Pre Revision

Study & Evaluation Scheme

of

Master of Science
(Mathematics)

[Applicable for Academic Session 2018-19]
[Approved by Hon'ble VC dated August 08, 2017]
[With revision approved by VC date July 23, 2018, August 14, 2018 & November 29, 2019]

TEERTHANKER MAHAVEER UNIVERSITY
N.H.-24, Delhi Road, Moradabad, Uttar Pradesh-244001
Website: www.tmu.ac.in

Study and Evaluation Scheme
Semester I

S. No.	Subject Code	Subject	Periods			Credit	Evaluation Scheme		
			L	T	P		Internal	External	Total
1	MAT111	Differential Equation	4	-	-	4	40	60	100
2	MAT112	Real Analysis	4	-	-	4	40	60	100
3	MAT113	Linear Algebra	4	-	-	4	40	60	100
4	MAT115	Research Methodology	3	1	-	4	40	60	100
5	**MAT116**	Computer System & Programming in C^{++}	3	-	-	3	40	60	100
6	**MAT161**	Computer System & Programming in C^{++} (Lab)	-	-	2	1	50	50	100
7	MOOC11	MOOC Program-I (Optional)	-	-	-	1/2	-	100	100
8	MSC111	Discipline & General Proficiency	-	-	-	-	100	-	100
		Total	18	1	2	20	350	350	800

Semester II

S. No.	Subject Code	Subject	Periods			Credit	Evaluation Scheme		
			L	T	P		Internal	External	Total
1	MAT211	Complex Analysis	4	-	-	4	40	60	100
2	MAT212	Advance Abstract Algebra	4	-	-	4	40	60	100
3	MAT213	Numerical Techniques	4	-	-	4	40	60	100
4	MAT214	Topology	4	-	-	4	40	60	100
5	MAT215	Operation Research	4	-	-	4	40	60	100
6	MAT261	Numerical Techniques (Lab)	-	-	2	1	50	50	100
7	MOOC12	MOOC Program-II (Mandatory)	-	-	-	1/2	-	100	100
8	MSC211	Discipline & General Proficiency	-	-	-	-	100	-	100
		Total	20	0	2	22/23	350	450	800

Semester III

S. No.	Subject Code	Subject	Periods			Credits	Evaluation Scheme		
			L	T	P		Internal	External	Total
1	MAT311	Functional Analysis	4	-	-	4	40	60	100
2	MAT312	Partial Differential Equations	4	-	-	4	40	60	100
3	MAT314	Graph Theory	4	-	-	4	40	60	100
	Departmental Elective-I								
4	MAT315	Probability & Mathematical Statistics	3	-	-	3	40	60	100
	MAT316	Calculus of variations and Integral Equation							
	Open Elective								
5	MSC011	Industrial Safety & Health Hazards	4	-	-	4	40	60	100
	MSC012	Elementary Biophysics							
	MSC013	Statistical Techniques in Data Mining							
	MSC014/ ECS411/511/ 611	Database Management System							
6	MOOC13	MOOC Program-III (Mandatory)	-	-	-	1/2	-	100	100
7	MSC311	Discipline & General Proficiency	-	-	-	1	100	-	100
		Total	19	0	0	21/22	300	400	700

Semester IV

S. No.	Subject Code	Subject	Periods			Credits	Evaluation Scheme		
			L	T	P		Internal	External	Total
1	MAT411	Number Theory	3	-	-	3	40	60	100
2	MAT412	Advance Discrete Mathematics	4	-	-	4	40	60	100
Departmental Elective-II									
3	MAT413	Fourier & Integral Transform	3	-	-	3	40	60	100
	MAT414	Fuzzy sets & its application							
4	MAT461	MATLAB Programming	-	2	2	2	50	50	100
5	MAT492	Project, Seminar & Viva	-	-	24	12	50	50	100
6	MSC411	Discipline & General Proficiency	-	-	-	1	100	0	100
		Total	10	2	26	25	320	280	600

Study & Evaluation Scheme

of

Master of Science
(Mathematics)
[Applicable for Academic Session 2019-20]

TEERTHANKER MAHAVEER UNIVERSITY
N.H.-24, Delhi Road, Moradabad, Uttar Pradesh-244001
Website: www.tmu.ac.in

