file operations.

SRR & CVR GOVT. DEGREE COLLEGE (A), NAAC B+

Department of Mathematics

M.Sc. MATHEMATICS SYLLABUS

SEMESTER-I PAPER-VI

PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS – 22 MAT 106

No. of Hours: 04 Total credits: 03

Total Marks: 100 (Internal: 40 M & External: 60 M)

Course Description and Purpose:

Personality development is the development of your behavior patterns and attitude. It is the result we are born, the circle we interact with and our personal temperament. Every person is different. There are some characteristics traits that make you you". Personality development through life enlightenment course aims to help students identify negative behaviors which may be stopping them from reaching their desired goals. This course will help students both in their personal and desired professional life. The other purposes of personality development through life enlightenment course are to enable you lead stress-free and healthier life, ethical decision making ability, enhanced confidence level, and building a more pleasing personality.

Course Objectives:

The Course will introduce the students to Learn to achieve the highest goal happily.

1) Become a person with stable mind, pleasing personality and determination. 2) Learn to build positive attitude, self-motivation, enhancing self-esteem and emotionalintelligence

3) Learn to develop coping mechanism to manage stress through Yoga and meditationtechniques

4) Awaken wisdom among them.

Course Learning Outcomes:

At the end of this course the students should be able to:

- Develop their personality and achieve their highest goals of life.

Lead the nation and mankind to peace and prosperity • Practice emotional self regulation.

• Develop a positive approach to work and duties

• Develop a versatile personality

Course Content:

UNIT I

Introduction to Personality Development

The concept of personality - Dimensions of Personality Theories of Personality development (Freud & Erickson) The concept of Success and Failure - Factors responsible for Success - Hurdles in achieving Success and Overcoming Hurdles - Causes of failure-Conducting SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis.

UNIT II

Attitude, Motivation and Self-esteem

Conceptual overview of Attitude - Types of Attitudes - Attitude Formation - Advantages/Disadvantages of Positive/Negative Attitude - Ways to Develop Positive Attitude Concept of motivation: Definition and Nature of Motivation/Motive - Internal and external motives - Theories of Motivation - Importance of self- motivation Factors leading to de-motivation. Self-esteem - Definition and Nature of self-esteem - Do's and Don'ts to develop positive self-esteem- Low self-esteem - Personality having low self-esteem - Positive and negative Self-esteem.

UNIT III

Other Aspects of Personality Development

Body language - Problem-solving - Conflict Management and Negation skills - Decision-makingskills - Leadership and qualities of a successful leader - Character building -Team-work- Time management - Work ethics - Good manners and etiquette - Emotional Ability/Intelligence - Dimensions of Emotional Intelligence - Building Emotional Intelligence.

UNIT IV

Neetisatakam-Holistic Development of Personality

Verses- 19,20,21,22 (wisdom) - Verses- 29,31,32 (pride and heroism) - Verses- 26,28,63,65(virtue) Personality of Role Model - Shrimad Bhagwadgeeta Chapter2-Verses 17 - Chapter 3-Verses 36,37,42 - Chapter 4-Verses 18, 38,39 - Chapter 18-Verses 37,38,63

UNIT V

Yoga & Stress Management Meaning and definition of Yoga Historical Perspective of Yoga Principles of Astanga Yoga by Patanjali - Meaning and Definition of Stress Types of Stress - Eustress and Distress -Stress Management - Pranayama Pranayama: Anulom and Vilom Pranayama - Nadishudhi Pranayama
- Kapalabhati-Pranayama Bhramari Pranayama Nadanusandhana Pranayama Meditation techniques: Om Meditation Cyclic meditation: Instant Relaxation technique (QRT), Quick Relaxation Technique (QRT), Deep Relaxation Technique (DRT) (Theory & Practical).

P**RACTICAL COMPONENTS:**

- Students should identify different types of personality to know their own personality. Students are to describe the characteristics of their personalities and submit the same for assessment.

- Students are to form in groups (a group consists of 4-6 students) to identify and write a brief note on famous personalities of India and World.
- Students are required to identify different types of attitudes and give any five examples of each.

- Students are expected to check their attitudes and develop ways to improve their attitudes at work place and home. Students are required to identify keys to self-motivation to achieve their goals.

Students are expected to identify at least seven types of body language and conduct activities with the following:

. Pose	possible interpretations
Standing with your hands on your hips	Aggressive, disgusted
Standing upright	Confidence
Arms crossed on your chest	Defensive
Resting your hand on your cheek	Thinking
Touching or rubbing your nose	Doubt,lying
Tapping your fingers	Impatience
Resting your head in your hands	Boredom, tired
Biting your nails	Nervous,insecure
Playing with your hair	Insecure
Rubbing your eyes	Disbelief,Doubt

Conduct the following exercise to develop communication skills - Negotiation Skills and Empathy Exercise: Card Pieces.

In this activity, team members trade pieces of playing cards to put together complete cards. Uses This exercise is useful for showing team members others' perspectives. It builds communication and negotiation skills, and helps people to develop empathy.

People and Materials

Enough people for at least three teams of two.

Playing cards-use between four and six for each person.

• A private room.

Time-15 minutes.

Instructions:

1. Cut each playing card into half diagonally, then in half diagonally again, so you have four triangular pieces for each card.

2. Mix all the pieces together and put equal numbers of cards into as many envelopes as you have teams.

3. Divide people up into teams of three or four. You need at least three teams. If you're short of people, teams of two will work just as well.

4. Give each team an envelope of playing card pieces.

5. Each team has three minutes to sort its pieces, determine which ones it needs to make complete cards, and develop a bargaining strategy.

6. After three minutes, allow the teams to start bartering for pieces. People can barter on their own or

collectively with their team. Give the teams eight minutes to barter. 7. When the time is up, count each team's completed cards. Whichever team has the most cards wins the round.

Advice for the Teacher/Facilitator

After the activity, ask your team members to think about the strategies they used. Discuss these questions: 1)Which negotiation strategies worked? Which didn't?

2) What could they have done better?

3) What other skills, such as active listening or empathy, did they need to use?

Conduct following Time management activity - Ribbon of Life

Take a colored ribbon length of approximately 1 meter/100 cm. and scissors. Start with the following questions:

1. If the life span of an individual is say. 100 years. Consider that each cm represents one year. The response will be that few live that long. Assuming a life of 75 to 90 years, cut 10 to 25 cm off the
2. What is the average age of the participants sitting here, the response would be 25 to 30 depending on the group, in that case, cut another 25 cms of the ribbon and say that is gone you cannot do ribbon, accordingly. anything
3. What is left is 50 years? People will say, "Yes," but the answer is NO.
4. Every year we have 52 weeks, that is 52 Sundays. If we multiply that by 50 years, it comes to 7.14 years. Reduce the ribbon by another 7.14 cm.
5. We also usually have Saturdays off, so reduce another 7. cms.
6. Public/National holidays are 10 multiple with 50 years. That comes to another 1.5 years. Reduce ribbon by another 1.5 cms.
7. Your casual leave, sick leave, and annual holidays approx. 40 days a year, multiplied by 50. Cut off another 5 cmns. Now you are left with about 29.5 years. But, the calculation is not over yet.
8. You sleep an average of 8 hours daily, multiply that by 365 days and again by 50 years (ie. 122 days X 50 almost 17 years). Cut off another 17 cm.
9. You spend time eating lunch, breakfast, snacks, and dinner total 2 hours daily (i.e.30 days a year X 50 years 4 years or so). Cut off another 4 cm. 10. Last, lets figure we spend about 1 hour a day traveling from place to place for activities and such.(thats about 2 more years). We're down to 6 (SIX) years of life to make it or break it.

Exercise Decision making skills - Create Your Own In this exercise, teams must create their own, brand new, problem-solving activity.

Uses This game encourages participants to think about the problem-solving process. It builds skills such as creativity, negotiation and decision making, as well as communication and time management. After the activity, teams should be better equipped to work together, and to think on their feet.

What You'll Need

- Ideally four or five people in each team.

A large, private room

Paper, pens and flip charts.

Time-Around one hour.

Instructions:

1. As the participants arrive, you announce that, rather than spending an hour on a problem solving team building activity, they must design an original one of their own.
3. Divide participants into teams and tell them that they have to create a new problem-solving team building activity that will work well in their organization. The activity must not be one that they have already participated in or heard of
. 3. After an hour, each team must present their new activity to everyone else, and outline its key benefits.

Advice for the Teacher/Facilitator:

There are four basic steps in problem solving defining the problem, generating solutions, evaluating and selecting solutions, and implementing solutions. Help your team to think creatively at each stage by getting them to consider a wide range of options. If ideas run dry, introduce an alternative brainstorming technique, such as brain writing. This allows your people to develop one others' ideas, while everyone has an equal chance to contribute.

After the presentations, encourage teams to discuss the different decision-making processes they followed. You might ask them how they communicated and managed their time. Another question could be about how they kept their discussion focused. And to round up, you might ask them whether they would have changed their approach after hearing the other teams' presentations.
Students are asked to recite verses: 26,28,63,65 (virtue) of Neetisatakam-Holistic development ofpersonality.

- Students are asked to identify personality of role Mmodels from Shrimad Bhagwadgee ta and portray the roles of the same.

Students are asked to practice Yoga and meditation techniques

REFERENCE BOOKS:

1. Hurlock. E.B. Personality Development, 28th Reprint. New Delhi: Tata McGraw Hill, 2006.

2. Gopinath Rashtriya Sanskrit Sansthanam P. Bhartrihari's ThreeSatakam, Niti-sringar- vairagya, New Delhi, 2010

3. Swami Swarupananda, Srimad Bhagavad Gita, Advaita Ashram Publication Department, Kolkata, 2016.

4. Lucas, Stephen. Art of Public Speaking. New Delhi. Tata - Mc-Graw Hill. 2001

5. Mile, D.J Power of positive thinking. Delhi. Rohan Book Company. (2004).

6. Pravesh Kumar. All about Self- Motivation. New Delhi. Goodwill Publishing House.2005.

7. Smith, B. Body Language. Delhi: Rohan Book Company. 2004

8. Yogic Asanas for Group Training - Part-I: Janardhan Swami Yogabhyasi Mandal,Nagpur.

9. Rajayoga or Conquering the Internal Nature by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata.

10. Nagendra HR nad Nagaratna R. Yoga Perspective in Stress Management, Bangalore, Swami Vivekananda Yoga Prakashan.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc16_ge04/preview

2. https://freevideolectures.com/course/3539/indian-philosophy/11

SRR & CVR GOVT.DEGREE COLLEGE (A) NAAC B^{+}

Department of Mathematics

M.Sc. MATHEMATICS SYLLABUS

SEMESTER-I PAPER-VII

C- PROGRAMMING LAB - 22MATLAB 101

No. of Hours: 06 Total credits: 03
Total Marks: 100 (Internal: 40M & External: 60M)

LIST OF C – PROGRAMES:

1. Factorial of a number
2. Reverse of a number
3. GCD of two numbers using EUCLIDIAN algorithm
4. Fibonacci numbers up to "N"
5. Perfect numbers up to "N"
6. Prime numbers up to "N"
7. Sum of digits of a number
8. Number palindrome
9. Find the squares of first ten natural numbers using function
10. Find biggest of three numbers using function
11. Find biggest element in an array
12. Find Transpose of a Matrix
13. Sum of the matrices
14. Product of the matrices
15. To find String length using user defined function

SRR & CVR GOVT.DEGREE COLLEGE
(AUTONOMOUS) NAAC B+
Department of Mathematics
M.Sc (MATHEMATICS) SYLLABUS
SEMESTER-II PAPER-I
COMPLEX ANALYSIS – 22 MAT 201

No. of Hours: 04 Total credits: 04
Total Marks: 100 (Internal: 40M & External: 60 M)

Course Learning Objectives:
This course helps to describe basic properties of complex integration and having the ability to compute integrals and decide the analytic function and able to expand complex function in power series, finding complex integrals, using residues and having the ability of using Linear transformations.

