DEPARTMENT OF MATHEMATICS

SYLLABUS BASED ON CHOICE BASED CREDIT SYSTEM (CBCS)

FOR

M.Sc. (Semester – I & II) MATHEMATICS 2018-2019

M.Sc. (Semester – III & IV) MATHEMATICS 2019-2020

LACHOO MEMORIAL COLLEGE OF SCIENCE AND TECHNOLOGY (AUTONOMOUS)

JODHPUR

M.Sc. (Mathematics) Semester-wise course description:

The academic program at M.Sc. level is through a semester examination scheme. The course work includes lectures, seminars and quiz/laboratory activities.

The full course is of **FOUR SEMESTERS** spread for **TWO YEARS** duration. A semester-wise list of courses to be offered is given below:

SEMESTER- I

MSMT-101: Algebra – I
MSMT-102: Advanced Real Analysis
MSMT- 103: Differential Equations
MSMT-104: Special Functions
MSMT-105: Analytical Dynamics and Numerical Analysis - I

SEMESTER – II

MSMT- 201: Algebra – II
MSMT- 202: Measure Theory and Integration
MSMT- 203: Hydrodynamics
MSMT- 204: Classical Polynomials and Integral Transforms
MSMT- 205: Analytical Dynamics and Numerical Analysis - II

SEMESTER - III

MSMT- 301: Complex Analysis
MSMT- 302: Tensor Analysis
MSMT- 303: Functional Analysis – I
MSMT-304: Any one from Elective Course from **Group – 304**
MSMT-305: Any one from Elective Courses from **Group – 305**

SEMESTER – IV

MSMT-401: Topology
MSMT- 402: Differential Geometry
MSMT- 403: Functional Analysis – II
MSMT-404: Any one from Elective Courses from **Group – 404**
MSMT-405: Any one from Elective Courses from **Group – 405**

List of Skill Courses (SC) in Mathematics

MSMSC – 1 : Knowledge of Mathematical typing software

MSMSC – 2 : Knowledge of SPSS

MSM SC – 3 : Sampling and test of Significance – I

MSM SC – 4 : Knowledge of typing in latex

MSM SC- 5 : Knowledge of C Language

*List of Elective Papers (for Semester – III)

Group – 304	Group – 305
304a.Magnetofluid Dynamics - I	305a. Generalized Functions - I
304b.Linear Operators in Hilbert Space-I	305b.Fundamental of Operations Research-I
304c.Laminar Viscous Flow Theory-I	305c. Integral Equations and Boundary Value Problems-I
304d.Probability and Statistical Distributions-I	305d. Advanced Numerical Analysis – I

*List of Elective Papers (for Semester – IV)

Group – 404	Group – 405
404a.Magnetofluid Dynamics - II	405a. Generalized Functions - II
404b.Linear Operators in Hilbert Space-II	405b. Fundamental of Operations Research-II
404c.Laminar Viscous Flow Theory-II	405c. Integral Equations and Boundary Value Problems-II
404d.Probability and Statistical Distributions-II	405d. Advanced Numerical Analysis - II

GUIDELINES FOR CHOICE BASED CREDIT SYSTEM:

Definitions of Key Words:

1. **Academic Year**: Two consecutive (one odd + one even) semesters constitute one academic year.

2. **Choice Based Credit System (CBCS):** The CBCS provides choice for students to select from the prescribed elective and skill courses. A student need to select **two elective papers** offered by the Department in which he/she is doing core course this shall be part of core programme during third and fourth semester.

3. **Course**: Usually referred to, as 'papers' is a component of a programme. All courses need not carry the same weight. The courses should define learning objectives and learning outcomes. A course may be designed to comprise lectures/ tutorials/laboratory work/ field work/ project work/ self-study etc. or a combination of some of these.

4. **Credit Based Semester System (CBSS)**: Under the CBSS, the requirement for awarding a degree is prescribed in terms of **number of credits to be completed by the students.**

5. **Credit Point**: It is the **product of grade point and number of credits for a course.**

6. **Credit**: **A unit by which the course work is measured.** It determines the number of hours of instructions required per week. **One credit is equivalent to one period of teaching** (lecture or tutorial) or two periods of practical work/field work per week.

7. **Cumulative Grade Point Average (CGPA)**: It is a measure of overall cumulative performance of a student over all semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.

8. **Grade Point**: It is a numerical weight allotted to each letter grade on a 10-point scale.

9. **Letter Grade:** It is an index of the performance of students in a said course. Grades are denoted by letters O, A+, A, B+, B, C, P and F.

10. **Programme**: An educational programme leading to award of the Postgraduate Degree in the Core subject in which he/she is admitted.

11. **Semester Grade Point Average (SGPA)**: It is a measure of performance of work done in a semester. **It is ratio of total credit points secured by a student** in various courses registered in a

semester and the total course credits taken during that semester. It shall be expressed up to two decimal places.

12. **Semester**: Each semester will consist of 15-18 weeks of academic work **equivalent to 90 actual teaching days.** The odd semester may be scheduled from **July to November/ December and even semester from December/January to May**.

13. **Transcript or Grade Card or Certificate:** Based on the grades earned, a statement of grades obtained shall be issued to all the **registered students after every semester.** This statement will display the course details (**code, title, number of credits, grade secured)** along with SGPA of that semester and **CGPA earned** till that semester

Fairness in Assessment

Assessment is an integral part of system of education as it is instrumental in identifying and certifying the academic standards accomplished by a student and projecting them far and wide as an objective and impartial indicator of a student's performance. Accordingly the Faculty of Science resolves the following:

a. All internal assessments shall be open assessment system only and that are based on Quizzes, term test and seminar.
b. Attendance shall carry the prescribed marks in all papers and Practical examination CCA (Continuous Comprehensive Assessment).
c. In each semester **three out of four theoretical component College examinations shall be undertaken by external examiners from outside the university** conducting examination, who may be appointed by the competent authority.

Grievances and Redressal Mechanism

a) The students will have the right to make an appeal against any component of evaluation. Such appeal has to be made to the Principal of the College stating in writing the reason(s) for the complaint / appeal.

b) The appeal will be assessed by the Chairman and he/she shall place before the **Grievance Redressal Committee (GRC),** Chaired by the Principal, comprising all HODs of the Faculty and if need be Course Teacher(s) be called for suitable explanation; GRC shall meet at least once in a semester and prior to CCA finalization.

c) The Committee will consider the case and may give a personal hearing to the appellant before deciding the case. The decision of the Committee will be final.

Table 1: Grades and Grade Points

S.No.	Letter Grade	Meaning	Grade Point
1	'O'	Outstanding	10

2	'A+'	Excellent	9
3	'A'	Very Good	8
4	'B+'	Good	7
5	'B'	Above Average	6
6	'C'	Average	5
7	'P'	Pass	4
8	'F'	Fail	0
9	'Ab'	Absent	0

i. A student obtaining Grade F in a paper shall be **considered failed and will be required to reappear in the End Semester examination.**

ii. For **noncredit courses** (Skill Courses) '**Satisfactory' or "Unsatisfactory**' shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA

Grade Point assignment

= and > 95 % marks Grade Point 10.0
90 to less than 95 % marks Grade Point 9.5
85 to less than 90 % marks Grade Point 9.0
80 to less than 85 % marks Grade Point 8.5
75 to less than 80 % marks Grade Point 8.0
70 to less than 75 % marks Grade Point 7.5
65 to less than 70 % marks Grade Point 7.0
60 to less than 65 % marks Grade Point 6.5
55 to less than 60 % marks Grade Point 6.0
50 to less than 55 % marks Grade Point 5.5
45to less than 50 % marks Grade Point 5.0
40 to less than 45 % marks Grade Point 4.5
35 to less than 40 % marks Grade Point 4.0

Computation of SGPA and CGPA:

i. The SGPA is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.

$$\textbf{SGPA}\ (Si) = \Sigma\ (Ci \times Gi) / \Sigma Ci$$

Where Ci is the number of credits of the ith course and Gi is the grade point scored by the student in the ith course.