# Program Structure-M.Sc. Mathematics

A. Introduction:

M.Sc. Mathematics is a two-year post-graduate programme designed to extend students knowledge and refine their abilities to solve complex problems accurately. M.Sc. Mathematics introduces students to a wide choice of modules in interesting areas such as Abstract Algebra, Real Analysis, Complex Analysis, Topology, Operation research, graph theory & number theory etc. This programme also gives an opportunity for students to conduct independent researches in pure to applied mathematics. Besides the programme, focuses on propelling students' numeracy skills and the ability to use mathematical concepts to the model the solution to mathematical problems. The programme also enables the students to develop the ability to consolidate and communicate mathematics logically and briefly in a variety of forms. Students who want to pursue higher education in the field of Mathematics can opt for PhD in the same discipline.

B. Choice Based Credit System (CBCS)

Choice Based Credit System (CBCS) is a versatile and flexible option for each student to achieve his target number of credits as specified by the UGC and adopted by our University.

The following is the course module designed for the M.Sc. program:

- *Core competency:* A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course. We are offered core course in all semesters like operation research, Differential Equation, Real Analysis, Topology, Number Theory etc with the 4 & 5 credit of each.

- *Program/Discipline Specific Elective Course (DSEC):* A Post graduate student is expected to be capable of demonstrating comprehensive knowledge and understanding of both theoretical and experimental/applied mathematics knowledge in various fields of interest like Statistics Software & Tools, Numerical Techniques & its lab etc.

- *Skilled communicator:* The course curriculum incorporates basics and advanced training in order to make a post graduate student capable of expressing the subject through technical writing as well as through oral presentation.

- *Critical thinker and problem solver:* The course curriculum also includes components that can be helpful to post graduate students to develop critical thinking ability by way of solving problems/numerical using basic & advance knowledge and concepts of mathematics.

- *Sense of inquiry:* It is expected that the course curriculum will develop an inquisitive characteristics among the students through appropriate questions, planning and reporting experimental investigation.

- *Skilled project manager:* The course curriculum has been designed in such a manner as to enabling a post graduate student to become a skilled project manager by acquiring knowledge about mathematical project management, writing, planning, study of ethical standards and rules and regulations pertaining to scientific project operation.

- *Ethical awareness/reasoning:* A post graduate student requires understanding and developing ethical awareness/reasoning which the course curriculums adequately provide.
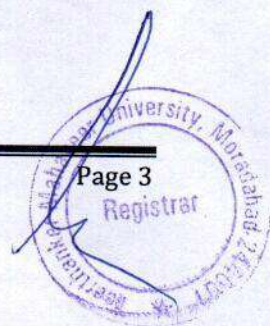
Study and Evaluation Scheme
Semester I

S. No.		Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC	MAT111	Differential Equation	4	-	-	4	40	60	100
2	CC	MAT112	Real Analysis	4	-	-	4	40	60	100
3	CC	MAT113	Linear Algebra	4	-	-	4	40	60	100
4	SEC	MAT115	Research Methodology	3	1	-	4	40	60	100
5	AECC	MAT116	Computer System & Programming in C++	3	-	-	3	40	60	100
6	AEC	MAT161	Computer System & Programming in C++ (Lab)	-	-	2	1	50	50	100
			Total	18	1	2	20	250	350	600

Value Added Course: It is an audit course. The performance of the student in this course will not be counted in the overall result however the student has to pass it compulsorily with 45% marks.

1	VAC-1	TMUPA-101	Elementary Arithmetic & Analytical Reasoning	2	1	-	-	40	60	100

MOOC Course:

1	MOOC	MOOC11	MOOC Program-I (Optional)	-	-	-	2	-	100	100

Semester II

S. No.		Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC	MAT211	Complex Analysis	4	-	-	4	40	60	100
2	CC	MAT212	Advance Abstract Algebra	4	-	-	4	40	60	100
3	CC	MAT213	Numerical Techniques	4	-	-	4	40	60	100
4	CC	MAT214	Topology	4	-	-	4	40	60	100
5	CC	MAT215	Operation Research	4	-	-	4	40	60	100
6	AEC	MAT261	Numerical Techniques (Lab)	-	-	2	1	50	50	100
			Total	20	0	2	21	250	350	600

*Value Added Course:

1	VAC-2	TMUPA-201	Progressive Algebra & Data Management	2	1	-	-	40	60	100

MOOC Course:

1	MOOC-1	MOOC12	MOOC Program –I (Optional)	-	-	-	2	-	100	100

M.Sc. (Mathematics)-Semester III

S. No	Category	Course Code	Course		Periods			Credit	Evaluation Scheme		
					L	T	P		Internal	External	Total
1	CC	MAT311	Functional Analysis		4	1	-	5	40	60	100
2	CC	MAT312	Partial Differential Equations		4	1	-	5	40	60	100
3	AECC	MHM320	Human values & Professional Ethics		3	-	-	3	40	60	100
4	DSE		Discipline Specific Elective Courses	Discipline Specific Elective Course-I	4	1	-	5	40	60	100
5	DSE			Discipline Specific Elective Course-II	4	1	-	5	40	60	100
6	PROJ	MAT392	Industrial Training & Presentation		-	-	12	6	50	50	100
7	DGP	MGP311	Discipline & General Proficiency		-	-	-	-	100	-	100
			Total		19	4	12	29	250	350	600

MOOC Course:

1	MOOC	MOOC13	MOOC Program –II (Optional)	-	-	-	2	-	100	100

M.Sc. (Mathematics)-Semester IV

S. No	Category	Course Code	Course		Periods			Credit	Evaluation Scheme		
					L	T	P		Internal	External	Total
1	CC	MAT411	Number Theory		4	1	-	5	40	60	100
2	CC	MAT412	Advance Discrete Mathematics		4	1	-	5	40	60	100
3	DSE		Discipline Specific Elective Courses	Discipline Specific Elective Course-III	4	1	-	5	40	60	100
4	SEC	MAT461	MATLAB Programming		-	1	2	2	50	50	100
5	PROJ	MAT492	Project		-	-	18	9	50	50	100
6	DGP	MGP411	Discipline & General Proficiency		-	-	-	-	100	-	100
			Total		12	4	20	26	220	280	500

ELECTIVE COURSES OFFERED

S. No	Code	Course	L	T	P	Credit
Semester III- Discipline Specific Elective Course-I -(Any one)						
1	MAT314	Graph Theory	4	1	0	5
2	MSC014	Database Management System	4	1	0	5
Semester III- Discipline Specific Elective Course-II -(Any one)						
3	MAT315	Probability & Mathematical Statistics	4	1	0	5
4	MSC013	Statistical Techniques in Data Mining	4	1	0	5
Semester IV- Discipline Specific Elective Course-III -(Any one)						
5	MAT414	Fuzzy sets & its application	4	1	0	5
6	MAT415	Calculus of variations and Integral Equation	4	1	0	5

Course Code: TMUPA-101	Elementary Arithmetic & Analytical reasoning	L-2 T-1 P-0 C-0
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Operationalizing the inter-related concept of Percentage in Profit Loss and Discount, Si/CI and Mixture/Allegation.	
CO2.	Applying the arithmetical concepts in Ratio Proportion Variation, Average.	
CO3.	Employing the techniques of Percentage, Ratios and Average in inter related concepts of Time and Work, Time Speed and Distance.	
CO4.	Evaluating the different possibilities of various reasoning based problems in series, Blood relation, Ranking , Direction and Syllogism.	
CO5.	Examining the optimized approach to solve Visual Reasoning based problem.	
Course Content:		
Unit-1:	**Percentages** Basic calculation, ratio equivalent, base, change of base, multiplying factor, percentage change, increment, decrement, successive percentages, word problems	4 Hours
Unit-2:	**Profit Loss Discount** Basic definition, formula, concept of mark up, discount, relation with successive change, faulty weights	3 Hours
Unit-3:	**SI and CI** Simple Interest, finding time and rate, Compound Interest, difference between SI and CI, Installments	2 Hours
Unit-4:	**Averages** Basic Averages, Concept of Distribution. Weighted Average, equations	2 Hours
Unit-5:	**Mixtures and allegations** Mixtures of 2 components, mixtures of 3 components, Replacements	1 Hour
Unit-6:	**Number and alphabet series** Number series, alphabet series	1 Hour
Unit-7:	**Blood relations** Indicating type, operator type, family tree type	2 Hours
Unit-8:	**Ranking** Linear ranking, complex ranking	1 Hour
Unit-9:	**Direction sense** Simple statements, shadow type	1 Hour
Unit-10:	**Cubes and dices** Concept of cubes, rotation type, Dices, regular dices, irregular dices	2 Hours
Unit-11:	**Ratio, proportions and variations** Concept of ratios, proportions, variations, properties and their applications	1 Hour
Unit-12:	**Time and Work** Same efficiency, different efficiency, alternate work, application in Pipes and Cisterns	3 Hours