UNIT-I
Analytic Functions: Limits- Continuity- Derivatives- Differentiation Formulas- Cauchy- Riemann Equations-Sufficient conditions for Differentiability-Polar Coordinates- Analytic Functions-Harmonic Functions
[Sec 18 to 27 of Chapter 2 of the Text Book]

UNIT-II
Integrals: Contours- Contour Integrals- CauchyTheorem-proof of the theorem-Cauchy-Goursat Theorem(With out prof)- Simply Connected Domains- Multiply Connected Domains- Cauchy Integral Formula- An extension of Integral Formula- Some Consequences of the extension-Liouville's Theorem and the Fundamental Theorem of Algebra
[Sec 42 to sec 45,50,52-55,57& 58 of chapter 4 of the Text Book]

UNIT-III
Series: Taylor's series – Proof of Taylor's theorem- Examples- Laurent's series – Proof of Laurent"s Series- Examples.
[Sec 62 to 68 of Chapter-5 of the Text Book]

UNIT-IV
Residues and Poles: Isolated singular points- Residues – Cauchy's residue theorem-proof- Residue at Infinity- the three types of isolated singular points - Residues at poles, Zeroes of analytic function- Zeroes and Poles- Evaluation of improper integrals with no root on real axis- Indented paths, Definite integrals involving Sines and Cosines.
[Sec 74 to 83 of chapter 6 and sec 85,86 & 92 of chapter 7 of the Text Book]

UNIT-V
Argument principle- Rouche's theorem- Linear Transformations: The transformation w=1/z - mappings by w=1/z - Linear fractional transformations (problems only) - The transformation w=sinZ, Mapping by Z^2 .
[93 & 94 of chapter7, sec 96 -100, 103-106 of chapter 8 of the Text Book]

Course Learning Outcomes:

This Course helps the student to evaluate complex integrals and expanding complex function in power series, advantage of residues and the application of linear transformation.

Text Book:

1. Complex Variables and Applications by James Ward Brown, Ruel V. Churchill, McGraw- Hill International Editions-Ninth Edition.

Reference Books:

1. Complex analysis for Mathematics and Engineering by John H. Mathews and Russel. W, Howell, Narosa Publishing house.
2. Complex Variables by H. S. Kasana, Prentice Hall of India.

S.R.R & C.V.R GOVT DEGREE COLLEGE

M.Sc., Mathematics

SEMESTER –II PAPER - I

[Question paper pattern for semester end (External) examination]

COMPLEX ANALYSIS 22 MAT 201

Time: 3 Hours Max Marks: 60M

`

I. Answer any 5 questions out of the 10 short answer questions 5X4 =20 M

1. Check the differentiability of $f(z) = \bar{z}$
2. Determine the singular points of $f(z) = z^2 + 1/(z^2 + 2z + 2)$.
3. Write the polar form of C-R equations.
4. Expand the function in a series, $f(z) = 1 / z^2 (1 + z)$.
5. State Liouville's theorem and fundamental theorem of algebra.
6. Find the value of the integral of g (z) around the circle $|z - i| = 2$, if $g(z) = 1 / (z^2 + 4)$
7. Find the residue of the function $f(z) = 2z / (z + 4)(z - 1)^2$ at $z = 1$.
8. Define three types of Isolated singular points.
9. Define Argument principle.
10. Define Mobius transformation and Inverse transformation.

II. Answer Five Questions choosing One question from each unit.
All questions carry equal marks 5 X 8M = 40M

UNIT - I

11. The complex function $w = f(z) = u + iv$ is differentiable if and if 'u' and 'v' are differentiable and satisfies C – R equations. $u_x = v_y$, $u_y = -v_x$.

(OR)

12. Find an analytic function f (z) and its harmonic function v (x, y) when $u(x, y) = e^x (x\cos y - y\sin y)$.

UNIT – II

13. State and Prove Cauchy-Goursat Theorem.

(OR)

14. State and Prove Cauchy Integral formula.

UNIT - III

15. State and prove Taylor's theorem.

(OR)

16. State and prove Laurent's theorem.

UNIT – IV

17. State and prove Cauchy's residues theorem.

(OR)

18. Using residue theorem, evaluate the improper integral

$$\int_{\infty-}^{\infty} \frac{cosx\ dx}{(x^2+a^2)(x^2+b^2)} (a > b > 0)$$

UNIT - V

19. **S**tate and prove Rouche's Theorem.

(OR)

20. Discuss the transformation $w = z^2$.

SRR & CVR GOVT.DEGREE COLLEGE
(AUTONOMOUS) NAAC B^+
Department of Mathematics
M.Sc (MATHEMATICS) SYLLABUS
SEMESTER-II PAPER-II
PARTIAL DIFFERENTIAL EQUATIONS -22 MAT 202

No. of Hours: 04 Total credits: 04
Total Marks: 100 (Internal: 40M & External: 60M)

Course Learning Objectives:
The goal of this course is provide the students with an understanding of the solutions of First and Second order Partial Differential Equations and applications of Partial Differential Equations.

UNIT-I

First Order PDE's: Introduction – Methods of solution of $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$ orthogonal trajectories of a system of curves on a surface- Pfaffian Differential forms and equations – Solutions of Pfaffian differential Equations in three variables – Cauchy's problem for first order PDE. [Sections 3 to 6 of Chapter 1, Sections 1 to 3 of Chapter 2]

UNIT-II

Linear Equations of the first order – Integral Surfaces – Orthogonal Surfaces – Non-Linear PDE of the first order – Cauchy's method of characteristics – compatible systems of first order equations – Charpit's method – special types of first order equations – Jacobi's method [Sections 4 to 13 of Chapter 2]

UNIT-III

Partial differential equations of the second order, their origin, linear partial differential equations with constant and variable coefficients – solutions of linear Hyperbolic equations – Method of separation of variables – Monger‟s method. [Sections 1 to 5 and sections 8, 9, 11 of Chapter 3]

UNIT-IV

Laplace Equation – elementary solutions of families of equipotential surfaces, boundary value problems, method of separation of a variable of solving Laplace equation, problems with axial symmetry, Kelvin's inversion theorem. [Section 1 to 7 of Chapter 4]

UNIT-V

The wave equation, elementary solution in one dimensional form, Riemann – Volterra solution of one-dimensional wave equation. [Sections 1 to 3 of Chapter 5]
[Problematic approach is Preferred]

Course Learning Outcome(s):

From this course Student will be able to learn the study of Partial derivatives on the Existence and Uniqueness of Solutions and theory of Differential Equations widely used in formulating wave equations and Laplace equations.

Prescribed Text Book:

1. **Elements of partial differential equations** by I. N. Sneddon, McGraw-Hill, international edition, Mathematics series.

Reference Book:

1. **An Elementary Course in Partial differential equations** byT. Amaranth, Second Edition, Narosa Publishing House.

S.R.R & C.V.R GOVT DEGREE COLLEGE

M.Sc., Mathematics

SEMESTER – II PAPER II

[Question paper pattern for semester end (External) examination]

PARTIAL DIFFERENTIAL EQUATIONS– 22 MAT 202

Time: 3 Hours Max Marks: 60M

I. Answer any 5 questions out of the 10 short answer questions 5X4M =20M

1. Define orthogonal trajectories on surface of the given system of curves.
2. Define Pfaffian differential equation and state the necessary and sufficient condition to be integrable.
3. Define the three classes of integrals of a Partial differential equation.
4. If the expression $(p^2 + z)\,dx + x^2 + z\,dy$is and exact differential equation.
5. Define Wave equation and Laplace equation
6. Define Greens function.
7. Write the two types of boundary value problems for Laplace equations.
8. Reduce the equation $u_{xx} - x^2 u_{yy} = 0$ to a canonical form.
9. Define Helmholtzs equation.
10. Write the Riemann-Volterra solution form one dimensional wave equation.

II. Answer Five Questions choosing One question from each unit.
All questions carry equal marks 5 X 8M=40M

UNIT-I

11. A necessary and sufficient condition that there exists between two functions u(x, y) and v(x, y) is a relation F(u, v) = 0 not involving x or y explicitly is that $\frac{\partial(u,v)}{\partial(x,y)} = 0$

(OR)

12. Verify that the equation $(z+y^2)\,dx+z\,(z+x^2)\,dy-xy\,(x+y)\,dz=0$ is integrable and find its primitive.

UNIT-II

13. Explain the Charpit's method of solving the equation $f\,(x, y, z, p, q) = 0$.Using this method find the complete integral of the equation $(p^2 + q^2) = qz$.

(OR)

14. Find a complete integral of $p^2x+q^2y=z$ using Jacobi's method.

UNIT-III

15. Solve the equation $r + s - 2t = e^{x+y}$ with usual notation.

(OR)

16. Solve the equation $\mathbf{r+4s+t+rt-s^2=2}$ using Monge's method.

UNIT-IV

17. A rigid sphere of radius a is placed in a stream of fluid whose velocity in the undisturbed state is V. Determine the velocity of the fluid at any point of the disturbed stream.

(OR)

18. State and Prove Kelvin's inversion theorem.

UNIT-V

19. Derive D'Alembert's solution of the one-dimensional wave equation.

(OR)

20 If Ψ is determined by the differential equation $a^2 \frac{\partial^2 \varphi}{\partial x^2} + b^2 = \frac{\partial^2 \varphi}{\partial y^2}$ where 'a' and 'b' are constants and by the conditions $y = 0, \Psi = f(x), \frac{\partial \varphi}{\partial y} = g(x)$ Show by the Riemann-Volterra Method.

SRR & CVR GOVT.DEGREE COLLEGE
(AUTONOMOUS) NAAC B^+
Department of Mathematics
M.Sc (MATHEMATICS) SYLLABUS
SEMESTER-II PAPER-III
NUMERICAL ANALYSIS - 22 MAT 203

No. of Hours: 04 Total credits: 04
Total Marks: 100 (Internal: 40M & External: 60M)

Course Learning Objectives:
This Course is introduced a broad range of Numerical methods for solving Mathematical problems that arise in Science and Engineering and helps to choose, develop and apply the appropriate Numerical techniques for the Mathematical problems.

UNIT-I:

Transcendental and Polynomial Equations: Introduction - Bisection method - Iteration methods based on first degree equation - Secant method – Regula falsi method - Newton Raphson method - Iteration method based on second degree equation - Rate of convergence of secant method - Newton Raphson method.
[Above topics are from Chapter-2 of the Text Book]

UNIT-II:

System Of Linear Algebraic Equation And Eigen Value Problems: Direct methods - Introduction - Gauss Elimination Method- Gauss – Jordan Method - Triangularisation method - Iteration Methods- Jacobi iteration Method - Gauss-Seidel Iteration Method - Eigen values and Eigen vectors.
[Above topics are from Chapter-3 of the Text Book]

UNIT-III:

Interpolation and Approximation: Introduction - Lagrange Interpolation - Newton Divided Differences - Finite Difference Operators - Interpolating Polynomials using finite differences- Gregory- Newton forward difference interpolation- Backward difference interpolation - Stirling and Bessel interpolation – Hermite interpolation-Spline interpolation – Approximation: Least Square approximation.
[Above topics are from Chapter-4 of the Text Book]

UNIT-IV:

Numerical Differentiation and Integration: Introduction – Numerical differentiation: Methods based on finite differences.
[Above topics are from Chapter-5 of the Text Book]

UNIT-V:

Numerical integration: Composite integration methods-Trapezoidal rule- Simpsons rules – numerical solution of ODEs by Picard – Euler - Modified Euler – Runge Kutta methods.
[Above topics are from Chapter- 6 of the Text Book]

Course Learning Outcome(s):

From this Course Students are able to learn how to apply the Numerical method for various Mathematical operations and tasks such as Interpolation, Differentiation, Integration, the solution of Differential Equations analyses and evaluate the accuracy of common Numerical methods.

Text Book:

Numerical Methods for Scientific and Engineering Computation by M. K. Jain, S. R. K. Iyengar, R. K. Jain, New Age International (p) Limited, Publishers, 5 th Edition.

Reference Book:

An Introduction to Numerical Analysis by Kendall E. Atkinson.