ii. The CGPA is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme, i.e.

$$\textbf{CGPA} = \Sigma\ (Ci \times Si) / \Sigma\ Ci$$

where Si is the SGPA of the ith semester and Ci is the total number of credits in that semester.

iii. The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

***Illustration* for SGPA**

S.No.	**Course**	**Credit**	**Grade letter**	**Grade point**	**Credit Point** (Credit x Grade)
1	Course 1	6	**B**	**6**	**6 x 6 = 36**
2	Course 2	6	**B+**	**7**	**6 X 7 = 42**
3	Course 3	6	**B**	**6**	**6 X 6 = 36**
4	Course 4	6	**O**	**10**	**6 X 10 = 60**
5	Course 5	6	**C**	**5**	**6 X 5 = 30**
	Total	**30**			**204**

Thus, **SGPA = 204 / 30 = 6.8**

***Illustration* for CGPA**

	Semester- I	**Semester-II**	**Semester-III**	**Semester-IV**
Credit	**30**	**30**	**30**	**30**
SGPA	**6.67**	**7.25**	**7**	**6.25**

CGPA = (30X6.67+ 30X 7.25 + 30X7 + 30 X 6.25)/120

815.1/120 = 6.79

SEMESTER-WISE THEORY PAPERS / SKILL COMPONENT:

Core Courses	Course code	Title of the Course	Lecture-Tutorial-Practical/Week	No. of credits	Continuous Comprehensive Assessment (CCA)	End-Semester Examination (ESE) [University Examination]	Total
Semester I							
Course- 1	MSMT-101	Algebra – I	6-0-0	6	30	70	100
Course- 2	MSMT-102	Advanced Real Analysis	6-0-0	6	30	70	100

Course- 3	MSMT-103	Differential Equations	6-0-0	6	30	70	100
Course- 4	MSMT-104	Special Functions	6-0-0	6	30	70	100
Course- 5	MSMT-105	Analytical Dynamics and Numerical Analysis- I	6-0-0	6	30	70	100
Skill Course I*	As per the list		2-0-2				
Total				30	150	350	500
Semester II							
Course- 6	MSMT-201	Algebra - II	6-0-0	6	30	70	100
Course- 7	MSMT-202	Measure Theory and Integration	6-0-0	6	30	70	100
Course- 8	MSMT-203	Hydrodynamics	6-0-0	6	30	70	100
Course- 9	MSMT-204	Classical Polynomials and Integral Transforms	6-0-0	6	30	70	100
Course- 10	MSMT-205	Analytical Dynamics and Numerical Analysis- II	6-0-0	6	30	70	100
Skill course II*	As per the list		2-0-2				
Total				30	150	350	500
Semester III							
Course- 11	MSMT-301	Complex Analysis	6-0-0	6	30	70	100
Course- 12	MSMT-302	Tensor Analysis	6-0-0	6	30	70	100
Course- 13	MSMT-303	Functional Analysis – I	6-0-0	6	30	70	100
Course- 14	MSMT-304	Any one from Elective Courses from **Group – A****	6-0-0	6	30	70	100
Course- 15	MSMT-305	Any one from Elective Courses from **Group – B****	6-0-0	6	30	70	100
Skill course –III*	As per the list		2-0-2				
Total				30	150	350	500
Semester IV							
Course- 16	MSMT-401	Topology	6-0-0	6	30	70	100
Course- 17	MSMT-402	Differential Geometry	6-0-0	6	30	70	100
Course- 18	MSMT-403	Functional Analysis – II	6-0-0	6	30	70	100
Course- 19	MSMT-404	Any one from Elective Courses from **Group – A****	6-0-0	6	30	70	100
Course- 20	MSMT-405	Any one from Elective Courses from **Group – B****	6-0-0	6	30	70	100

Skill course –IV*	As per the list	2-0-2				
Total			30	150	350	500

*** The College shall offer two skill courses per semester from the list of skill courses approved for the College.**

Course Evaluation (Evaluation of the Students)

All courses (Core/ Elective) involve an evaluation system of students that has the following two components:-

(i) **Continuous Comprehensive Assessment (CCA)** accounting for 30% of the final grade that a student gets in a course; and

(ii) **End-Semester Examination (ESE)** accounting for the remaining 70% of the final grade that the student gets in a course.

(i) **Continuous Comprehensive Assessment (CCA)**: This would have the following components:

a. **Quizzes:** Two Quiz examinations of 45 minutes duration each having a maximum of 25 marks shall be arranged for each theory paper during the semester course period

b. **Term Test**: One term test **shall be arranged for each theory paper** prior to End-Semester Examination; examination duration shall be of three hours; maximum marks shall be 70

c. **Seminar**: Each student shall prepare and deliver a seminar per theory paper; maximum marks shall be 15. The seminar shall commence after first quiz examination and shall be completed prior to term test for all the papers.

d. **Classroom Attendance –** Each student will have to attend a minimum of 75% Lectures / Tutorials / Practicals. **A student having less than 75% attendance will not be allowed to appear in the End-Semester Examination (ESE).** Attendance shall have 15 marks and will be awarded by following the system proposed below:

Those having greater than 75% attendance (for those participating in Co-curricular activities, 25% will be added to per cent attendance) will be awarded CCA marks as follows:-

75% to 80%	=	3 marks
80% to 85%	=	6 marks
85 to 90%	=	9 marks
90% to 95%	=	12 marks
> 95%	=	15 marks

Each student's cumulative attendance shall be displayed in the College Notice Board every month with a copy to the Principal of the College.

e. CCA are based on open evaluation system without any bias to any student

f. Any grievance received in the Department from student shall be placed before the **Grievance Redressal Committee** with adjudicated comments

Each component marks will be added without rounding and the total thus obtained is ratio by a factor of six. This value shall be rounded.

Illustration: Quiz 1 – Marks obtained = 20
Quiz 2 – Marks obtained = 18
Term Test Marks obtained= 50.5
Seminar Marks obtained = 14
Attendance Marks obtained = 9
Total = 111.5
Conversion = 111.5/5 = 22.3
Award (Rounded off to next integer) = 23.00

Skill Course Evaluation: Based on his/her performance and hands on practice, the respective Department shall declare the result as "Satisfactory" or "Non-Satisfactory"; each student need to get a minimum of three "Satisfactory" declaration for the course completion

For QUIZ (2 quizzes per semester), 25 marks per Quiz and total of 50 marks, 45 minutes duration for each quiz:

Types of question	Number of Questions	Marks per question	Total marks per type
1. Multiple choice	10	1	10
2. Fill in the blanks	10	1	10
3. Short answer (15 words)	5	1	05
Total	25		25

For the Term test and ESE:

Part A

Ten short type questions (Definitions, illustrations, functions, short explanations, etc; 25-50 words) for two marks each. 10 × 2= 20 marks; two questions from each Unit; no choice in this part

Part B

Five short answer (250 words) type questions for four marks each. 5 × 4 = 20 marks; one question from each Unit with internal choice

Part C

Five questions of long/explanatory answer (500 words) type, one drawn from each Unit; student need to answer any three; ten marks each; 3 × 10 = 30 marks

20+20+30 = 70 marks

Qualifying for Next semester

1. **A student acquiring minimum of 40% in total of the CCA is eligible to join next semester**.

2. A student who does not pass the examination (CCA+ESE) in any course(s) (or due to some reason as he/she not able to appear in the ESE, other conditions being fulfilled, and so is considered as 'Fail'), shall be permitted to appear in such failed course(s) in the subsequent ESE to be held in the following October / November or April / May, or when the course is offered next, as the case may be.

3. A student who fails in one or more papers in a semester shall get three more chances to complete the same; if he/she fails to complete the same within the prescribed time, i.e. three additional chances for each paper; the student is ineligible for the Postgraduate degree in the Subject in which he/she is admitted, for additional chances examination fee shall be on additive basis.