Course Code: TMUPS-101	Value Added Course M.Sc. Mathematics- Semester-I **Managing Self**	L-2 T-1 P-0 C-0
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Utilizing effective verbal and non-verbal communication techniques in formal and informal settings	
CO2.	Understanding and analyzing self and devising a strategy for self growth and development.	
CO3.	Adapting a positive mindset conducive for growth through optimism and constructive thinking.	
CO4.	Utilizing time in the most effective manner and avoiding procrastination.	
CO5.	Making appropriate and responsible decisions through various techniques like SWOT, Simulation and Decision Tree.	
CO6.	Formulating strategies of avoiding time wasters and preparing to-do list to manage priorities and achieve SMART goals.	
Course Content:		
Unit-1:	**Personal Development:** Personal growth and improvement in personality Perception Positive attitude Values and Morals High self motivation and confidence Grooming	**10 Hours**
Unit-2:	**Professional Development:** Goal setting and action planning Effective and assertive communication Decision making Time management Presentation Skills Happiness, risk taking and facing unknown	**8 Hours**
Unit-3:	**Career Development:** Resume Building Occupational Research Group discussion (GD) and Personal Interviews	**12 Hours**
Reference Books:	1. Robbins, Stephen P., Judge, Timothy A., Vohra, Neharika, Organizational Behaviour (2018), 18th ed., Pearson Education 2. Tracy, Brian, Time Management (2018), Manjul Publishing House 3. Hill, Napolean, Think and grow rich (2014), Amazing Reads 4. Scott, S.J., SMART goals made simple (2014), Createspace Independent Pub 5. https://www.hloom.com/resumes/creative-templates/ 6. https://www.mbauniverse.com/group-discussion/topic.php 7. Rathgeber, Holger, Kotter, John, Our Iceberg is melting (2017), Macmillan 8. Burne, Eric, Games People Play (2010), Penguin UK 9. https://www.indeed.com/career-advice/interviewing/job-interview-tips-how-to-make-a-great-impression ***** **Latest editions of all the suggested books are recommended.**	

New course Added

Course Code: TMUPA-201	Progressive Algebra & Data Management	L-2 T-1 P-0 C-0
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Applying the concepts of modern mathematics Divisibility rule, Remainder Theorem, HCF /LCM in Number System.	
CO2.	Relating the rules of permutation and combination, Fundamental Principle of Counting to find the probability.	
CO3.	Applying calculative and arithmetical concepts of ratio, Average and Percentage to analyze and interpret data	
CO4.	Implementing the rules of different geometrical concepts in Lines and Angles, Triangles, Area and volumes of different figures.	
CO5.	Recognizing the rules of Crypt-arithmetic and relate them to find out the solutions.	
CO6.	Employing the concept of higher level reasoning in Clocks, Calendars and Puzzle Problems.	
Course Content:		
Unit-1:	**Number theory** Classification of Numbers, Divisibility Rules, HCF and LCM, Factors, Cyclicity (Unit Digit and Last Two digit), Remainder Theorem, Highest Power of a Number in a Factorial, Number of trailing zeroes	**6 Hours**
Unit-2:	**Data interpretation** Data Interpretation Basics, Bar Chart, Line Chart, Tabular Chart, Pie Chart, DI tables with missing values	**4 Hours**
Unit-3:	**Permutations and combinations** Fundamental counting, and or, arrangements of digits, letters, people in row, identical objects, rank, geometrical arrangements, combination: - basic, handshakes, committee, selection of any number of objects, identical and distinct, grouping and distribution, de-arrangements	**3 Hours**
Unit-4:	**Probability** Introduction, Probability based on Dice and Coins, Conditional Probability, Bayes Theorem	**2 Hours**
Unit-5:	**Geometry and Mensuration** Lines and Angles, Triangles – Areas, Similar Triangles, Circles, Polygons, 2D Mensuration , 3D Mensuration	**5 Hours**
Unit-6:	**Crypt Arithmetic** Introduction of Crypt Arithmetic, Mathematical operations using Crypt Arithmetic	**2 Hours**
Unit-7:	**Progressions** Introduction to AP, GP and HP, Common terms in Progressions	**3 Hours**
Unit-8:	**Set theory** Introduction , Venn Diagrams basics	**1 Hours**
Unit-9:	**Problem Solving** Introduction, Puzzle based on 3 group variable	**2 Hours**
Unit-10:	**Clocks and calendars**	**2 Hours**