S.R.R & C.V.R GOVT DEGREE COLLEGE

M.Sc., Mathematics

SEMESTER - II PAPER - III

[Question paper pattern for semester end (External) examination]

NUMERICAL ANALYSIS - 22 MAT 203

Time: 3 Hours Max. Marks: 60 M

I. Answer any 5 questions out of the 10 short answer questions 5X4=20M

2. Define bisection method.
3. Write REGULA-FALSI Formula
4. Write the condition for Guass Elimination Method fails.
5. Write system of linear equations if m=n.
6. Prove that $\Delta = E - 1$
7. Find the third difference with arguments 2,4,9,10 of the function $f(x) = x^3 - 2x$
8. Write Newton's backward interpolation Formula.
9. Write Simpson's 1/3 formula.
10. Solve the differential equation $y' = x + y$ with $y\ 0 = 1$, $x \in [0,1]$ by Taylor Series expansion to obtain y for $x = 0.1$
11. Write second order Runge-Kutta formula.

II. Answer Five Questions choosing One question from each unit.
All questions carry equal marks 5X8=40M

UNIT-I

12. Use Newton-Raphson method to obtain a root, correct to 3 decimal places of the equation $x + logx = 2$.

(OR)

13. Find a root of the equation $f(x) = x^3-4x-9=0$, using the bisection method in Four stages.

UNIT-II

14. Solve the equations $10x+2y+z=9$, $2x+3y-2z=-44$, $-2x+3y+10z=22$ by Using Gauss –Seidal method.

(OR)

15. Solve the system of linear equations $x_1+x_2+x_3=1$, $4x_1+3x_2-x_3=6$, $3x_1+5x_2+3x_3=14$, by Triangulation method.

UNIT-III

16. The value of x and y are given as below:

x	5	6	9	11
f(x)	12	13	14	16

Find the value of y at x=10 by using Lagrange's formula.

(OR)

17. Given the following values of f(x) and f'(x)

x	f(x)	$f^2(x)$
-1	1	-5
0	1	1
1	3	7

Estimate the values of $f\ (-0.5)$ and f' (0.5) using Hermite interpolation.

UNIT-IV

18. Find $f'\ (0.6)$ by using stirling's formula

X	0.4	0.5	0.6	0.7	0.8
f(x)	1.5836	1.7974	2.0442	2.3275	2.6510

(OR)

19. Values of x (in degrees) and sin x are given in the following table.

x (in degree)	sin x
15	0.2588190
20	0.3420201
25	0.4226183
30	0.5
35	0.5735764
40	0.6427876

Determine the value of first derivative value of sin 38°.

UNIT-V

20. i) Evaluate $\int_{-2}^{2} \frac{x}{5+2x} dx$ by using the Trapezoidal rule with five ordinates.

ii) Evaluate $\int_{0}^{2} \frac{dx}{x^3+x+1}$ by using the Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule with h= 0.25.

(OR)

21. Solve $\frac{dy}{dx} = -2xy^2$ with y(o)=1 and h=0.2 on the interval [0,1] using Runge - Kutta fourth order method.

SRR & CVR GOVT.DEGREE COLLEGE (A), NAAC B^{+}

Department of Mathematics

M.Sc. MATHEMATICS SYLLABUS

SEMESTER-II PAPER-IV

ALGEBRA – 22 MAT 204

No. of Hours: 04 Total credits: 04

Total Marks: 100 (Internal: 40 M & External: 60 M)

Course Learning Objectives:

The objective of the course is to introduce the basic structures of algebra like groups, rings, fields, and vector spaces which are the main pillars of modern mathematics.

UNIT-I

Group Theory: Definition of a Group, Some Examples of Groups, Some Preliminary Lemmas, Subgroups, A counting Principles, Normal Subgroups and Quotient groups, Homomorphism, Automorphism.

(2.1 to 2.8 of the prescribed book [1]).

UNIT-II

Group Theory Continued: Cayley's theorem, Permutation groups. Another counting principle.

(2.9 to 2.11 of the prescribed book [1]).

UNIT-III

Group Theory Continued: Sylow's theorem, Direct products, Finite Abelian groups.

(2.12 to 2.14 of the prescribed book [1]).

UNIT-IV

Ring Theory: Definition and Examples of Rings, Some special classes of Rings, Homomorphisms, Ideals and quotient Rings, More Ideals and quotient Rings, The field of quotients of an Integral domain.

(3.1 to 3.6 of the prescribed book [1]).

UNIT-V

Ring Theory Continued: Euclidean rings, A Particular Euclidean ring, Polynomial Rings, Polynomials over the rational field, Polynomial Rings over Commutative Rings.

(3.7 to 3.11 of the Prescribed books [1]).

Course Learning Outcome(s):

From this course students will be able to learn the fundamental concept of algebra and their role in mathematics and applied contexts.

PRESCRIBED TEXT BOOK

Topics in Algebra by I. N. HERSTEIN, Second Edition 1988, Wiley Eastern Limited. New Delhi.

REFERENCE BOOK:

1. **Basic Abstract Algebra** by BHATTACHARYA P. B., JAIN S. K., NAGPAUL S.R. Cambridge Press, Second Edition.
2. **Abstract Algebra** by David S Dummit and Richard M Foote , Wiley Publication, Third Edition.
3. **Introduction to rings and modules**, by C Musili, Narosa Publications.

S.R.R & C.V.R GOVT DEGREE COLLEGE (A), VJA.

M.Sc. MATHEMATICS

SEMESTER –II PAPER - IV

[Question paper pattern for semester end (External) examination]

ALGEBRA 22 MAT 204

Time: 3 Hours **Max Marks: 60M**

`

I. Answer any 5 questions out of 10 short answer questions **5X4=20M**

1. If G is a finite group and a ϵ G then $\mathbf{a^{O(G)} = e}$.
2. If $\emptyset$ is a homomorphism from $\mathbf{G \rightarrow G'}$, then $\emptyset(x^{-1}) = [\emptyset(x)]^{-1}$
3. State Sylow's theorem.
4. Define direct product of groups.
5. Define an ideal and maximal ideal of ring **R**.
6. Define integral domain with an example.
7. Define Euclidean Ring.
8. Define irreducible polynomial over a field **F**.
9. Write a short note about vector space.
10. Define finite dimensional vector space.

II. Answer Five Questions choosing One question from each unit **5X8=40M**

UNIT-I

11. If **H** and **K** are finite subgroups of **G** of orders **O(H)** and **O(K)** respectively then $O(HK) = \frac{O(H).O(K)}{O(H \cap K)}$

12. Prove that if G is a group then A(G), the set of automorphisms of a group G is also a group;.

UNIT-II

13. State and Prove Cauchy's Theorem.

(OR)

14. State and Prove fundamental theorem on finitely generated Abelian groups.

UNIT-III

15. If **R** is a commutative ring with unity and **M** is an ideal of **R**, then prove that **M** is maximal if $f = \frac{R}{M}$ is a field

(OR)

16. Prove that every integral domain can be embedded in a field.

UNIT-IV

17. Prove that **J[i],** the ring of Gaussian integers is a Euclidean ring.

(OR)

18. State and prove Gauss Lemma.

UNIT-V

19. Prove that **L(S)**, the linear span of **S**, is a subspace of the vector space **V**.

(OR)

20. If **V** is a finite dimensional vector space and **W** is a subspace of **V**, then prove that **W** is a finite dimensional, $\boldsymbol{dim\, W \leq dim\, V}$ *and* $\boldsymbol{dim \frac{V}{W} = dim\, V - dim\, W}$

SRR & CVR GOVT.DEGREE COLLEGE (A), NAAC B+

Department of Mathematics

M.Sc. (MATHEMATICS) SYLLABUS

SEMESTER-II PAPER-V

RESEARCH METHODOLOGY & IPR - 22 MAT 205

No. of hours: 03 Total credits:03
Total marks: 100 (Internal: 40 M & External: 60M)

Course Description and Purpose:

The aim of this course is to develop research bent of mind (spirit of inquiry) and impart research skills to the all Post graduate students. It also encompasses the series of research methodology contents: from problem formulation. to design, to data collection, analysis, reporting and dissemination. This course also covers intellectual property rights (IPR), and intended to equip students with conceptual understandings of current scenario of IPR, and the practical issues encountered in filing patents, trademarks and copyrights.

Course Objectives:

To understand some basic concepts of research and its methodologies To develop an understanding of the basic framework of research process.

To develop an understanding of various research designs and techniques.

To identify various sources of information for literature review and data collection.

Ability to write a research Proposal, report and thesis To demonstrate knowledge and understanding of IPR Filing and Rights

Course Learning Outcomes:

At the end of this course the students should be able to: • Understand some basic concepts of research and its methodologies

Identify appropriate research topics:

Select and define appropriate research problem and parameters • Demonstrate the ability to choose methods appropriate to research aims and objectives

Have adequate knowledge on measurement & scaling techniques

Have basic awarenessof data analysis-and hypothesis testing procedures

Prepare a project proposal (to undertake a project)

Write a research report and thesis

File Patents, Trademarks and Copy Rights

Course Content:

UNIT I

Foundations of Research
Meaning of Research - Definitions of Research - Motivation in Research - General Characteristics of Research Criteria of Good Research - Types of Research - Research Process - Research Methods vs. Methodology - Defining and Formulating the Research Problem - Review of Literature - Approaches to Critical Literature Review-Importance of Literature Review in Identifying Research Gaps and Defining a Problem - Development of Working Hypothesis.

UNIT II

Research Design, Sampling Concepts, and Data Collection Methods
Meaning. Significance and Characteristics of Good Research Design - Types of Research Design: Exploratory,Conclusive Research and Experimental Sampling Theory: Types of Sampling and Errors in Sampling - Data Collection: Types of Data - Data Collection Methods and Techniques for Primary and Secondary Data.

UNIT III

Measurement & Scaling Techniques, Hypothesis Formulation and Testing, Overview of Data Analysis and Report Writing
Basic measurement scales - Reliability & Validity - Definition and Types of Hypothesis - Hypothesis Formulation and Testing Procedure - Overview of Data Analysis: Methods, Process and Types - Report Writing: Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports - How to Write a Research Proposal - Research Ethics, Conflict of Interest and Plagiarism.

UNIT IV

Intellectual Property Rights (IPR)
Definition and Nature and Features of Intellectual Property Rights (IPR) - Types of Intellectual Property Rights -Procedure for Grants of Patents - Rights of a Patent-Scope of a Patent Rights - Licensing and Transfer of Technology - Why protection of intellectual property is important? - Enforcement of IPR - Infringement of IPR.

UNIT V

Indian and International Scenario and New Developments in IPR
IPR Developments in India for the past Five Years -Development of IPR Laws in India - International Cooperation on IPR - New Developments in IPR - Administration of Patent System International Patent protection - Case Studies in Indian and Global Contexts.

PRACTICAL COMPONENTS:

- Students should identify different research problems with examples and describe the characteristics of researchable problems in their academic area/society/community/organization concerned.
- Students are to form in groups (a group consists of 4-6 students) and conduct critical literature survey with gaps regard to the identified research problems and prepare a brief literature review coupled with research and working hypothesis.
- Students are required to identify and develop good research design to address the defined research problems. Students are expected to write the research design on Exploratory and Descriptive Research.
- students are required to develop practical experience in writing a research proposal by conducting thorough critical review of any three research proposals (examples).

Students are expected to develop templates for technical report writing. Students should conduct a team based mini research project, which is a unified andpractical casea topic of their choice, with approximately 4-6 students per group on.

- Students are expected to identify types of plagiarism in academic research, and how toavoid plagiarism in research. Students are asked to identify and submit a brief report on Indian patents of Internationalrepute.
- Students are asked to write on Patent registration procedure, and visit Official website ofIntellectual Property India https://ipindia.gov.in to know how to get IPR in India.
- Students are asked to identity and summarise remedies available against the infringement of intellectual property rights in Indian and global contexts.
- Students are asked to submit any five examples of ethical issues in copyright and patents.