Improvement Option:

Every student shall have the opportunity to improve Credit thorough University Examination only. Improvement opportunity for each paper is only with two additional chances; improvement examination fee shall be on additive basis; the Credit obtained in improvement examination shall be final. There shall be no improvement opportunity in Practical examinations**.**

Result Declaration:

The ESE (End Semester Examination/University Examination) results shall be declared within twenty days of the last examination. The Theory/ Practical Classes of even semesters shall begin from the next day of ESE; whereas odd semester classes shall commence after summer vacation.

ADMISSION

The minimum qualification for admission to M.Sc. Course is B.Sc. (10+2+3) degree with Mathematics as a major subject. The details of eligibility conditions and admission procedure are given in the admission form. The admission will be done on the basis of merit calculated by the aggregate marks obtained at the B.Sc. level and marks of Mathematics in B.Sc. Part I , II , III. Reservation of Scheduled Caste/Scheduled Tribes/Disabled/OBC/SBC will be as per university rules. The candidates are required to attend minimum of a 75% of classes in both theory and practical.

TEACHING AND EXAMINATION SCHEME

Per Semester

Course	Periods/Week	Examination hours	CCA	ESE	Total
Theory Papers					

Course - I	6	3	30	70	100
Course - II	6	3	30	70	100
Course - III	6	3	30	70	100
Course – IV	6	3	30	70	100
Course – V	6	3	30	70	100

Students are required to pass in each theory papers in every semester.

Skill Courses are to be passed (with satisfactory grade) in each Semester (Odd Semester from Department and Even Semester from outside Department).

Detailed Syllabus for M.Sc. (Semester – I & II) Mathematics Examination 2018-2109

SEMESTER – I

MSMT-101: ALGEBRA-I

Duration of Paper: 03 Hours **Max. Marks: 70**

Note: Each theory paper is divided in three parts i.e. Section – A, B and C .
Section A will consist of 10 compulsory questions. There will be two questions from each unit and answer (30 words). Each question carries 2 marks.
Section B will consist of 10 questions. Two questions from each unit and the examinee will answer (250 words) one question from each Unit. Each question carries 4 marks.
Section C will consist of 5 questions, one from each unit. The examinee will answer any 03 questions (with answer limit of 500 words). Each question carries 10 marks.

Unit 1: Groups: Law of isomorphism. Direct products of groups. Theorems related to composition series. Jordan-Holder theorem.

Unit 2: Groups :Definition of P-Group H-Conjugate Cauchy's theorems for finite Abelian and finite group. Sylow's theorems for abelian groups, solvable groups.

Unit 3: Rings and Fields of Extension: Theorems on endomorphism of an abelian group. Direct product of rings. Polynomials rings, Factorisation in integral domain.

Unit 4: Rings and Fields of Extension : Theorems related to finite and infinite extension of field. Minimal, Polynomials, Splitting field. Theorems on roots and coefficients of polynomial separable and inseparable extensions.

Unit 5: Canonical Forms: Jordan Matrix, Jordan canonical form, Some decomposition theorems. Jordan normal forms. Definition and examples of linear algebra. Linear transformations.

BOOKS RECOMMENDED :

Surjeet Singh and Qazi Zammeruddin: Modern Algebra
Aggarwal, R.S.: Modern Algebra
Shanti Narain: Abstract Algebra; S. Chand & Co., New Delhi
Raisinghania, M.D. : Modern Algebra
Kofman, Kunj, Linear Algebra

MSMT-102: ADVANCED REAL ANALYSIS

Duration of Paper: 03 Hours **Max. Marks: 70**

Note: Each theory paper is divided in three parts i.e. Section – A, B and C .
Section A will consist of 10 compulsory questions. There will be two questions from each unit and answer (30 words). Each question carries 2 marks.
Section B will consist of 10 questions. Two questions from each unit and the examinee will answer (250 words) one question from each Unit. Each question carries 4 marks.
Section C will consist of 5 questions, one from each unit. The examinee will answer any 03 questions (with answer limit of 500 words). Each question carries 10 marks.

Unit 1: Real Sequences and convergence: Definition, limit point, bounds and properties of real sequences. Limit inferior and limit supirior of sequences. Bolzano – Weierstrars theorem for sequences, convergent and non-convergent sequences.

Unit 2: Cauchy's general principle of convergence. Cauchy sequence, various theorems on limit of sequences. Monotonic sequence and its convergence.

Unit 3: Cantor's set, Continuity and Discontinuity of functions of two and more variables, types of discontinuity. Jacobians.

Unit 4: Uniform Convergence of sequences and series of functions. Various tests for uniform convergence. Weierstrass's M – Test.

Unit 5: Uniform convergence and continuity. Uniform convergence and integration. Uniform convergence and differentiation.

BOOKS RECOMMENDED :

Shanti Narayan: Mathematical Analysis;S. Chand & Co., New Delhi.

Royden, H.L.: Real Analysis;MacMillan Publishing Co., New York

H.K. Pathak: Real Analysis; Shiksha Sahitya Prakashan; Meerut.

Malik, S.C. and Arora, S.: Mathematical Analysis. New Age India Int. (P) Ltd., New Delhi.

MSMT-103: DIFFERENTIAL EQUATIONS

Duration of Paper: 03 Hours **Max. Marks: 70**

Note: Each theory paper is divided in three parts i.e. Section – A, B and C .
Section A will consist of 10 compulsory questions. There will be two questions from each unit and answer (30 words). Each question carries 2 marks.
Section B will consist of 10 questions. Two questions from each unit and the examinee will answer (250 words) one question from each Unit. Each question carries 4 marks.
Section C will consist of 5 questions, one from each unit. The examinee will answer any 03 questions (with answer limit of 500 words). Each question carries 10 marks.

Unit 1: Non-linear ordinary differential equations of particular forms. Riccati's equation –General solution and the solution when one, two or three particular solutions are known.

Unit 2: Classification of linear partial differential equation of second order, Canonical forms.

Unit 3: Solutions of Laplace, Wave and Heat conduction equations, Fourier series with application to simple boundary value problems on wave and heat conduction equations.

Unit 4: Linear homogeneous boundary value problem, Eigen values and eigen functions, Sturm-Liouville boundary value problems, Lagrange's identity, properties of eigen functions, Periodic functions.

Unit 5: Non-homogeneous boundary value problems, Non-homogeneous Sturm-Liouville boundary value problems (method of eigen function expansion).

BOOKS RECOMMENDED :

Chaturvedi, J.C. and Ray, M.: Differential Equations; Ram nath Kedar Nath & Co. Agra.

Bansal, J.L. and Dharmi, H.S.: Differential Equations Vol. II, An Elementary Treatise Differential Equations; Jaipur Publishing House, Jaipur

Arnold, V.I.: Ordinary Differential Equations, MIT Press, Cambridge, 1981

MSMT-104: SPECIAL FUNCTIONS

Duration of Paper: 03 Hours **Max. Marks: 70**

Note: Each theory paper is divided in three parts i.e. Section – A, B and C .
Section A will consist of 10 compulsory questions. There will be two questions from each unit and answer (30 words). Each question carries 2 marks.
Section B will consist of 10 questions. Two questions from each unit and the examinee will answer (250 words) one question from each Unit. Each question carries 4 marks.
Section C will consist of 5 questions, one from each unit. The examinee will answer any 03 questions (with answer limit of 500 words). Each question carries 10 marks.

Unit 1: Hypergeometric functions: Definition of the Hypergeometric series and function. Properties of hypergeometric functions. Integral formula for hypergeometric series, Linear transformations.

Unit 2: Contiguous function relations. Linear relations between the solutions of hypergeometric differential equation. Kummer's confluent hypergeometric function.

Unit 3 : Elementary properties of generalized hypergeometric function ${}_pF_q$.

Unit 4 : Legendre Polynomials : Legendre's differential equation and its series solution, Generating Function of Legendre's polynomials $P_n(x)$, Orthogonality, Laplace's First and Second Integral for $P_n(x)$, Rodrignue's formula, Recurrence Relations.