Registrar

Course Code: TMUPS-201	Value Added Course M.Sc. Mathematics- Semester-II **Managing Work and Others**	L-2 T-1 P-0 C-0
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Communicating effectively in a variety of public and interpersonal settings.	
CO2.	Applying concepts of change management for growth and development by understanding inertia of change and mastering the Laws of Change.	
CO3.	Analyzing scenarios, synthesizing alternatives and thinking critically to negotiate, resolve conflicts and develop cordial interpersonal relationships.	
CO4.	Functioning in a team and enabling other people to act while encouraging growth and creating mutual respect and trust.	
CO5.	Handling difficult situations with grace, style, and professionalism.	
Course Content:		
Unit-1:	**Intrapersonal Skills:** Creativity and Innovation Understanding self and others (Johari window) Stress Management Managing Change for competitive success Handling feedback and criticism	**8 Hours**
Unit-2:	**Interpersonal Skills:** Conflict management Development of cordial interpersonal relations at all levels Negotiation Importance of working in teams in modern organisations Manners, etiquette and net etiquette	**12 Hours**
Unit-3:	**Interview Techniques:** Job Seeking Group discussion (GD) Personal Interview	**10 Hours**
Reference Books:	1. Robbins, Stephen P., Judge, Timothy A., Vohra, Neharika, Organizational Behaviour (2018), 18th ed., Pearson Education 2. Burne, Eric, Games People Play (2010), Penguin UK 3. Carnegie, Dale, How to win friends and influence people (2004), RHUK 4. Rathgeber, Holger, Kotter, John, Our Iceberg is melting (2017), Macmillan 5. Steinburg, Scott, Nettiquette Essentials (2013), Lulu.com	

Registrar

Course Code: MHM320	M.Sc. Mathematics- Semester-III	L-3 T-0 P-0 C-3
	Human Values & Professional Ethics	
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding** the importance of value education in life and method of self-exploration.	
CO2.	**Understanding** 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration.	
CO3.	**Applying** right understanding about relationship and physical facilities.	
CO4.	**Analysing** harmony in myself, harmony in the family and society, harmony in the nature and existence.	
CO5.	**Evaluating** human conduct on ethical basis.	
Course Content:		
Unit-1:	Understanding of Morals, Values and Ethics; Introduction to Value Education- need for Value Education. Self- Exploration– content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration. Continuous Happiness and Prosperity- basic Human Aspirations. Gender Issues: Gender Discrimination and Gender Bias (home & office), Gender issues in human values, morality and ethics.	8 Hours
Unit-2:	Conflicts of Interest: Conflicts between Business Demands and Professional Ethics. Social and Ethical Responsibilities of Technologists. Ethical Issues at Workplace: Discrimination, Cybercrime, Plagiarism, Sexual Misconduct, Fraudulent Use of Institutional Resources. Intellectual Property Rights and its uses. Whistle blowing and beyond, Case study.	8 Hours
Unit-3:	Harmony in the Family and Society- Harmony in Human-Human Relationship, Understanding harmony in the Family- the basic unit of human interaction. Understanding values in human-human relationship; meaning of Nyaya; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship. Understanding the meaning of Vishwas; Difference between intention and competence. Understanding the meaning of Samman and other salient values in relationship.	8 Hours
Unit-4:	Understanding Harmony in the Nature and Existence – Whole existence as Co-existence. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature. Understanding Existence as Coexistence (Sah-astitva) of mutually interacting units in all pervasive space. Holistic perception of harmony at all levels of existence.	8 Hours
Unit-5:	Implications of the above Holistic Understanding of Harmony on Professional Ethics. Natural acceptance of human values. Definitiveness of Ethical Human Conduct. Competence in professional ethics:	8 Hours