REFERENCE BOOKS:

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002, An introduction to Research Methodology. RBSA Publishers.
2. Cohen, L. Lawrence, M., & Morrison, K. (2005), Research Methods in Education (5th edition). Oxford: Oxford University Press.
3. Kothari. C.R., 1990. Research Methodology: Methods and Techniques, New AgeInternational.
4. Domnyei, Z. (2007). Research Methods in Applied Linguistics. Oxford: Oxford UniversityPress.
5. Anthony, M., Graziano, A.M. and Raulin, M.L... 2009, Research Methods: A Process ofInquiry, Allyn and Bacon.
6. Fink, A., 2009, Conducting Research Literature Reviews: From the Internet to Paper. SagePublications.
7. Day. R.A., 1992. How to Write and Publish a Scientific Paper, Cambridge University Press.
8. Wadehra, B.L. 2000. Law relating to patents, trademarks, copyright designs and geographical indications.Universal Law Publishing.
9. Coley, S.M. and Scheinberg. C. A., 1990, Proposal Writing, Sage Publications
10. Carlos, C.M., 2000. Intellectual property rights, the WTO and developing countries: the TRIPS agreement and policy options, Zed Books, New York.
11. Leedy, P.D. and Ormrod, J.E.. 2004, Practical Research: Planning and Design, Prentice Hall.
12. Satarkar, S.V., 2000. Intellectual property rights and Copy right. Ess Ess Publications.

Important Websites:

www.ipindia.nic.in - Intellectual Property Office, India

www.patentoffice.nic.in-Patent office, India

http://copyright.gov.in/ - Copyright Office, India

ipr.icegate.gov.in-Automated Recordation & Targeting for IPR Protection

http://www.icegate.gov.in- E-Commerce portal of Central Board of Excise and Customs >www.ipab.tn.nic.in - Intellectual Property Appellate Board, India

www.mit.gov.in - Department of Information Technology. India
http://www.mit.gov.in/content/office-semiconductorintegrated-circuits-layout-designregistry

Semiconductor Integrated Circuits Layout-Design Registry (SICLDR)

www.plantauthority.gov.in Plant Varieties and Farmers' Rights Authority. India
http://nbaindia.org/ - National Biodiversity Authority

www.nipo.in- The Indian IPR Foundation

www.wipo.int-World Intellectual Property Organisation

http://www.wto.org - World Trade Organisation.

SRR & CVR GOVT.DEGREE COLLEGE
(AUTONOMOUS) NAAC B^{+}
Department of Mathematics
M.Sc (MATHEMATICS) SYLLABUS
SEMESTER-II PAPER-VI
DISCRETE MATHEMATICAL STRUCTURES - 22 MAT DSE 201

No. of Hours: 04 Total credits: 04
Total Marks: 100 (Internal: 40M & External: 60M)

Course Description and Purpose:

The course is introduced to give knowledge about the concepts of mathematical logic for analyzing propositions and proving theorems. The course serves the purpose of providing knowledge about how to use sets for solving applied problems, and use the properties of set operations algebraically, Work with relations and investigate their properties.

Course Objectives:

- The course provided the systematic process to develop logical thinking.
- They learn the applications of logic to computer science.

Course Learning Outcome(s):

From this course students are able to acquire ability to learn relations, lattices, boolean algebra and mathematical logic.

Course Content:

UNIT-I:
Logic: Computer Representation of sets, Mathematical Induction, Matrices, Logic, Tautology, Normal forms, Logical Inferences, Predicate Logic, Universal Quantifiers, Rules of Inference [Chapter 1 of Text Book 2]

UNIT-II:
Relations and ordering: Relations- properties of binary relations in a set - partially ordering - Partially ordered sets - representation and associated terminology. [2-3.1, 2-3.2, 2-3.8, 2-3.9 of Chapter 2 of the Text Book]

UNIT-III:
Lattices: Lattices as partially ordered sets - some properties of Lattices - Lattices as algebraic systems - Sub-Lattices - direct product and homomorphism some special Lattices. [4-1.1 to 4-1.5 of Chapter 4 of the Text Book]

UNIT-IV:
Boolean Algebra: Sub algebra - direct product and Homomorphism - Boolean forms and free Boolean Algebras - values of Boolean expressions and Boolean function. [4-2.1, 4-2.2, 4-3.1, 4-3.2 of Chapter 4 of the Text Book]

UNIT-V:

Representations and minimization of Boolean Function: Representation of Boolean functions - minimization of Boolean functions - Finite State Machines - Introductory Sequential Circuits - Equivalence of Finite - State Machines.
[4-4.1, 4-4.2, 4-6.1, 4-6.2 of Chapter 4 of the Text Book]

Prescribed Text Book:

1. Discrete Mathematical structures with applications to Computer Science by JP. Trembly and R. Manohar, Tata McGraw-Hill Edition.

Reference Book:

1. Discrete Mathematics for Computer Scientists and Mathematicians by J. L. Mott, A. Kandel and T. P. Baker, Prentice-Hall India.

S.R.R & C.V.R GOVT DEGREE COLLEGE

M.Sc., Mathematics

SEMESTER - II PAPER - VI

[Question paper pattern for semester end (External) examination]

DISCRETE MATHEMATICAL STRUCTURES - 22 MAT DSE 201

Time: 3 Hours Max. Marks: 60 M

Answer any five Questions. (5 X 4 = 20 M)

1. a) Define a tautology with an example.

b) Define disjunctive normal form and conjunctive normal form of a statement formula. c) Define partially ordered relation with an example.

d) Give an example of a relation which is neither reflexive nor irreflexive

e) Define lattice and give an example. f) What is a distributive lattice.

g) Define Boolean Algebra with an example.

h) Obtain the value of the Boolean form x1(x1 x2)

i) Define minterm & maxterm.

j) Define transition diagram.

Answer Five Questions. Choose One Question from each Unit.
ALL Questions carry equal Marks 5X8=40M

UNIT-I

2. a) Show that n'+2n is divisible by n.

(OR)

b) Show that SVR is tautologically implied by (PVQ) PQ, Q→S.

UNIT-II

3. a) Let X = (1, 2, 3) if R = {(x, y)/ x EXAyEXA ((x-y) is an integral non zero multiple of 2)), S= {(x, y)/ x EXAyEXA ((x-y) is an integral non zero multiple of 3)).Find RUS and RS (b) If X = (1, 2, 3, ...). What is RS for R and S as defined in (a)

(OR)

b) Draw Hasse diagrams of ((A), C) for (a) A= (a); (b) A=(a, b); Let A be a given finite set and p(A) its power set. Let be the inclusion relation on the A= (a, b, c) (d) A= (a, b, c, d)

UNIT-III

4. a) Let (L, ≤) be a lattice. For any a, b, c E L show that the followingholds: a≤ca (b*c) ≤ (ab) * c

(OR)

b) Show that in a lattice (L.), for any a, b, cE L, the distributive inequalities hold: a (bc)<(ab) *(a@c) a (bc)≥ (ab)(a* c)

UNIT-IV

5.a) Write the following Boolean expression in an equivalent sum of products Canonical form in three variables X1, X2 and x3 (a) x1* x2;
(b) x1 x2:
(c) (x1 x2)" *x3

(OR)

b) Obtain the values of the Boolean forms x1* (xx2), xX1*X2 and x(x*x2) over the ordered pairs of the two-element Boolean algebra.

UNIT-V

6. a) Draw the karnaugh map for one variable, two variables, 3-variable, 4-variable

(OR)

b) Discuss the model of a finite state machine.

SRR & CVR GOVT.DEGREE COLLEGE(A) NAAC B^{+}

Department of Mathematics

M.Sc (MATHEMATICS) SYLLABUS

SEMESTER-II PAPER-VII

NUMERICAL METHODS LAB - 22 MATLAB 201

No. of Hours: 06 Total credits: 03
Total Marks: 100 (Internal: 40M & External: 60M)

LIST OF PROGRAMS:

1. Bisection method
2. False position method
3. Newton Raphson method
4. Secant method
5. Gauss elimination method
6. Gauss seidal method
7. Difference table method
8. Trapezoidal method
9. Simpson 1/3 rule
10. Simpson 2/3 rule2
11. Euler's method
12. Thomas method
13. LaGrange's method
14. Taylor's method
15. Runge-kutta method
16. Modified Euler's Method.

SRR & CVR GOVT. DEGREE COLLEGE (A), NAAC B^{+}

Department of Mathematics

M.Sc. MATHEMATICS SYLLABUS

SEMESTER-III PAPER-I

TOPOLOGY – 20 MAT 301

No. of Hours: 04 Total credits: 04
Total Marks: 100 (Internal: 40M & External: 60M)

Course Learning Objectives:
In this course we shall come across important notions and various definitions, theorems andtheir proofs to understand the concepts of metric spaces and topological spaces.

UNIT-I
Metric Spaces: The definition and some examples – Open sets – Closed sets – Convergence, Completeness and Baire's Theorem [Section 12 of Chapter-2]

UNIT-II
Topological Spaces: Topological Spaces - the definition and some examples – Elementary concepts – Open bases and Open sub bases. [Sections 16, 17 and 18 of Chapter-3 of Text Book]

UNIT-III
Compactness: Compact spaces – Product spaces – Tychonoff's theorem and locally compactspaces – Compactness for Metric spaces – Ascoli's Theorem. [Sections 21-24 and 25 of Chapter-4 of Text Book]

UNIT-IV
Separation: T1-Spaces and Hausdorff's spaces – Completely regular spaces and normal spaces–Urysohn's lemma and the Tietze extension theorem – The Urysohn's imbedding theorem. [Sections 26-29 of Chapter-5 of Text Book]

UNIT-V
Connectedness**:** connected spaces – The components of a space – Totally disconnected spaces–Locally connected spaces. [Chapter-6 of Text Book]

Course Learning Outcome (s):
From this course students are able to know how the topology on a space is determined by the collection of open sets and basic properties of connectedness and compactness.

Text Book:

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

Reference Book:

1. **Topology** by James R. Munkres, Second Edition, Pearson Education Asia.

SRR & CVR GOVT. DEGREE COLLEGE (A), NAAC B$^+$

M.Sc. MATHEMATICS

SEMESTER - III PAPER - I

[w.e.f. 2020 - 21 Admitted Batch]

[Question paper pattern for semester end (External) examination]

TOPOLOGY - 20 MAT 301

Time: 3 Hours. **Max.Marks:60M**

Answer any 5 Questions out of 10 Short Answer Questions **5X4=20M**

1. a) Define Metric space.
   b) Define Open set and Closed set
   c) Define Topological space.
   d) Show that $\bar{A} = A \cup D(A)$.
   e) Define compact space.
   f) State Ascoli's Theorem.
   g) Define Hausdorff's space.
   h) Define connected space.
   i) Define Cantor set and show that the cantor set is compact.
   j) Define totally disconnected space.

Answer Five Questions choosing One question from each unit.
All questions carry equal marks **5X8=40M**

UNIT I

2 a) State and prove Cantor's Intersection Theorem.

(OR)

b) Let **X** be a metric space. Then prove that
   (i) Any finite intersection of open sets is open.
   (ii) Each closed sphere is a closed set.

UNIT II

3 a) State and Prove Lindelof's theorem.

(OR)

b) Show that every separable metric space is second countable.

UNIT III

4 a) State and Prove Tychonoff's Theorem.

(OR)

b) Show that every sequentially compact metric space is compact.

UNIT IV

5 a) State and Prove Urysohn's lemma.

(OR)

b) Show that every compact Hausdorff's space is normal.

UNIT V

6 a) Prove that the Product of any non - empty class of connected space is connected.

(OR)

b) Let X be a Hausdorff's space. If X has an open base whose sets are also closed, then show that X is totally disconnected.

SRR & CVR GOVT. DEGREE COLLEGE(A), NAAC B+

Department of Mathematics

M.Sc. MATHEMATICS SYLLABUS

SEMESTER-III PAPER-II

PROBABILITY& STATISTICS - 20 MAT 302

No. of Hours: 04 Total credits : 04
Total Marks: 100 (Internal: 40M &External:60M)

Course Learning Objectives:
The objective of this course is to introduce the basic concepts of statistics like probability theory, distributions, correlation and regression techniques and sampling distributions.