Unit 5 : Bessel's equation and its solution; Bessel function of the first kind, Generating function for $J_n(x)$, Recurrence relations, Integral representations for $J_n(x)$, Addition formula for the Bessel functions.

BOOKS RECOMMENDED :

Rainville, E.D.: Special Functions, Macmillan and Co., New York 1960.

Sneddon, I.N.: Special Functions of Mathematical Physics and Chemistry,Oliver and Byod, 1961.

Watson, G.N.: A Treatise on the Theory of Bessel Functions, Cambridge University Press, 1931

Labedye, N.N.: Special Functions and their Applications, Dover, 1972.

Saxena, R.K. and Gokhroo, D.C.; Special Functions, Jaipur Publishing House.

MSMT-105: ANYLYTICAL DYNAMICS AND NUMERICAL ANALYSIS I

Duration of Paper: 03 Hours **Max. Marks: 70**

Note: Each theory paper is divided in three parts i.e. Section – A, B and C .
Section A will consist of 10 compulsory questions. There will be two questions from each unit and answer (30 words). Each question carries 2 marks.
Section B will consist of 10 questions. Two questions from each unit and the examinee will answer (250 words) one question from each Unit. Each question carries 4 marks.
Section C will consist of 5 questions, one from each unit. The examinee will answer any 03 questions (with answer limit of 500 words). Each question carries 10 marks.

Unit-1:- D` Alembert's principle, General equations of motion, motion of the centre of intertia, motion relative to the centre of inertia, moment of effective forces about fixed axis of Rotation, moment of momentum about the Axis of Rotation, kinetic Energy of a Rotating body about a fixed line, Equation of motion of a body about the Axis of Rotation, Principle of Energy and work, time of a complete oscillation of a compound pendulum, simple equivalent pendulum, centre of suspension and centre of oscillation, minimum time of oscillation of a compound pendulum.

Unit-2:-Conservation law of Linear and Angular Momentum under Finite and Impulsive Forces. Kinetic Energy as a Sum of Kinetic Energy due to Translation and Rotation.

Unit-3 :-Calculus of variations: - linear functional, minimal functional theorem, general variation of a functional equation, another form of Euler-Lagrange equation, functional dependent on higher-order derivatives and several dependent variables.
Unit-4:- Various fundamental problems viz.- Shortest Distance, Shortest Time, Minimum Surface of Revolution and Isoperimetric Problem. Rayleigh-Ritz Method for Boundary Value Problem.
Unit-5:-Numerical solution of ordinary differential equation: - Euler method, modified Euler method Taylor series, Picard method Runge-Kutta method Milne method
BOOKS RECOMMENDED:
Loney, S.L.: An Elementary Treatise on the Dynamics of a Particle and Rigid Bodies, Cambridge University Press.
Ray,M.: Dynamics of Rigid Bodies, Students Friends and Co.
Gupta, P.P.: Rigid Bodies analytic Dynamics I, II, Krishna prakashan media (P)Ltd.
Soarborough, James, B.: Numerical Analysis
Freeman, H.: Finite Differences and Mathematics for Actuarial Students
Richardson,H.C.: Calculus of Finite Differences
Elsgotts, L.E.: Calculus of Variations
Bansal, J.L.: Dynamics of a Rigid Body, Jaipur Publishing Co.,

SEMESTER – II

MSMT-201: ALGEBRA-II

Duration of Paper: 03 Hours **Max. Marks: 70**

Note: Each theory paper is divided in three parts i.e. Section – A, B and C .
Section A will consist of 10 compulsory questions. There will be two questions from each unit and answer (30 words). Each question carries 2 marks.
Section B will consist of 10 questions. Two questions from each unit and the examinee will answer (250 words) one question from each Unit. Each question carries 4 marks.
Section C will consist of 5 questions, one from each unit. The examinee will answer any 03 questions (with answer limit of 500 words). Each question carries 10 marks.

Unit 1: Kernel and range space of a linear mapping, Rank and nullity, Singular and non-singular mapping or transformations. Invariance and Reducibility.

Unit 2: Galois Theory, Monomorphism and their Linear Independence. Arten theorem on automorphism, Normal extensions and Fundamental theorem of Galois theory.

Unit 3: Radical extensions and solvability by Radicals. Constructions by Ruler and Compass Ring with Chain conditions. Hilbert's Bases theorem. Artinian rings.

Unit 4: Linear transformations and system of linear equations. Quotient transformations. Inner product. Inner product spaces. Algebra of linear operators.

Unit 5: Matrix representation of linear operators. Dual spaces. Unitary and normal operators. Matrices of linear transformations with respect of different bases.

BOOKS RECOMMENDED :

Surjeet Singh and Qazi Zammeruddin: Modern Algebra

Aggarwal, R.S.: Modern Algebra
Shanti Narain: Abstract Algebra; S. Chand & Co., New Delhi
Raisinghania, N.D. : Modern Algebra
Kofman, Kunj, Linear Algebra

MSMT-202: MEASURE THEORY AND INTEGRATION

Duration of Paper: 03 Hours **Max. Marks: 70**

Note: Each theory paper is divided in three parts i.e. Section – A, B and C .
Section A will consist of 10 compulsory questions. There will be two questions from each unit and answer (30 words). Each question carries 2 marks.
Section B will consist of 10 questions. Two questions from each unit and the examinee will answer (250 words) one question from each Unit. Each question carries 4 marks.
Section C will consist of 5 questions, one from each unit. The examinee will answer any 03 questions (with answer limit of 500 words). Each question carries 10 marks.

Unit 1: Definitions of measure, Lebesgue outer measure, Measure of sets, Non-measurable sets, Exterior and interior measure of sets and their simple properties, Measurable functions.

Unit 2: Definition of Lebesgue Integral of a bounded measurable function, Comparison of Lebesgue and Riemann Integral. Lebesgue theorem of bounded convergence, Egoroff's theorem.

Unit 3: Lebesgue Integral of unbounded function, Elementary properties of Integrals, Definition and simple properties of function of bounded variation.

Unit 4: Absolutely continuous functions. The Lebesgue set, Integration by parts, The second mean value theorem, The Lebesgue class L^p, Schwarz's inequality.

Unit 5: Holder's inequality, Holder's inequality for sums, Minkowski's inequality. Integration of a function of L^p, mean convergence for the function of the class L^p.

BOOKS RECOMMENDED :

Malik, S.C. and Arora, S.: Mathematical Analysis. New Age India Int. (P) Ltd., New Delhi.

Jain, P.K. and Gupta, V.P. Lebsegue Measure and Integration, New Age Int. (P) Ltd., New Delhi.

MSMT-203: HYDRODYNAMICS

Duration of Paper: 03 Hours **Max. Marks: 70**

Note: Each theory paper is divided in three parts i.e. Section – A, B and C .
Section A will consist of 10 compulsory questions. There will be two questions from each unit and answer (30 words). Each question carries 2 marks.
Section B will consist of 10 questions. Two questions from each unit and the examinee will answer (250 words) one question from each Unit. Each question carries 4 marks.

Section C will consist of 5 questions, one from each unit. The examinee will answer any 03 questions (with answer limit of 500 words). Each question carries 10 marks.

Unit1 : Kinematics of fluids in motion, Lagrange's and Euler's methods, Stream lines and path lines, Velocity potential. Vorticity vector, Equation of continuity in Cartesian, spherical polar and cylindrical coordinates, Boundary surface condition.

Unit 2 : Euler's equations of motion, Bernoulli's equation, Bernoulli's theorem. Impulsive motion,

Unit 3: Motion in two-dimensions, Stream function, Complex potential. Sources, Sinks, Doublets, Images in two-dimensions. Milne Thomson circle theorem.

Unit 4 : Vorticity and circulation, Viscosity, Newton's law of viscosity, Navier-stoke's, equations of motion for viscous incompressible flow.