New course Added

Course Code: MAT392	M.Sc. Mathematics- Semester-III **Industrial Training & Presentation**	L-0 T-0 P-12 C-6
Course Procedure:		
	Students will have to undergo industrial training of six weeks in any industry or reputed organization after the II semester examination in summer. The evaluation of this training shall be included in the III semester evaluation. The student will be assigned a faculty guide who would be the supervisor of the student. The faculty would be identified before the end of the II semester and shall be the nodal officer for coordination of the training. Students will prepare an exhaustive technical report of the training during the III semester which will be duly signed by the officer under whom training was undertaken in the industry/ organization. The covering format shall be signed by the concerned office in-charge of the training in the industry. The officer-in-charge of the trainee would also give his rating of the student in the standard University format in a sealed envelope to the Director/Principal of the college. The student at the end of the III semester will present his report about the training before a committee constituted by the Director/Principal of the College which would comprise of at least three members comprising of the Department Coordinator, Class Coordinator and a nominee of the Director/Principal. The students guide would be a special invitee to the presentation. The seminar session shall be an open house session. The internal marks would be the average of the marks given by each member of the committee separately in a sealed envelope to the Director/Principal. The marks by the external examiner would be based on the report submitted by the student which shall be evaluated by the external examiner and cross examination done of the student concerned. Not more than three students would form a group for such industrial training/ project submission.	
	The marking shall be as follows.	
Internal: 50 marks	By the Faculty Guide – 25 marks. By Committee appointed by the Director/Principal – 25 marks.	
External: 50 marks	By Officer-in-charge trainee in industry – 25 marks. By External examiner appointed by the University – 25 marks	
	Technical report will consist five chapter as per given format:	
Chapter 1:	Brief about organization	
Chapter 2:	Detail of business carried out by organization	
Chapter 3:	Specific contribution during the industrial training (not more than 500 words)	
Chapter 4:	Learning during the industrial training (not more than 200 words)	
Chapter 5:	Conclusion	

Course Code: MAT415	Discipline Specific Elective Course-III M.Sc. Mathematics- Semester-IV **Calculus of variations and Integral Equation**	L-4 T-1 P-0 C-5
Course Outcomes:	On completion of the course, the students will be :	
CO1.	**Understanding** the concepts of variationally problems.	
CO2.	**Applying** the numeric method on various integral equations.	
CO3.	**Applying** the method of Successive Approximations & Fredholm Theory.	
CO4.	**Analyzing** isoperimetric problems.	
CO5.	**Analyzing** the decomposition method.	
Course Content:		
Unit-1:	**Variationally Problems with Moving Boundaries:** The concept of Variation and its properties – Euler's equation – Variationally problems for functional – Functionals dependent on higher order derivatives – Functions of several independent variables – Some applications to problems of mechanics.	8 Hours
Unit-2:	**Variationally Problems With Moving Boundaries (Contd.)** Movable boundary for a functional dependent on two functions – One sided variations – Reflection and Refraction of extremals – Diffraction of light rays.	8 Hours
Unit-3:	**Integral Equations** Introduction – Definition – Regularity conditions – Special kinds of Kernals – Eigen values and eigen functions – Convolution integral – Reduction to a system of algebraic equations – Examples – Fredholm alternative – Examples – An approximation method.	8 Hours
Unit-4:	**Method of Successive Approximations and Fredholm Theory:** Method of successive approximations – Iterative scheme – Examples – Volterra integral equations – Examples – Some results about the resolvent kernel – The method of solution of Fredholm equation – Fredholm first theorem – Examples.	8 Hours
Unit-5:	**Applications to Ordinary Differential Equations** Initial value problems – Boundary value problems – Examples – Singular integral equations – The Abel integral equations - Examples.	8 Hours
Text Books:	1. A. S. Gupta, Calculus of Variations with Applications, PHI, New Delhi.	
Reference Books:	1. M. D. Raisinghania, Integral Equations and Boundary Value Problems, S. Chand & Co., New Delhi. 2. Sudir K. Pundir and Rimple Pundir, Integral Equations and Boundary Value Problems, Pragati Prakasam. * Latest editions of all the suggested books are recommended	
Additional electronic reference material	https://www.youtube.com/watch?v=H9L3M67C5r0 https://www.youtube.com/watch?v=J8YFK0wnW_g	

Registrar