UNIT-I:
Sample Space & Events - Axioms of probability - Some theorems on probability - Boole's Inequality- probability - Multiplication theorem on probability - Independent events - Multiplication theorem on probability for independent Events - Extension of Multiplication theorem on Probability to n Events - Baye's theorem.
[3.2 to 3.95 of Chapter3 & 4.2 of Chapter4]

UNIT-II:
Distribution functions: Discrete random variable - Continuous random variable - Two- Dimensional Random variables - Mathematical expectation - Moments of a distribution function - Moment generating functions - Characteristic functions and their properties –Chebychev inequality - Probability generating functions.
[5.2 to 5.5(up to 5.5.5.) of Chapter - 5, Chapter 6 except 6.7 and 7.1, 7.2, 7.3, 7.5 and 7.9 of
Chapter 7]

UNIT-III:
Distributions: Discrete Distributions Binomial - Poisson distributions and their properties - Continuous distributions - Normal and Rectangular distributions and their properties.
[8.1 to 8.5 of Chapter 8 and 9.1 to 9.3 of Chapter 9]

UNIT-IV:
Correlation and Regression: Correlation - Karl Pearson's coefficient of correlation - Calculation of correlation coefficient for bivariant frequency distribution – Spearman's rank correlation coefficient - Linear regression - Regression coefficients and their properties - Angle between regression lines.
[10.1 to 10.5 and 10.7.1 of Chapter 10 and Chapter 11 (up to 11.2.3)]

UNIT-V:
Sampling distribution: Sampling and Large sample tests, Exact sampling distributions - χ^2, '**t**' and **F**- distributions.
[Chapter-14, Chapter 15 up to 15.6.4 and Chapter 16 up to 16.6 except 16.4]

Course Learning Outcome(s):

From this course students will be able to learn the fundamental concept of statistics andtechniques required for data analysis which is widely used in practical analysis of any data.

Text Book:

Fundamentals of Mathematical Statistics by S.C. Gupta and V.K. Kapoor , 11th Edition,Sultan Chand & Sons, New Delhi.

Reference Book:

Probability and Statistics for Engineers and Scientists, 9th edition, Walpole Myers, KeyingYe Pearson Publications.

SRR & CVR GOVT.DEGREE COLLEGE (A), NAAC B$^+$

M.Sc. MATHEMATICS

SEMESTER-III PAPER-II

[w.e.f. 2020 - 21 Admitted Batch]

[Question paper pattern for semester end (External) examination]

PROBABILITY & STATISTICS - 20 MAT 302

Time: 3 Hours **Max. Marks: 60M**

1. Answer any 5 Questions out of 10 Short Answer Questions. **5 X4=20M**

k) Define equally likely event
l) Definition of Axiomatic probability.
m) Define Correlation.
n) Define random variable.
o) Define moment generating function.
p) Define Normal distribution.
q) Define characteristic function.
r) Write Application of Normal distribution.
s) Define chi-square distribution of goodness of fit.
t) Write properties of F- distribution.

Answer Five Questions. Choose One Question from each Unit.
ALL Questions carry equal Marks **5X8=40M**

UNIT - I

2. (a) State and prove multiplication theorem in probability

(OR)

(b) State and prove Baye's theorem.

UNIT - II

3. (a) prove that $\mathbf{M(X_1+X_2+X_3+X_4+\ldots\ldots+X_n) = MX_1+MX_2+MX_3+MX_4+------+MX_n}$

(OR)

(b) Write properties of Characteristic function.

UNIT - III

4. (a) Using MGF derive mean and variance of Binomial distribution

(OR)

(b) Write properties of Normal distribution

UNIT - IV

5. (a) Calculate Karl-Pearson's coefficient of correlation between expenditure advertising and sales from the data given below advertising.

Expenses (000's)	39	65	62	90	82	75	25	98	36	78
Sales (Lakhs Rs.)	47	53	58	86	62	68	60	91	51	84

(OR)

(b) What is linear regression? State and prove angle between two regression lines.

UNIT – V

6 (a) The number of scooter accidents per month in a certain town were as follows.

12 8 20 2 14 10 15 6 9 4

Are there frequencies in agreement with the belief that accident conditions were the same during this 10 month period?

(OR)

(b) Ten cartons are taken at random from an automatic filling machine. The mean net weight of the **10** cartons is 11.8 and **S.D.** is **0.15**. Does the sample mean differ significantly from the intended weight of **12.02**? You are given that for **v** = 9 and **t0.05=2.20**

SRR & CVR GOVT. DEGREE COLLEGE (A), NAAC B^{+}

Department of Mathematics

M.Sc. (MATHEMATICS) SYLLABUS

SEMESTER-III PAPER-III

GALOIS THEORY - 20 MAT 303

No. of hours: 04 Total credits:04
Total marks: 100 (Internal: 40 M & External: 60M)

Course learning objectives:
This course is the study of roots of polynomials and their symmetries in terms of Galois groups, modules and extension of fields**.**

UNIT-I
Modules: Definition and examples, sub modules and direct sums, **r**-homomorphism's and quotientmodules, completely reducible modules.
(Sections 1 to 4 of chapter 14 of [1])

UNIT-II
Algebraic extensions of fields: irreducible polynomials and Eisenstein's criterion, adjunction of roots,algebraic extensions, algebraically closed fields.
(Sections 1 to 4 of chapter 15 of [1])

UNIT-III
Normal and separable extensions: splitting fields, normal extensions, multiple roots, finite fields,separable extensions.
(Sections 1 to 5 of chapter 16 of [1])

UNIT-IV
Galois Theory: Automorphism groups and fixed fields, fundamental theorem of Galois Theory,Fundamental theorem of Algebra.
(Sections 1 to 3 of chapter 17 of [1])

UNIT-V
Applications of Galois Theory to Classical Problems: roots of unity and cyclotomic polynomials - cyclic extensions - ruler and compass constructions.
(Sections 1, 2, 5 of chapter 18 of [1])

Course learning outcome (s):
This course is able to reach the students by learning modules, fundamental theorem of Galois Theory and applications of Galois Theory to classical problems.

PRESCRIBED TEXT BOOK:

1. **Basic Abstract Algebra** by Bhattacharya P. B. Jain S. K., Nagpaul s. R, second edition, Cambridge Press.

REFERENCE BOOKS:

1. **Galois Theory** by Joseph Rotman, second edition 1998, Springer.
2. **Algebra** by Artinm, 1991, PHI.
3. **Abstract Algebra** by David S Dummit and Richard M Foote, Wiley Publications, Third Edition.

SRR & CVR GOVT. DEGREE COLLEGE (A), NAAC B$^+$

M.Sc. MATHEMATICS

SEMESTER - III PAPER - III

[w.e.f. 2020 - 21 Admitted Batch]

[Question paper pattern for semester end (External) examination]

GALOIS THEORY - 20 MAT 303

Time: 3 Hours. **Max. Marks: 60**

Answer any 5 Questions out of 10 Short Answer Questions **5X4=20M**

1. a) Define **R** - Module and a sub module.
   b) Define **R** - homomorphism and irreducible **R**-module.
   c) Define a root of polynomial and monic polynomial
   d) Show that $x^2 - 2$ is irreducible over **Z**.
   e) Define the splitting field of a polynomial and give an example.
   f) Define normal extension of a field and a prime ideal.
   g) What is meant by the fixed field of a Group homomorphism?
   h) Write a Short note on the Galois extension of a field.
   i) What is Cyclotonic polynomial? Explain with an example.
   j) Define Cyclic extension and a radical extension of a field.

Answer Five Questions choosing One question from each unit.
All Questions carry equal marks **5X8=40M**

UNIT I

2. a) Let **f** be an **R** - homomorphism of an **R** - module **M** into an **R** - module Then prove that **M / kerf ≅ f(M)**

(OR)

b) Let **R** be a ring with unity, then prove that an **R** - module **M** is cyclic iff **M ≅ R/ I**, for some left ideal **I** of **R**

UNIT II

3. a) State and prove Gauss's lemma.

(OR)

b) Define algebraic element and algebraic extension of a field. If **E** is a finite extension of a field **F**, then prove that **E** is an algebraic extension of **F**.

UNIT III

4. a) State and prove Uniqueness of splitting field.

(OR)

b) Let **f(x) ϵ F[x]** be a polynomial of degree **≥ 1** with **α** as a root, then prove that **α** is a multiple root if and only if **f ' (α) = 0.**

UNIT IV

5. a) State and prove the fundamental theorem of Galois theory.

(OR)

b) State and prove Dedekind's lemma.

UNIT V

6. a) Let **F** be a field contains a primitive $\mathbf{n^{th}}$ root unity, then prove the following are Equivalent.
   i). **E** is a finite cyclic extension of degree **n** over **F.**
   ii). **E** is the splitting field of an irreducible polynomial $\boldsymbol{x^n}$**– b ϵ F[x].**

(OR)

b) If **a** and **b** are constructible numbers, then prove that
   i) **ab** is constructible.
   ii) **a/b , b ≠ 0** is constructible

SRR & CVR GOVT.DEGREE COLLEGE (A), NAAC B^{+}

Department of Mathematics

M.Sc. MATHEMATICS SYLLABUS

SEMESTER-III PAPER-IV

MATHEMATICAL METHODS - 20 MAT 304

No. of Hours: 04 Total credits: 04
Total Marks: 100 (Internal: 40M & External: 60M)

Course Learning Objectives:
The aim of this course is provide the students with the basic knowledge of various mathematical methods we use like Fourier series, calculus of variation. Provide basic idea of difference equations and the Laplace Transformations.

UNIT-I:
Fourier Series: Fourier coefficients- Even and Odd functions- Cosine and Sine series- Fourier Series on arbitrary intervals.
[5.1, 5.3 and 5.4 of Text Book-1]

UNIT-II:
The Calculus of variations: Euler's Equation – Functions of the form:
$\int_{x_0}^{x_1} f(x, y_1, y_2, y_3, ..., y_n, y_1^{1}, y_2^{1}, y_3^{1}, ...y_n^{1})dx$ -Functional dependence on the higher order derivatives – Variational problems in parametric form and applications.
[Text Book-1]

UNIT-III:
Difference Equations: Introduction, Definition, Formation of difference equations, Linear difference equations, Rules for finding complementary function, Rules for finding the Particular Integral.
[From Text Book 2]

UNIT- IV:
Laplace Transforms: Existence of Laplace Transform- Functions of exponential-Shifting Theorems-Scale Property-Laplace Transform of derivatives- Initial and final value theorems-Laplace Transforms of integrals-multiplication by. t^n and division by t-Laplace Transform of periodic and some special function.
[Chapter 1 of the text book3].

UNIT- V:
Inverse Laplace Transforms: Shifting theorems and Scale Property of inverse Laplace transforms-Use of partial fractions-Inverse Laplace transforms to derivatives and integrals-multiplication and division by powers of p-convolution theorem-Heaviside's expansion theorem- complex inversion formulae.
[Chapter 2 of the Text Book3]

Course Learning Outcome (s):

From this course Student will be able to learn the Fourier series and calculus of variation techniques that are very much essential for engineering applications. Also they get exposed to difference equations and Laplace Transforms which are used widely.

Text Books:

1. **Differential Equations Theory, Technique and Practice** by George F. Simmons and Steven G. Krantz, Tata McGraw-Hill Edition.
2. **Higher Engineering Mathematics** by B.S. Grewal, Khanna Publishers.
3. **Integral Transforms** by A.R. Vashishta and R.K. Gupta, Krishna Prakashan Media (P) Ltd.

SRR & CVR GOVT.DEGREE COLLEGE (A), NAAC B^{+}

M.Sc. MATHEMATICS

SEMESTER - III PAPER - IV

[w.e.f. 2020 - 21 Admitted Batch]

[Question paper pattern for semester end (External) examination]

MATHEMATICAL METHODS - 20 MAT 304

Time: 3 Hours **Max. Marks: 60M**

Answer Any 5 Questions out of 10 Short Answer Questions. **5X4=20M**

1. a) Write the Dirichlet's conditions for a Fourier series.

b) Write the Fourier series expansion of even periodic function.

c) Write Euler's function formula

d) Define covariant vector & invariant vector.

e) Solve the difference equation Solve $y_{n+2} - 5y_{n+1} - 6y_n = 0$.

f) Find the extrimal of the functional $\{\sqrt{1 + (y')^2}\} / y$

g) Write the first and second shifting theorems of Laplace Transformations.

h) Find the Laplace transformation of $e^{2t} + 4t^3 - 2\sin 3t + 3\cos 3t$.

i) Find Inverse Laplace transformation of p/p^2-a^2

j) Find Inverse Laplace transformation of $\log(p+3/p+4)$

Answer any Five Questions choosing One Question from each Unit.