Unit 5 : Dynamical similarity, Dimensional analysis. π-Buckimgham theorem. Physical importance of non-dimensional parameters. Renold's number, Prandtl number. Mach number, Froude Number, Nusselt number.

BOOKS RECOMMENDED :

Bansi Lal: Theoretical Hydrodynamics; jaipur Publishing House, Jaipur.
Milne-Thomson: Theoretical Hydrodynamics
Ray, M.: A Text Book of Fluid Dynamics; S. Chand & Co., New Delhi.
Chorlton, F.: Text Book of Fluid Dynamics
Bansal, J.L. : Viscous Fluid Dynamics; jaipur Publishing House, Jaipur.

MSMT-204: CLASSICAL POLYNOMIALS AND INTEGRAL TRANSFORMS

Duration of Paper: 03 Hours **Max. Marks: 70**

Note: Each theory paper is divided in three parts i.e. Section – A, B and C .
Section A will consist of 10 compulsory questions. There will be two questions from each unit and answer (30 words). Each question carries 2 marks.
Section B will consist of 10 questions. Two questions from each unit and the examinee will answer (250 words) one question from each Unit. Each question carries 4 marks.
Section C will consist of 5 questions, one from each unit. The examinee will answer any 03 questions (with answer limit of 500 words). Each question carries 10 marks.

Unit 1: Generating function and other properties associated with Hermite Polynomials.

Unit 2: Generating function and other properties associated with Laguerre Polynomials.

Unit 3: Fourier transforms and its properties. Fourier sine and consine transforms. Convolution theorem for fourier transforms. Parseval's identity for fourier transforms.

Unit 4: Mellin transform and their properties.

Unit 5: Elementary properties of Hankel transforms, relation between Hankels and laplace transform. Parseval's theorem for Hankel transforms.

BOOKS RECOMMENDED :

Sneddon, I.N.: Use of Integral Transforms; Tata MacGraw-Hill, New Delhi.

Rainville, E.D.: Special Functions, Macmillan and Co., New York 1960.

Sneddon, I.N.: Special Functions of Mathematical Physics and Chemistry,Oliver and Byod, 1961.

Watson, G.N.: A Treatise on the Theory of Bessel Functions, Cambridge University Press, 1931

Labedye, N.N.: Special Functions and their Applications, Dover, 1972.

Saxena, R.K. and Gokhroo, D.C.; Special Functions, Jaipur Publishing House.

MSMT-205: ANALYTICAL DYNAMICS AND NUMERICAL ANALYSIS-II

Duration of Paper: 03 Hours **Max. Marks: 70**

Note: Each theory paper is divided in three parts i.e. Section – A, B and C .
Section A will consist of 10 compulsory questions. There will be two questions from each unit and answer (30 words). Each question carries 2 marks.
Section B will consist of 10 questions. Two questions from each unit and the examinee will answer (250 words) one question from each Unit. Each question carries 4 marks.
Section C will consist of 5 questions, one from each unit. The examinee will answer any 03 questions (with answer limit of 500 words). Each question carries 10 marks.

Unit-1:- Generalized and Principal coordinates, Lagrange's equations for finite and impulsive forces, small oscillations.

Unit-2:-Motion in three dimensions. Euler's dynamical and geometrical equations for the motion of a rigid body and problems related to no external forces. Deduction of Euler equation from Lagrange's equation.

Unit-3:-Hamilton's canonical equations of motion. Hamilton's principle and principle of least action. Deduction of Euler equation from Hamilton's canonical equations.

Unit-4:-Canonical Transformations, Poisson's brackets and their properties. General equations of motion in terms of Poisson brackets. Lagrange's brackets and their properties.

Unit-5:-Finite Difference Scheme for Partial Difference Equation: - Difference Quotients, SFPF and DFPF. Iteration Method, Jacobi Method, Gauss-Seidel Method, Successive over Relaxation Method, Bender-Schmidt Method.

BOOKS RECOMMENDED:

Loney, S.L.: An Elementary Treatise on the Dynamics of a Particle and Rigid Bodies, Cambridge University Press.

Ray,M.: Dynamics of Rigid Bodies, Students Friends and Co.

Gupta, P.P.: Rigid Bodies analytic Dynamics I, II, Krishna prakashan media (P)Ltd.

Soarborough, James, B.: Numerical Analysis

Freeman, H.: Finite Differences and Mathematics for Actuarial Students

Richardson,H.C.: Calculus of Finite Differences

Elsgotts, L.E.: Calculus of Variations

Bansal, J.L.: Dynamics of a Rigid Body, Jaipur Publishing Co.,

Detailed Syllabus for M.Sc. (Semester – III & IV) Mathematics Examination 2019

SEMESTER – III

MSMT-301: COMPLEX ANALYSIS

Duration of Paper: 03 Hours **Max. Marks: 70**

Note: Each theory paper is divided in three parts i.e. Section – A, B and C .
Section A will consist of 10 compulsory questions. There will be two questions from each unit and answer (30 words). Each question carries 2 marks.
Section B will consist of 10 questions. Two questions from each unit and the examinee will answer (250 words) one question from each Unit. Each question carries 4 marks.
Section C will consist of 5 questions, one from each unit. The examinee will answer any 03 questions (with answer limit of 500 words). Each question carries 10 marks.

Unit 1 : Conformal transformations, bilinear transformation, cross ratios and some special transformations. Taylor's and Laurent's theorem.

Unit 2: Poles and Singularities. Theory of residues. Contour integration.

Unit 3: Principle of maximum and minimum modulus; principle of argument, Schwarz's lemma, Rouche's theorem, Fundamental theorem of Algebra.

Unit 4: Meromorphic function, Mittag-Leffler's theorem, Analytic continuation, definition and illustrations.

Unit 5 : Harmonic Functions: Definition, Basic Properties, Maximum Principle (First Version), and (second Version). Harnack's inequqality, subharmonic and superharmonic functions.

BOOKS RECOMMENDED :
1. Shanti Narayan: Theory of Functions of Complex Variable; S. Chand & Co., New Delhi.
2. Mathews, J.H.: Howell, R.W. Complex analysis, Jones and Bartlet, India (2011).
3. Chouhan, J.P. Complex Analysis, (2006), Kedar Nath Ram Nath.
4. H.K. Pathak: Complex Analysis; Shiksha Sahitya, Prakashan, Meerut (2011).

MSMT-302: TENSOR ANALYSIS

Duration of Paper: 03 Hours **Max. Marks: 70**

Note: Each theory paper is divided in three parts i.e. Section – A, B and C .

Section A will consist of 10 compulsory questions. There will be two questions from each unit and answer (30 words). Each question carries 2 marks.
Section B will consist of 10 questions. Two questions from each unit and the examinee will answer (250 words) one question from each Unit. Each question carries 4 marks.
Section C will consist of 5 questions, one from each unit. The examinee will answer any 03 questions (with answer limit of 500 words). Each question carries 10 marks.

Unit 1: Notations and definitions of contravariant and covariant tensors of first and second order. Mixed tensors, higher order tensors. Contraction and Quotient law for tensors. Symmetric and skew symmetric tensors.

Unit 2: Metric [Fundamental] tensor, conjugate metric tensors. Definitions and properties of first and second kind of Christoffel's symbols. Laws of transformation of Christoffel's symbols.

Unit 3: Covariant derivatives of contravariant and covariant tensors of first and second orders. Laws of covariant differentiation. Ricci's Theorem.

Unit 4: Definition and properties of Riemann-Christoffel's tensor. Definition and properties of covariant curvature tensor.

Unit 5: Contraction of Riemann-Christoffel Tensor-Ricci tensor.

BOOKS RECOMMENDED:

Bansal, J.L.: Tensor Analysis, Jaipur Publishing House, (2004).

MSMT-303: FUNCTIONAL ANALYSIS - I

Duration of Paper: 03 Hours **Max. Marks: 70**

Note: Each theory paper is divided in three parts i.e. Section – A, B and C .

Section A will consist of 10 compulsory questions. There will be two questions from each unit and answer (30 words). Each question carries 2 marks.
Section B will consist of 10 questions. Two questions from each unit and the examinee will answer (250 words) one question from each Unit. Each question carries 4 marks.
Section C will consist of 5 questions, one from each unit. The examinee will answer any 03 questions (with answer limit of 500 words). Each question carries 10 marks.

Unit 1: Metric Spaces: Definitions and examples of the metric space, Open and Closed sets, Neighbourhood, Interior, Limit points and Isolated points, Subspace of a metric space, Product spaces. Completeness: Convergent sequence, Complete spaces,Dense sets and Separable spaces, Baire's Category theorem.

Unit 2: Compactness: Compact spaces and sets, Sequential compactness, Heine-Borel theorem, Equivalence of compactness and sequential compactness, Continuous mapping.

Unit 3: Normed spaces and their Properties: Banach space, Quotient space of a Banach space, Finite dimensional normed spaces and subspaces. Linear Operators, Linear operators and functionals on finite dimensional spaces. Normed spaces of operators.

Unit 4: Dual space : Space B(x,y), completeness theorem. Fundamental theorem for normed spaces and Banach space: Zorn's lemma, Hahn-Banach theorem, Hahn-Banach theorem for complex vector spaces and normed spaces.

Unit 5: Reflexive operator, Definitions of strong convergence and weak convergence, Lemma for weak convergence, Lemma for weak convergence for the space l^p , Strong and weak convergence theorem, Open mapping theorem, Closed graph theorem.s

BOOKS RECOMMENDED:
1. Kreyszig, E. Introductory Functional Analysis with Applications, John Wiley & Sons (1978).
2.Somasundaram, D.A. First Course in Functional Analysis, Narosa Publishing House, Delhi (2006).
3.Taylor, A.E. Introduction to Functional; Analysis, John Wiley & Sons (1958).
4.Choudhary, B. and Nanda, S. Functional Analysis with Applications, Wiley Eastern Limited, Delhi (1989).
5.Rudin, W. Functional Analysis, Tata McGraw-Hill Publ. Co. Ltd., Delhi (1977).
6.Jain, P.K. and Ahmad, Khalil, Metric Spaces, Narosa Publishing House (1996).
7.Copson, E.T. Metric Spaces, Universal Book Stal, Delhi (1989).
8.Berberian, S. Introduction to Hilbert Space, Oxford University Press, Oxford (1961).
9.Edwards, R.E. Functional Analysis Theory and Applications, Dover Publications, Inc. (1995).

Elective Papers Group – A (Any One)

MSMT-304a: Magneto Fluid Dynamics - I

Duration of Paper: 03 Hours **Max. Marks: 70**

Note: Each theory paper is divided in three parts i.e. Section – A, B and C .
Section A will consist of 10 compulsory questions. There will be two questions from each unit and answer (30 words). Each question carries 2 marks.
Section B will consist of 10 questions. Two questions from each unit and the examinee will answer (250 words) one question from each Unit. Each question carries 4 marks.
Section C will consist of 5 questions, one from each unit. The examinee will answer any 03 questions (with answer limit of 500 words). Each question carries 10 marks.

Unit 1: Definition of MFD and MFD Phenomenon. Charge conservation equation, Maxwell's equations, constitutive equations, Generalized Ohm's law. Equation of State, Equation of continuity, Equations of motion, Equation of energy.

Unit 2: MFD approximations, Magnetic field equation, Magnetic Reynolds number, Alfven's theorem, Magnetic energy, Electromagnetic stresses, force-free magnetic fields.

Unit 3: Basic equations for MHD flow, MHD boundary conditions, MHD flow between parallel plates. Velocity distribution in Hartmann flow and Hydromagnetic Couette flow.

Unit 4: MHD flow in a tube of rectangular cross-section, MHD pipe flow.

Unit 5: MHD flow in an annular channel, MHD flow between two rotating coaxial cylinders, MHD boundary layer approximations.

BOOKS RECOMMENDED :

Bansal, J.L.: Magnetofluiddynamics of Viscous fluids, Jaipur Publishing House, Jaipur, India
Farraro, V.C.A. and Plumpton, C.: Magnetofluidmecbanics Jeffereys, A.; Magnetohydrodynamics
Cowing, T.G.: Magnetohydrodynamics
Cramer, K.R. and Pai S.I.: Magnetofluiddynamics for Engineers and Physicists, Scripta Publishing Company, Washington, D.C., 1973.
Pai, S.I.: Magneto Geodynamics & Plasma Dynamics, Springer-Verlag, New York, 1962.
Shereliff, J.A.: Magnetohydrodynamics, Pergamon Press, London, 1965.
Charlton, P.: Text Book on Fluid Dynamics, CBS Publications, Delhi, 1985.
Rathy, R.K.: An Introduction to fluid dynamics Oxford & IBH Publishing Company, New Delhi, 1976.

Elective Papers Group – A (Any One)

MSMT-304b: LINEAR OPERATORS IN HILBERT SPACE - I

Duration of Paper: 03 Hours **Max. Marks: 70**

Note: Each theory paper is divided in three parts i.e. Section – A, B and C .
Section A will consist of 10 compulsory questions. There will be two questions from each unit and answer (30 words). Each question carries 2 marks.
Section B will consist of 10 questions. Two questions from each unit and the examinee will answer (250 words) one question from each Unit. Each question carries 4 marks.
Section C will consist of 5 questions, one from each unit. The examinee will answer any 03 questions (with answer limit of 500 words). Each question carries 10 marks.

Unit 1: Linear spaces. The scalar product, Hilbert space, Linear manifolds and subspaces. The distance from a point to a subspace. Projection of a vector on a subspace.

Unit 2: Orthogonalization of a sequence of vectors Complete orthonormal systems. The space L^2 and complete orthonormal system in $\boldsymbol{L}_1^2$.

Unit 3: Linear functionals. The theories of F Riesz. A criterion for the closure in H of given system of vectors. A Lemma concerning convex functionals Bounded linear operators.

Unit 4: Bilinear functions. The general form of a Bilinear functional adjoint operators. Weak convergence in H weak compactness.

Unit 5: A criterion for the boundedness of an operator, Linear operators in a separable space. Complete continuous operators. A criterion for complete continuity of an operator. Sequence of bounded Linear Operators.

BOOKS RECOMMENDED :

Akhiezer, N.I. and Glazman, I.M.: Theory of Linear Operation in Hilberts Space.

Translated from the Russian by Merlyind Nestell, Vingar Pub. Co., New York.

Elective Papers Group – A (Any One)

MSMT-304c: LAMINAR VISCOUS FLOW THEORY - I

Duration of Paper: 03 Hours **Max. Marks: 70**

Note: Each theory paper is divided in three parts i.e. Section – A, B and C .
Section A will consist of 10 compulsory questions. There will be two questions from each unit and answer (30 words). Each question carries 2 marks.
Section B will consist of 10 questions. Two questions from each unit and the examinee will answer (250 words) one question from each Unit. Each question carries 4 marks.
Section C will consist of 5 questions, one from each unit. The examinee will answer any 03 questions (with answer limit of 500 words). Each question carries 10 marks.

Unit 1: Fluid, Continuum hypothesis. Constitutive equation for Newtonian fluids, Navier-stoke's equations for viscous compressible flow.

Unit 2: Some exact solutions of N-S. equations, Plane Couette flow. Plane Poisseulle flow, Generalized plane Couette flow, Haigan-Poisseulle flow through circular pipe.

Unit 3: Some exact Solutions; Flow between two concentric rotating cylinders, stagnation in two dimensional flow. Flow due to a plane wall suddenly set in motion (Stoke's first problem). Flow due to an oscillating plane wall (Stoke's first problem).

Unit 4: Equation to energy, Temperature distributions in Couette flow, Plane Poissuille flow and Haigen-Poissuille flow in a circular pipe.