All questions carry equal marks **5X8=40M**

UNIT I

2. a) Find the Fourier series of the function $(x) = x\sin x$; $-\pi \le x \le \pi$.

(OR)

b) Find the Fourier series of the function (x) $= x\sin x$; $-\pi \le x \le \pi$. Deduce that $\frac{1}{1.3} - \frac{1}{3.5} + \frac{1}{5.7} - \ldots\ldots\ldots = \frac{\pi-2}{4}$

UNIT II

3 a) Find the curve passing through the points (x_1, y_1) and (x_2, y_2) and when rotated about the **X-** axis gives a minimum surface area.

(OR)

b) Prove that the necessary condition **for** $I = \int_{x1}^{x2} f(x, y, y')dx$ to have an extrimal is $\frac{\partial f}{\partial x} - \frac{\partial}{\partial x}\left\{\frac{\partial f}{\partial y}\right\} = 0$

UNIT III

4. a) (i) Solve $Y_{n+2} - 4Y_{n+1} + 3Y_n = 5^n$

(ii) Solve $Y_{n+2} - 2Y_{n+1} + Y_n = n^2 2^n$

(OR)

b) Solve the difference equation $u_{n+3} - 2u_{n+2} - 5u_{n+1} + 6u_n = 0$

UNIT IV

5. a) Prove the following Hypothesis:

If **F(t)** is continuous for all $t \geq 0$ and be of exponential order a as $t \to \infty$ and if **F(t)** is of class **A**, then the Laplace Transformation of the derivative **F'(t)** exist when **P >a** and **L[F'(t)] = PL[F(t) - F(0)]**

(OR)

b) Find the Laplace transformation of $\{e^{-at} - e^{-bt}\} / t$ and $\{J_o(t)\}$

UNIT V

6. a) Find the inverse Laplace transformation of the following functions

(i) $\frac{2p+1}{(p+2)^2(p-1)^2}$ **(ii)** $\frac{e^{-4p}}{(p-3)^4}$

(OR)

b) State and prove Convolution Theorem

SRR & CVR GOVT. DEGREE COLLEGE (A), NAAC B^{+}

Department of Mathematics

M.Sc. MATHEMATICS SYLLABUS

SEMESTER - III PAPER - V

ANALYTICAL NUMBER THEORY - 20 MAT 305

No. of Hours: 04 Total credits: 04
Total Marks: 100 (Internal: 40 M & External: 60 M)

Course Learning Objectives:
This course is introduced to illustrate how general methods of analysis can be used to obtain results about integers and prime number

UNIT-I
Arithmetical Functions and Dirichlet Multiplication: Introduction, The Mobius function **μ(n)**, The Euler Totient function **φ(n)**, A relation connecting **φ** and **μ**, A product formula for **φ(n)**, The Dirichlet product of arithmetical functions, Dirichlet inverses and Mobius inversion formula, The Mangoldt function **Λ(n)**, Multiplicative functions, Multiplicative functions and Dirichlet multiplication, The inverse of a completely multiplicative function, Liouville's function **λ(n)**, The divisor function $\sigma_Z(n)$. Generalized convolutions.
(Sections 2.1 to 2.14 of Chapter 2)

UNIT-II
Averages of Arithmetical Functions: Introduction, The big oh notation Asymptotic equality of functions, Euler's summation formula, Some elementary asymptotic formulas, The average order of **d(n)**, The average order of divisor functions $\sigma_Z(n)$, The average order of **φ(n)**, An application to the distribution of lattice points visible from the origin, The average order of **μ(n)** and **Λ(n)**, The partial sums of a Dirichlet product, Applications to **μ(n)** and **Λ(n)**, Another identity for the partial sums of a Dirichlet product.
(Sections 3.1 to 3.12 of Chapter 3)

UNIT-III
Some Elementary Theorems on the Distribution of Prime Numbers: Introduction, Chebyshev's functions **ψ(x)** and **ϑ(x).** Relations connecting **ϑ(x)** and **π(x),** Some equivalent forms of the prime number theorem, Inequalities of **π(n)** and ***pn*,** Shapiro's Tauberian theorem, Application of Shapiro's theorem, An asymptotic formulae for the partial sums $\sum_{psk}\left(\frac{1}{p}\right)$. The Partial Sums of the Mobius function.
(Sections 4.1 to 4.9 of Chapter 4)

UNIT-IV
Congruence's: Definition and basic properties of congruences, Residue classes and complete residue systems, Linear congruences, Reduced residue systems and Euler - Fermat theorem, Polynomial congruences modulo **p**, Lagrange's theorem, Applications of Lagrange's Theorem, (Sections 5.1 to 5.5 of Chapter 5)

UNIT-V

Simultaneous linear congruences, The Chinese remainder theorem, Applications of the Chinese
(5.6 to 5.9 of Chapter 5).

Course Learning Outcome (s):

From this students are able to understand better the distribution of prime numbers, and understanding the proof of Dirichlet's Theorem.

PRESCRIBED TEXT BOOK:

1. **Introduction to Analytic Number Theory** by Tom M. Apostol, Narosa Publishing House, New Delhi.

REFERENCE BOOK:

1. **An Introduction to the Theory of Numbers** by Hardy G. H. and Wright E. M., Oxford Press

SRR & CVR GOVT. DEGREE COLLEGE (A), NAAC B$^+$

M.Sc. MATHEMATICS

SEMESTER - III PAPER - V

[w.e.f. 2020 - 21 Admitted Batch]

[Question paper pattern for semester end (External) examination]

ANALYTICAL NUMBER THEORY - 20 MAT 305

Time: 3 Hours. **Max.Marks:60M**

Answer any 5 Questions out of 10 Short Answer Questions **5X4=20M**

1. a) Define Mobius function **μ(n).**
   b) Define multiplicative function.
   c) Define the average order of **d(n**).
   d) Write the average order of **μ(n)** and **∧(n).**
   e) Define Chebyshev's functions.
   f) State Shapiro's Tauberian theorem.
   g) Write an expression of an asymptotic formula for the partial sums.
   h) Prove congruence is an equivalence relation.
   i) State Little Fermat's Theorem.
   j) Solve the congruence **5x ≡ 3(mod24).**

Answer Five Questions choosing One question from each unit.
All questions carry equal marks **5X8=40M**

UNIT I

2. a) Define the Dirichlet product. State and prove Mobius Inversion formula.

(OR)

b) Show that if both **g** and **f *g** are multiplicative, and then **f** is also multiplicative.

UNIT II

3. a) State and prove Euler's summation formula.

(OR)

b) State and prove Legendre's Identity

UNIT III

4. a) Show that the following relations are logically equivalent:

(i) $\lim_{x\to\infty} \frac{\pi(x)\log x}{x} = 1$

(ii) $\lim_{x\to\infty} \frac{\vartheta(x)}{x} = 1$

(iii) $\lim_{x\to\infty} \frac{\psi(x)}{x} = 1$

(OR)

b) State and prove Abel's Identity.

UNIT IV

5. a) State and prove Chinese Remainder Theorem.

(OR)

b) State and prove Wilson's Theorem.

UNIT V

6. a) Show that a finite Abelian group **G** of order n has exactly **n** distinct characters.

(OR)

b) Let **A*** denote the conjugate transpose of a matrix **A**, then show that **AA* = nI**, where **I** is the **n x n** identity matrix and hence n^{-1} **A*** is the inverse of **A**

SRR & CVR GOVT.DEGREE COLLEGE (A), NAAC B^{+}

Department of Mathematics

M.Sc. (MATHEMATICS) SYLLABUS

SEMESTER-III PAPER-VI

NUMERICAL METHODS - 20 OE MAT 306

(Open Elective – II)

No. of Hours: 04 Total credits: 04
Total Marks: 100 (Internal: 40M & External: 60M)

Course Learning Objectives:
This Course is introduced a broad range of Numerical methods for solving Mathematical problems that arise in Science and Engineering and helps to choose, develop and apply the appropriate Numerical techniques for the Mathematical problems.

UNIT-I
Solution of Algebraic & Transcendental Equations: Introduction - The Bisection method - The method of false position - Newton Raphson method.
[Sections 2.1, 2.2., 2.4, 2.5 from Chapter 2 of Text Book 1].

UNIT-II
Interpolation: Finite differences - Forward differences, Backward difference, Central Differences, Symbolic relations, Differences of a polynomial, Newton's formulas for interpolation, Central Difference interpolation formulae, Gauss' central difference formulae, Sterling's formula, Lagrange's Interpolation formula.
[Sections 3.3, 3.5, 3.6, 3.71, 3.72, 3.9.1 from chapter 3 of Text Book 1].

UNIT-III
Curve fitting: Least - squares curve fitting procedures - fitting a straight line, Non - linear Curve fitting, Curve fitting by a sum of exponential.
(Sections 4.2 from chapter 4 of Text Book 1).

UNIT-IV
Numerical integration: Trapezoidal rule- Simpsons 1/3 rules, Simpson's 3/8 rule.
(Sections 5.4.1, 5.4.2, 5.4.3 from chapter 5 of Text Book 1]

UNIT-V
Numerical Solution of Ordinary Differential Equations: Solution by Taylor's series, Picard's method of successive approximations, Euler's method, modified Euler's method, Runge - Kutta method fourth order only. (Sections 7.2, 7.3, 7.4, 7.5 from chapter 7 of Text Book 1)

Course Learning Outcome(s):

From this Course Students are able to learn how to apply the Numerical method for various Mathematical operations and tasks such as Interpolation, Differentiation, Integration, the solution of Differential Equations analyze and evaluate the accuracy of common Numerical methods.

PRESCRIBED TEXT BOOK:

1. **Introductory method of Numerical Analysis** by S.S. Sastry, Third Edition, 1993, Prentice Hall of India Pvt. Ltd., New Delhi.

REFERENCE BOOK:

1. **Numerical Methods for Scientific and Engineering Computation** by M. K. Jain, S. R. K. Iyengar, R. K.Jain, New Age International (P) Limited, Publishers, 5th Edition.

SRR & CVR GOVT. DEGREE COLLEGE (A), NAAC B^{+}

M. Sc. MATHEMATICS

SEMESTER - III PAPER - VI

[w.e.f. 2020 - 21 Admitted Batch]

[Question paper pattern for semester end (External) examination]

NUMERICAL METHODS - 20 OE MAT 306

(Open Elective – II)

Time: 3 Hours **Max. Marks: 60**

Answer any 5 Questions out of 10 Short Answer Questions **5X4=20M**

1. a) Write the first and second approximation formulae of the method of false position.
b) Define Algebraic and Transcendental functions.
c) Define forward differences.
d) Show that $\mathbf{E = 1+\Delta}$
e) Write the normal equations of fitting a straight line.
f) Explain briefly the power function.
g) Write the formula of Trapezoidal rule.
h) Write the formula of Simpson's $\left(\frac{3}{8}\right)^{th}$ rule.
i) Write the Taylor's series expression for any function **y(x).**
j) Write the iterative formula of Modified Euler's method.

Answer five Questions choosing One question from each unit.
All Questions Carry equal marks **5X8=40M**

UNIT - I

2. a) Find the real root of the equation $\mathbf{x^3 - 3x - 5 = 0}$ using Newton's Raphson method.

(OR)

b) Find a real root of the equation $\mathbf{f(x) = x^3 – x – 1 = 0}$ using Bisection met

UNIT – II

3. a) The population of a town in the decimal census was as given below.

Years	**1891**	**1901**	**1911**	**1921**	**1931**
Population of Y (in Thousands)	**46**	**66**	**81**	**93**	**101**

Estimate the population for the year 1895 using Newton's backward difference interpolation formula.

(OR)

b) If **y (1) = -3, y (3) = 9, y (4) = 30 and y (6) = 132**, find the four point Lagrange's Interpolation polynomial that takes the same values as the function **y** at the given points.