Unit 5: Theory of very slow motion: Stoke's equation of very slow motion. Stoke's flow past a sphere, stoke's stream function. Oseen equations. Lubrication theory.

BOOKS RECOMMENDED :

Schliching H.: Boundary Layer Theory, McGraw Hill.

Pai, S.I.: Viscous Flow Theory, Vol.I, Laminar Flow, D.Van Nostrand Company, New York, 1956.

Bamal, J.L.: Viscous Fluid Dynamics, Oxford and IBH, 2004.

Elective Papers Group – A (Any One)

MSMT-304d: PROBABILITY AND STATISTICAL DISTRIBUTIONS - I

(Only for Non-Statistics students of B.Sc. Final)

Duration of Paper: 03 Hours **Max. Marks: 70**

Note: Each theory paper is divided in three parts i.e. Section – A, B and C .
Section A will consist of 10 compulsory questions. There will be two questions from each unit and answer (30 words). Each question carries 2 marks.
Section B will consist of 10 questions. Two questions from each unit and the examinee will answer (250 words) one question from each Unit. Each question carries 4 marks.
Section C will consist of 5 questions, one from each unit. The examinee will answer any 03 questions (with answer limit of 500 words). Each question carries 10 marks.

Unit 1: Probability, Random Variables & their probability distribution: Probability: Random Experiment, Statistical Regularity, Algebra of events. Classical, relative frequency and axiomatic approaches of probability. Additive law and Bool's inequalities. Conditional probability. Stochastic independence of events. Multiplicative law of probability and Baye's Theorem.

Unit 2: : Random Variable (R.V.): Discrete RV. Probability mass function (p.m.f.). continuous r.v. probability density functions (p.d.f). Cumulative distribution function (c.d.f). and its properties. Two dimensional Random Variable. Joint, marginal and conditional, p.m.f., p.d.f. and c.d.f. Independence of random variable

Unit 3: Expectation of Random Variable and function of r.v. Theorems on Expectation and inequalities, Moments: Factorial moments, Moments about a point A, Raw moments and Central moments. Measurers of Central tendency, Measures of Dispersion, Measures of Skewness and Kurtosis.

Unit 4: Moment generating function (m.g.f.), Cumalant generating function (c.g.f.) and characteristic function (c.f.) of random variables. Product moments and Joint m.g.f. of random variables. Convergence of sequence of random variables; Convergence in law (or in distribution), convergence in probability. Convergence in rth moment

Unit 5: Discrete Distribution. Discrete Uniform distribution. Bernoulli distribution Binomial distribution. Hypergeometric distribution.

BOOKS RECOMMENDED :

01. Mathematical Statistics By Parimal Mukhopadhyay (Books and Allied (P.) Ltd.,
02. An Introduction to Probability and Statistics By Vijay K. Rophtgi & A.K. Mod. Ehsanes Saleh.
03. Fundamental of Mathematical Statistics By S.C.Gupta and V.K. Kapoor (Sultan Chand & Sons).

Elective Papers Group – B (Any One)

MSMT-305a: GENERALIZED FUNCTIONS - I

Duration of Paper: 03 Hours **Max. Marks: 70**

Note: Each theory paper is divided in three parts i.e. Section – A, B and C .
Section A will consist of 10 compulsory questions. There will be two questions from each unit and answer (30 words). Each question carries 2 marks.
Section B will consist of 10 questions. Two questions from each unit and the examinee will answer (250 words) one question from each Unit. Each question carries 4 marks.
Section C will consist of 5 questions, one from each unit. The examinee will answer any 03 questions (with answer limit of 500 words). Each question carries 10 marks.

Unit 1: Definition and simple properties of generalized functions, Functional and generalized functions.

Unit 2: Differentiation and integration of generalized functions, Regularization of functions of algebraic singularities.

Unit 3: Associated functions, Convolution of generalized functions, Elementary solutions of differential equations with constant coefficient.

Unit 4: Fourier Transforms of generalized functions. Fourier transform of test function, Fourier transforms of generalized functions of one and several variables. Fourier transform and differential equations.

Unit 5: Particular type of generalized functions: Generalized functions concentrated on smooth monifolds of lower dimension. Generalized functions associated with Quadratic form. Homogeneous functions Arbitrary functions raised to a power.

BOOKS RECOMMENDED :

Gellifand, I.M. and Shilvo, G.C.: Generalized functions, Vol. I. Acad. Press. 1964.

Fredman, A.: Generalized Functions and Partial Differential Equations,

Prentice Hall. Inc., Englewood Cliffs, N.J., U.S.A., 1963.

Elective Papers Group – B (Any One)

MSMT-305b: FUNDAMENTALS OF OPERATIONS RESEARCH - I

Duration of Paper: 03 Hours **Max. Marks: 70**

Note: Each theory paper is divided in three parts i.e. Section – A, B and C .

Section A will consist of 10 compulsory questions. There will be two questions from each unit and answer (30 words). Each question carries 2 marks.
Section B will consist of 10 questions. Two questions from each unit and the examinee will answer (250 words) one question from each Unit. Each question carries 4 marks.
Section C will consist of 5 questions, one from each unit. The examinee will answer any 03 questions (with answer limit of 500 words). Each question carries 10 marks.

Unit 1: Basic concepts of probability. Conditional probability, Bayes' theorem; Basic concepts of Poisson, exponential distributions.

Unit 2: Definition, scope and objectives of O.R., Different types of O.R. Models, basic ideas of convex sets. Linear programming problems-Simplex Method, two phase method.

Unit 3: Duality of L.P.P., Transportation and assignment problems.

Unit 4: Theory of games: Competitive strategies, minimax and maximin criteria, two person zero-sum games with and without saddle point, dominance, fundamental theorem of game.

Unit 5: Inventories: Single item deterministic inventory models with finite and infinite rates of replenishment,

BOOKS RECOMMENDED :

Kanti Swaroop, Gupta, Man Mohan: Operations Research, Sultan Chand and Sons.

Goel and Mittal: Operations Research, Pragati Prakashan

Mittal, K.V.: Optimizadon Methods in O.R. and S. Analysis

Sharma, S.D.: Operations Research

Loomba, N.P.: Linear Programming

Satty, T.L.: Mathematical Methods of Operations Research.

Elective Papers Group – B (Any One)

MSMT-305c: INTEGRAL EQUATIONS AND BOUNDARY VALUE PROBLEMS - I

Duration of Paper: 03 Hours **Max. Marks: 70**

Note: Each theory paper is divided in three parts i.e. Section – A, B and C .
Section A will consist of 10 compulsory questions. There will be two questions from each unit and answer (30 words). Each question carries 2 marks.
Section B will consist of 10 questions. Two questions from each unit and the examinee will answer (250 words) one question from each Unit. Each question carries 4 marks.
Section C will consist of 5 questions, one from each unit. The examinee will answer any 03 questions (with answer limit of 500 words). Each question carries 10 marks.

Unit 1: General concepts of integral equation. Linear integral equations of the first and second kind of Fredholm and Volterra types. Solution by successive substitution and successive approximations.

Unit 2: Solution of integral equation by Resolvent Kernel. Singular Integral equation. Solution of Abel's integral equation. General form of Abel Singular integral equation. Weakly Singular Kernel.

Unit 3: Hilbert – Schmidt theory by symmetric kernels. Riesz – Fischer theorem. Hilbert – Schmidt theorem. Hilbert's theorem.

Unit 4: Schmidt's solution of the non-homogeneous fredholm integral equation of second kind.

Uni 5 Homogeneous Fredholm integral equations. Eigen values and Eigen functions.

BOOKS RECOMMENDED:

W.V.Lovaitt: Linear Integral Equation, Dover Publications, 1950.

Krasnov, Kiselev and MakrankoL Problem and Exercises in Integral Equations, Translated by G. Yankovsky, Mir Publishers, Moscow, 1971.

Mikhlim, S.G.: Integral Equations, Pergamon, Oxford, 1957

Triconi, F.D.: Integral Equations, Interscience, New York, 1957.