UNIT – III

4. a) Fit a straight line of the form $\mathbf{y = a_0 + a_1 x}$ to the data.

x	1	2	3	4	6	8
y	2.4	3.1	3.5	4.2	5.0	6.0

(OR)

b) Fit a polynomial of the second degree to the data points given in the following table.

x	0.0	1.0	2.0
y	1.0	6.0	17.0

.

UNIT – IV

5. a) Evaluate **I** = $\int_0^1 \frac{dx}{1+x}$, correct to the three decimal places using Trapezoidal rule.

(OR)

b) Apply Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule to the integral **I** = $\int_0^1 \sqrt{1-x^2}\,dx$.

UNIT – V

6. a) Solve **y' = -y, y(0) =1**, using Euler's method.

(OR)

b) Solve $\frac{dy}{dx} = y - x$, **y (0) = 2**, find **y(0.1**) and **y(0.2), c**orrect to four decimal places using Runge-Kutta fourth order formula.

SRR & CVR GOVT. DEGREE COLLEGE(A), NAAC B^{+}

Department of Mathematics

M.Sc. MATHEMATICS SYLLABUS

SEMESTER - III PAPER -VII

Python Lab - 20 L MAT 307

No. of Hours: 03 Total credits:00
Total Marks: 100 (Internal: 40M & External: 60M)

List of Programs:

1. Write Python Program to reverse a number and also find the Sum of digits in the reversed number. Prompt the user for input.
2. Write Python code to print all prime numbers between an interval.
3. Write Python code to check if a given year is a leap year or not.
4. Write Python code to determine whether the given string is a Palindrome or not using slicing.
5. Write Python program to add two matrices and also find the transpose of the resultant matrix.
6. Write Python program to swap two numbers without using Intermediate Temporary variables. Prompt the user for input.
7. Consider a Rectangle Class and Create Two Rectangle Objects. Write Python program to Check Whether the Area of the First Rectangle is Greater than Second by Overloading > Operator.
8. Write Python program to count the number of times an item appears in the list.
9. Write Python program to convert uppercase letters to lowercase and vice versa.
10. Write Python program to perform a linear search for a given Key number in the list and report Success or Failure.
11. Write Python program to sort numbers in a list in ascending order using Bubble Sort by passing the list as an argument to the function call.
12. Write Python program to Calculate Area and Perimeter of different shapes using Polymorphism

SRR & CVR GOVT. DEGREE COLLEGE (A), NAAC B^{+}

M.Sc. MATHEMATICS

SEMESTER IV PAPER I

MOOCS – 20 MO MAT 401

No. of Hours : 04. **Max. Marks : 100**
Total Credits : 04. **(Internal:40M & External:60M)**

MOOCS : NPTEL / SWAYAM / NSE-NCFM Any course related to **M.Sc**. Mathematics from the authentic sources with prior permission

Typical Structure of a MOOC : The common duration of **a MOOC** is from 6 to 12 weeks. A MOOC is accessible 24 hours a day, 7 days a week. The majority of the content is to delivered asynchronously (meaning students can access it in their own time and at their own place). However, sometimes there can be optional synchronous events such as 'live' webinars (interactive sessions) which require participants to join in at a specific dates/times.

- A standard class becomes in a **MOOC** a set of videos of 5-10 minutes each
- The learning of students in a **MOOC** is usually accessed by multiple choice questions
- An important component of **MOOCS** is assignments. Students have to upload assignment solutions into the **MOOC** platform

Assignments can be evaluated and graded :

- Automatically when possible
- Peer-to-Peer students evaluate and grade themselves .
- Another component is the forum , where students post questions that other students can answer

Usually, there are no pre requisites for taking **a MOOC ,** apart from having access to a computer with an internet connection .Most of the time, the educational or a academic background of students is not important. Students usually don't need to buy any books for these courses, because all reading is either be provided with in the MOOC content or is linked to open access texts.

SRR & CVR GOVT. DEGREE COLLEGE (A), NAAC B^{+}

M.Sc. (MATHEMATICS) SYLLABUS

SEMESTER-IV PAPER-II

INTEGRAL TRANSFORMS – 20 ET MAT 402(B)

ELECTIVE -I

No. of Hours: 04 Total credits:04
Max. Marks: 100 (Internal: 40M & External: 60M)

Course Learning Objectives:
The objective of this course is to teach students to comprehend the Laplace transforms to solve Ordinary Differential Equations, Fourier and Hankel Transforms.

UNIT-I:
Laplace Transforms: Existence of Laplace Transform - Functions of exponential – Shifting Theorems - Scale Property - Laplace Transform of derivatives - Initial and final value theorems - Laplace Transforms of integrals - multiplication by. $\boldsymbol{t}$ and division by **t** – Laplace Transform of periodic and some special function.
[Chapter1of the text book].

UNIT-II:
Inverse Laplace Transforms: Shifting theorems and change of Scale Property of inverse Laplace transforms - Use of partial fractions - Inverse Laplace transforms to derivatives and integrals - multiplication and division by powers of **p**-convolution theorem - Heaviside's expansion theorem-complex inversion formulae.
[Chapter 2 of the Text Book]

UNIT-III:
Fourier Integral formula - Fourier Transform - Inversion Theorem for Complex Fourier transform
- Fourier sine transform - Inversion formula for Fourier sine transform – Fourier cosine transform - Inversion formula for Fourier cosine transform - Linearity property of Fourier transform - Change of Scale property - Shifting Property - Modulation theorem – Theorem - Multiple Fourier Transforms – Convolution - The Convolution Theorem– Parseval's identity.
[6.3to6.19 of chapter VI of the Text Book]

UNIT- IV:
Finite Fourier sine transforms-inversion formula for sine transform-Finite Fourier cosine transform - inversion formula for cosine transform - Multiple finite Fourier transforms - Operational properties of finite Fourier sine transforms - Operational properties of finite Fourier cosine transforms - Combined properties of finite Fourier sine and cosine transforms convolution.
[7.1to7.9 of chapter VII of the Text Book]

UNIT-V:

Hankel Transforms-Inversion formula for the Hankel transform-Some important Results for Bessel Functions-Linearity Property-Hankel transform of the Derivatives of a function-Hankel transform of $\frac{d^2 f}{dx^2} + \frac{1}{x}\frac{df}{dx} - \frac{n^2}{x^2} f$ – Parseval's Theorem.

[9.1 to 9.7 of chapter IX of the Text Book]

Course Learning Outcome (s):

From this course students are able to learn how to apply the concepts of transforms in solving problems in applications of Mathematics.

Text Book:

1. Integral Transforms by A.R. Vashishta and R.K. Gupta, Krishna Prakashan Media (P) Ltd.

Reference Books:

1. Hildenbrand, Methods of Applied Mathematics, PHI. New Jersey, 1960.
2. E.O. Brigham, The Fast Fourier Transforms, Prentice Hall, New Jersey, 1988.
3. E.I. Jury, Theory and Applications of Z - Transforms Method, John Wiley, 1964.

SRR & CVR GOVT. DEGREE COLLEGE (A), NAAC B^+

M.Sc. MATHEMATICS

SEMESTER-IV PAPER-II

[W.e.f. 2020 - 21 Admitted Batch]

[Question paper pattern for semester end (External) examination]

INTEGRAL TRANSFORMS - 20 ET MAT 402 (B)

(Elective – 1)

Time: 3 Hours. **Max. Marks: 60M**

Answer Any 5 questions out of 10 Short Answer Questions **5X4M=20M**

1 a) Write First and Second Shifting theorems of Laplace Transformation.

b) Find the Laplace Transformation of $\mathbf{e^{2t} + 4t^3 - 2\sin 3t + 3\cos 3t.}$

c) Find Inverse Laplace Transformation of $\mathbf{p / \{p^2 - a^2\}}$

d) Find Inverse Laplace Transformation of $\mathbf{\log [p + (3/p) + 4)].}$

e) State and Prove Modulation Theorem.

f) Find the sine and cosine Transform of $\mathbf{2e^{-5x} + 5e^{-2x}}$

g) Define Fourier finite sine and cosine Transform.

h) Find the Fourier Cosine Transform of $\mathbf{e^{-x^2}}$

i) Define Hankel Transform.

j) Write Linearity Property.

Answer any Five Questions choosing one question from each unit.

All questions carry equal marks **5X8=40M**

UNIT I

2 a) Prove the following Hypothesis:

If **F(t)** is continuous for all $\mathbf{t \geq 0}$ and be of exponential order as $\mathbf{t \to \infty}$ and if **F(t)** is of class of **A** , then the Laplace transformation of the derivative **F'(t)** exist when $\mathbf{p > a}$ and $\mathbf{L[F'(t)] = p\, L[F(t) - F(0)]}$

(OR)

b) Find the Laplace transformation of $\frac{e^{-at} - e^{-bt}}{t}$ and $\{J_0(t)\}$

UNIT II

3 a) Find the Inverse Laplace Transformation of the following functions

(i) $\frac{2p+1}{(p+2)^2(p-1)^2}$ (ii) $\frac{e^{-4p}}{(p-3)^4}$

(OR)

b) State and Prove Heaviside's Expansion Theorem.

UNIT-III

4 a) State and Prove Inversion Theorem for complex Fourier Transform.

(OR)

b) State and Prove Convolution Theorem.

UNIT-IV

5 a) Find the Inverse Fourier Cosine Transform of $\mathbf{f(x) = e^{-x}}$

(OR)

b) Find the Inverse Fourier Sine Transform of $\mathbf{f(x)} = \frac{1-cosn\pi}{n^2\pi^2}$

UNIT-V

6 a) State and Prove Inversion Theorem of Hankel Transform

(OR)

b) State and Prove Parseval's Identity of Hankel Transform.

SRR & CVR GOVT.DEGREE COLLEGE (A), NAAC B^{+}

Department of Mathematics

M.Sc. (MATHEMATICS) SYLLABUS

SEMESTER-IV PAPER-III

LINEAR PROGRAMMING - 20 ET MAT 403(B)

(Elective-II)

No. of Hours: 04 Total credits:04
Total Marks: 100 (Internal: 40M & External:60M)

Course Learning Objectives:
The objective of Linear programming is the linear equation which is representing some quantity which is to be maximized or minimized subject to the given constraints**.**

UNIT-I:
Overview of operations research: OR models - OR Techniques- Linear Programming- Introduction - Graphical solution - The standard form of linear programming problems- Basic feasible solutions- Unrestricted variables - Simplex Method.

UNIT-II:
Concept of Duality: Artificial variables - Big **M** and Two phase methods - Degeneracy - Alternative optima - Unbounded solutions - infeasible solutions.

UNIT-III:
Duality concept- Dual problems - Relation between primal and dual Problems Complementary slackness conditions - Dual simplex method.

UNIT-IV:
Transportation and Assignment Problems: Transportation model - Basic feasible solutions - North West corner Rule - Lowest cost method - Vogel approximation method - transportation algorithm (**MODI** - method).

UNIT-V:
Assignments problem – Description and mathematical formulation of the problem - Hungarian method.

Course Learning Outcome(s):
Students are able to learn how to formulate a given real world problem as a linear programming model and solve using simplex method and also learn transportation and assignment problems.

Text Book: Operations Research, Theory and Applications by J.K. Sharma.

Reference Books: 1. Operations Research, An Introduction- Hardy A. Taha, Seventh Edition.

2. Introduction to Operations Research- Hillier Lieberman, Tata McGraw Hill.

SRR & CVR GOVT.DEGREE COLLEGE (A), NAAC B^{+}

M.Sc. MATHEMATICS

SEMESTER - IV PAPER - III

[w.e.f. 2020 - 21 Admitted Batch]

[Question paper pattern for semester end (External) examination]

LINEAR PROGRAMMING - 20 MAT 403 (B)

(Elective – II)

Time: 3 Hours **Max. Marks: 60M**

Answer Any 5 Questions out of 10 Short Answer Questions **5X4=20M**

1. a) Write the general form of a Linear Programming Problem (LPP)

. b) With reference to an LPP define slack and surplus variables

c) Explain artificial variable of a LPP

d) Explain unbounded solution of a LPP

e) State the dual primal relation ships

f) What is meant by duality in LPP?

g) State the transportation problem in the format of a LPP

h) Explain North - West corner rule.

i) Give a mathematical formulation of the assignment problem.

j) What is an assignment problem.

Answer Five Questions Choosing One Question from each Unit.

ALL Questions carry equal Marks **5X8=40M**

UNIT I

2. a). Solve the following LPP by graphical method.

Maximize $\mathbf{Z = x_1 + 3x_2}$

Subject to constraints $\mathbf{3x_1 + 6x_2 \leq 8}$

$\mathbf{5x_1 + 2x_2 \leq 10}$ and $\mathbf{x_1, x_2 \geq 0}$.

(OR)

b). Solve the following LPP by simplex procedure.

Maximize $\mathbf{Z = 5x_1 + 3x_2}$

Subject to constraints $\mathbf{x_1 + x_2 \leq 2}$

$\mathbf{5x_1 + 2x_2 \leq 10,}$

$\mathbf{3x_1 + 8x_2 \leq 12}$ and $\mathbf{x_1, x_2 \geq 0}$

UNIT II

3. a). Solve the following LPP by Big - **M** method.

Minimize $Z = 4x_1 + 3x_2$

Subject to constraints $2x_1 + x_2 \geq 10$

$-3x_1 + 2x_2 \leq 6$

$x_1 + x_2 \geq 6$ and $x_1, x_2 \geq 0$

(OR)

b). Use Two - phase simplex method. to

Minimize $Z = 3x_1 + 2x_2$

Subject to constraints $2x_1 + x_2 \leq 2$

$3x_1 + 4x_2 \geq 12$ and $x_1, x_2 \geq 0$

UNIT III

4. a). Use dual simplex method to solve the following LPP.

Minimize $Z = x_1 + 2x_2 + 3x_3$

Subject to constraints $x_1 - x_2 + x_3 \geq 4$

$x_1 + x_2 + 2x_3 \leq 18$

$x_2 - x_3 \geq 2$ and $x_1, x_2, x_3 \geq 0$.

(OR)

b). Use complementary slackness conditions to solve the following LPP:

Minimize $Z = 3x_1 + x_2$

Subject to constraints $x_1 + x_2 \geq 1$;

$2x_1 + 3x_2 \geq 2$; $x_1, x_2 \geq 0$

UNIT IV

4. a). Solve the following TP by considering the initial feasible solution by Vogel's approximation method.

	M_1	M_2	M_3	M_4	Supply
A	6	3	5	4	22
B	5	9	2	7	15
C	5	7	8	6	8
Demand	7	12	17	9	

(OR)

b). Find the optimal solution to the following transportation problem obtaining the initial basic feasible solution by North - West Corner rule.

	M_1	M_2	M_3	M_4	Supply
A	7	9	3	2	16
B	4	4	3	5	14
C	6	4	5	8	20
Demand	11	9	22	8	

UNIT V

5. a). Describe an algorithm for the solution of the assignment problem.

(OR)

b). Solve the following assignment problem represented by the following matrix.

	A	B	C	D
1	10	25	15	20
2	15	30	5	15
3	35	20	12	24
4	17	25	24	20

SRR & CVR GOVT.DEGREE COLLEGE (A), NAAC B+

Department of Mathematics

M.Sc. (MATHEMATICS) SYLLABUS

SEMESTER-IV PAPER-IV

FUNCTIONAL ANALYSIS – 20 MAT 404

No. of Hours: 04 Total credits:04
Total Marks: 100 (Internal: 40M & External:60M)

Course Learning Objectives:
The Objective of the course is to introduce students to the ideas and some of the fundamental theorems of functional analysis on Banach Spaces, Hilbert Spaces & fixed point theory.

UNIT-I

Banach Spaces: Normed space – Banach space – properties of normed spaces – Finite dimensional normed spaces and subspaces – Compactness and finite dimension – Linear operators – Bounded and continuous linear operators – Linear functional - Linear operators and functional on finite dimensional spaces – Normed spaces of operators – Dual space. [2.2 – 2.10 of Text Book]

UNIT-II

Hilbert Space: Inner product space – Hilbert space – Properties of inner product spaces – Orthogonal complements and direct sums – Orthonormal sets and Sequences - Series related to orthonormal sequences and sets.

[3.1-3.5 of Text Book]

UNIT-III

Proper ties of Hilbert Space: Total orthonormal sets and sequences – Representation of functional on Hilbert spaces – Hilbert-Adjoint operator – Self Adjoint, unitary and normal operators.

[3.6 and 3.8-3.10 of Text Book]

UNIT-IV

Fundamental Theorems: Hahn Banach theorem for complex vector spaces and normed spaces– Adjoint operator – Reflexive space – Uniform boundedness theorem – Open mapping theorem – Closed graph theorem.

[4.3, 4.5-4.7, 4.12 and 4.13 of Text Book]

UNIT-V

Banach Fixed point Theory: Banach fixed pont theorem-applications of Banach's theorem to linear equations- -applications of Banach's theorem to differential equations --applications of Banach's theorem to integral equations.

[5.1 to 5.4 of Text Book]

Course Learning Outcome (s):

From this course students will be able to learn and apply the ideas from the theory of Banach Spaces, Hilbert Spaces & Fixed Point Theory.

Prescribed Text Book:

1. **Introductory Functional Analysis with Applications** by Erwin Kreyszig, John Wiley & Sons, 1989.

Reference Books:

1. **Introduction to Topology and Modern Analysis** by G. F. Simmons, McGraw-Hill Edition.
2. **Introduction to Functional analysis,** by E. Taylor, Wiley International Edition.
3. **First Course in Functional analysis,** by C. Goffman and G. Pedrick, 1991, Prentice Hall of IndiaPrivate Limited.
4. **Functional Analysis** by B.V. Limaye, New Age International Publishers, Third Edition.

SRR & CVR GOVT. DEGREE COLLEGE (A), NAAC B$^+$

M.Sc. MATHEMATICS

SEMESTER - IV PAPER - IV

[w.e.f. 2020 - 21 Admitted Batch]

[Question paper pattern for semester end (External) examination]

FUNCTIONAL ANALYSIS - 20 MAT 404

Time: 3 Hours. **Max.Marks:60M**

Answer any 5 Questions out of 10 Short Answer Questions 5X4M=20M

1. a) State Schwarz inequality and Triangle Inequality.
   b) Define inner product space & orthogonality.
   c) Define Hilbert space and Banach space.
   d) State Baire's Category Theorem in Complete metric space.
   e) Define Total Orthonormal Set.
   f) Define Hilbert - Adjoint operator.
   g) Define reflexive space.
   h) Define Closed - Linear operator.
   i) Define Contraction **T** on a metric space.
   j) Define Fred Holm and Volterra integral equations.

Answer any 5 Questions choosing One question from each unit.
All questions carry equal marks. 5X8=40M

UNIT I

2. a) Show that every finite dimensional subspace **Y** of a normal space **X** is complete. In particular, every finite dimensional normed space is complete.

(OR)

b) If **Y** is a Banach space then, prove that (the set of all bounded linear operators from **X** into **Y**) **B(X, Y**) is a Banach space.

UNIT II

3. a) State and prove Bessel's Inequality.

(OR)

b) State and prove Minimizing vector Theorem.

UNIT III

4. a) State and prove Riesz - Representation Theorem.

(OR)

b) Let the Operators **U: H → H and V: H → H** be unitary and **H** is Hilbert space. Then prove that a bounded linear operator **T** on a complete Hilbert space **H** is unitary if and only if **T** is isomeric and surjective.

UNIT IV

5. a) State and prove Generalized Hahn - Banach Theorem.

(OR)

b) State and prove Open Mapping Theorem.

UNIT V

6. a) State and prove Banach fixed point theorem.

(OR)

b) State and prove Picard's Existence and Uniqueness theorem.

S.R.R & C.V.R GOVT DEGREE COLLEGE (A), VJA.
M.Sc. MATHEMATICS
SEMESTER –IV PAPER - V

MEASURE AND INTEGRATION – 20 MAT 405

No. of Hours: 04 **Total credits: 04**
Max.Marks: 100 **(Internal: 40 M & External: 60 M)**

Course Learning Objectives:
The objectives of the course are to acquire the basic knowledge of measure theory needed to understand functional analysis.

UNIT-I
Lebesgue Measure: Introduction, Outer measure, Measurable sets and Lebesgue measure, A non- measurable set, Measurable functions, Little wood‟s three principles. (Chapter 3)

UNIT-II
The Lebesgue Integral: The Riemann Integral, The Lebesgue Integral of a bounded function over a set of finite measure, The Integral of a non- negative function Integral. (Sections 4.1 to 4.4 of Chapter 4).

UNIT-III
Differentiation and Integration: Differentiation of monotone functions, Functions of bounded variation, Differentiation of an Integral, Absolute continuity. (Sections 5.1 to 5.4 of Chapter 5)

UNIT-IV
Measure and Integration: Measure spaces, Measurable functions, Integration, General Convergence theorems, Signed Measures, The Radon-Nikodym theorem.(Sections 11.1 to 11.6 of Chapter 11)

UNIT-V
Measure and Outer Measure: Outer Measure and Measurability, The Extension theorem, Product measures.
(Sections 12.1, 12.2 & 12.4 of Chapter 12).

Course Learning Outcome(s):
From this course students are able to learn the concepts of measure theory and differentiation and integration of naonotone functions.

PRESCRIBED BOOK:

1. **Real Analysis** by H.L. Royden, Third Edition, Pearson pub.

REFERENCE BOOKS:

1. **Measure Theory** by P. R. Halmos, 1974, Springer-Verlag.
2. **Measure Theory** by V.I. Bogachev, 1997, Springer-Verlag.

S.R.R & C.V.R GOVT DEGREE COLLEGE (A), VJA.
M.Sc. MATHEMATICS
SEMESTER –IV PAPER - V
[w.e.f. 2020 - 21 Admitted Batch]
[Question paper pattern for semester end (External) examination

MEASURE AND INTEGRATION 20 MAT 405

Time: 3 Hours **Max.Marks:60M**

Answer any 5 questions out of 10 short answer questions **5X4=20M**

1.a) Define Outer measure
b) State Fatou's Lemma.
c) State bounded Convergence Theorem
d) State Jordan decomposition theorem.
e) State Radon Nikodym Theorem.
f) Define Measurable set.
g) Define Countable set.
h) Define Product measure.
i) Define Measurability.
j) Define Positive set and Negative set.

Answer Five Questions. Choose one Question from each Unit.
ALL Questions carry equal Marks

5X8=40M

UNIT I

2. (a) State and Prove Egoroff's theorem.

(OR)

(b) If{ En} is a decreasing sequence of measurable sets with mE1 finite, then Show that m(En) = lim m(En).

UNIT II

3. (a) State and Prove Lebesgue convergence theorem

(OR)

(b) Let f be a non negative function which is integrable over a set E. Then Show that given $\epsilon > 0$, there is a $\delta > 0$ such that for every set A E with $mA < \delta$, $f < \epsilon$ A.

UNIT III

4. (a) State and Prove Vitali Covering Lemma.

(OR)

(b) If f is absolutely continuous on [a,b] and f1(x)=0 a.e., then show that f is constant.

UNIT IV

5. (a) Define positive set and negative set with respect to a signed measure γ.Prove that the union of countable collection of positive sets is positive.

(OR)

(b) State and prove the Jordan Decomposition Theorem.

UNIT V

6. (a)State and prove the Caratheodary Extension Theorem.

(OR)

(b)State and prove Fubini's Theorem.

SRR & CVR GOVT.DEGREE COLLEGE (A), NAAC B^{+}

Department of Mathematics

M.Sc. (MATHEMATICS) SYLLABUS

SEMESTER-IV PAPER-VI

SEMINAR - 20 SM MAT 406

No. of Hours: 06 Total credits: 03
Total Marks: 100 (Internal: 50M & External: 50M)

The student will be given seminar topics at the beginning of the IV semester by faculty In-charge and the student has to present the topics, submit the hard copy of seminar topicreport at the end of the IV semester. Out of a total of 100 marks, for the Seminar Evaluation, 50 marks shall be for Seminar report/record and 50 marks for the End Semester Examination (Viva - Voce). The Viva - Voce shall be conducted by a committee consisting of HOD, faculty in charge and a senior faculty member/external examiner nominated by the university.