Pundir, S.K. and Pundir, R. Integral equations and Boundary Value Problems, Pragati Prakashan, Meerut (U.P.)

Chandramouli, A.B.: Integral Equations with Boundary Value Problems, Shiksha Sahitya Prakashan, Meerut (U.P.)

Elective Papers Group – B (Any One)

MSMT-305d: ADVANCED NUMERICAL ANALYSIS - I

Duration of Paper: 03 Hours **Max. Marks: 70**

Note: Each theory paper is divided in three parts i.e. Section – A, B and C .
Section A will consist of 10 compulsory questions. There will be two questions from each unit and answer (30 words). Each question carries 2 marks.
Section B will consist of 10 questions. Two questions from each unit and the examinee will answer (250 words) one question from each Unit. Each question carries 4 marks.
Section C will consist of 5 questions, one from each unit. The examinee will answer any 03 questions (with answer limit of 500 words). Each question carries 10 marks.

Unit 1 : Solution of Algebraic and Transcendental Equations: Newton-Raphson method for real multiple roots, Newton-Raphson method for complex roots and Newton-Raphson method for system of non-linear equations.

Unit 2: Synthetic Division, Birge-Vieta, Bairstow and Graefre's root squaring methods for Numerical solution of polynomial equations.

Unit 3 : Solution of simultaneous Linear Equations: Direct methods: Gauss-elimination, Gauss-Jordan, Cholesky and Partition method. Iterative Methods: Jacobi iteration, Gauss-seidel iteration and Successive Relaxation method.

Unit 4: Eigen value Problems: power method, Jacobi Method and Givin's Method for finding Eigen values of a matrix.

Unit 5 : Curve fitting and Function Approximation: Least square Method, Fitting a straight line, Second Degree Polynomials, Exponential Curves and Logarithmic Curves.

BOOKS RECOMMENDED:

Jain, M.K.,Iyenger, SRK, Jain R.K.: Numerical Methods for Scientists & Engineering Computations, Wiley Eastern Ltd.,

Shastry, S.S.: Introductory Methods of Numerical Analysis, Prentice Hall India Pvt., Ltd.,

Grewal, B.S. : Numerical Methods in Engineering & Science, Khanna Publishers.

Collatz, L.: Numerical Solution of Differential Equations, Tata McGraw-Hill.

D.S. Chouhan: Numerical Methods, JPH.

SEMESTER – IV

MSMT-401: TOPOLOGY

Duration of Paper: 03 Hours **Max. Marks: 70**

Note: Each theory paper is divided in three parts i.e. Section – A, B and C .
Section A will consist of 10 compulsory questions. There will be two questions from each unit and answer (30 words). Each question carries 2 marks.
Section B will consist of 10 questions. Two questions from each unit and the examinee will answer (250 words) one question from each Unit. Each question carries 4 marks.
Section C will consist of 5 questions, one from each unit. The examinee will answer any 03 questions (with answer limit of 500 words). Each question carries 10 marks.

Unit 1 : Definition of topological spaces by using open sets, Characterization in terms of closed sets. Interior, closure and neighborhood operators.

Unit 2: Frontier of a set, Sub-space. Bases and sub-bases, dense subsets. Connected spaces.

Unit 3 : Continuous functions, closed and open functions. Homomorphism, First and Second axioms of countability.

Unit 4: Separable spaces. Lindeloff spaces. T_0, T_1 and T_2 spaces. Regular and normal spaces.

Unit 5: Compactness.

BOOKS RECOMMENDED:

1. B.D. Gupta: Topology; Kedar Nath Ram Nath; Delhi; Meerut.

2. Colin Adams and Robert Franzosa: Introduction to Topology; Dorling Kindersley India Pvt. Ltd., Pearson Prentice Hall (2009), Delhi.

3. K.P. Gupta: Topology: Pragati Prakashan, Meerut.

MSMT-402: DIFFERENTIAL GEOMETRY

Duration of Paper: 03 Hours **Max. Marks: 70**

Note: Each theory paper is divided in three parts i.e. Section – A, B and C .
Section A will consist of 10 compulsory questions. There will be two questions from each unit and answer (30 words). Each question carries 2 marks.
Section B will consist of 10 questions. Two questions from each unit and the examinee will answer (250 words) one question from each Unit. Each question carries 4 marks.
Section C will consist of 5 questions, one from each unit. The examinee will answer any 03 questions (with answer limit of 500 words). Each question carries 10 marks.

Unit 1: Curves in Space: Definition of unit tangent vector, tangent line, Normal line and Normal plane. Contact of a curve and a surface. Equation of osculating plane. Fundamental unit vectors, equations of fundamental planes.

Unit 2: Curvature, Torsion and skew curvature vectors. Serret-Frenet formulae and their applications. Definition and properties of the osculating circle and osculating spheres. Bertrand curves and their properties. Involute and evolute of space curves.

Unit 3: Envelope of family of surfaces. Ruled surfaces: Definition and properties of developable and skew surfaces. Parametric representation of a surface. First and Second fundamental forms and magnitudes of various surfaces.

Unit 4: Definition and Differential equation of lines of curvature (Excluding theorms). Definition and equation of curvature and torsion of asymptotic lines. Beltrami-Enneper Theorem.

Unit 5: Fundamental equations of Surface Theory: Gauss equations, Gauss Characteristic equations, Weingarten equations and Mainardi-Codazai equations.

BOOKS RECOMMENDED:

Bansal, J.l. and Sharma, P.R.: Differential Geometry: Jaipur Publishing House (2004).

Thorpe, J.A.: Introduction to Differential Geometry, Springer-verlag.

Slemberg, S.: Lectures on Differential Geometry, P.H.I. (1964).

Docarmo, M.: Differential Geometry of Curves and surfaces, P.H.I. (1976).

Gupta, P.P. and Malik, G.S.: Three Dimensional Differential Geometry, Pragati Prakashan, Meerut.

MSMT-403: FUNCTIONAL ANALYSIS - II

Duration of Paper: 03 Hours **Max. Marks: 70**

Note: Each theory paper is divided in three parts i.e. Section – A, B and C .
Section A will consist of 10 compulsory questions. There will be two questions from each unit and answer (30 words). Each question carries 2 marks.
Section B will consist of 10 questions. Two questions from each unit and the examinee will answer (250 words) one question from each Unit. Each question carries 4 marks.
Section C will consist of 5 questions, one from each unit. The examinee will answer any 03 questions (with answer limit of 500 words). Each question carries 10 marks.

Unit 1: Convergence of sequences of operators and functional. Inner spaces: Hilbert spaces: Orthogonality, Euclidean space R^n , Unitary space C^n, Space L^2 [a,b].

Unit 2: Hilbert sequence space l^2 . Space l^p and space C [a,b], Properties of inner product spaces, Orthogonal sets and sequences, Representation of functional on Hilbert spaces, Hilbert adjoint operator.

Unit 3: Spectral theory of linear Operators in Normed Spaces: Bounded self-adjoint linear operator, Definitions : Eigenvalues, Eigenvectors,Eigenspaces and Spectrum, Resolvent set of a matrix.

Unit 4: Theorems: Eigenvalues of an operator,Adjoint operator, Closed spectrum theorem, Representation theorem. Hilbert adjoint operator.

Unit 5: Eigenvalue and Eigenvector Theorems, Norm theorem, Theorem on product of positive operators, monotone sequence, positive square root, Projection, Product of projection.

BOOKS RECOMMENDED :
1. Kreyszig, E. Introductory Functional Analysis with Applications, John Wiley & Sons (1978).
2.Somasundaram, D.A. First Course in Functional Analysis, Narosa Publishing House, Delhi (2006).
3.Taylor, A.E. Introduction to Functional; Analysis, John Wiley & Sons (1958).
4.Choudhary, B. and Nanda, S. Functional Analysis with Applications, Wiley Eastern Limited, Delhi (1989).
5.Rudin, W. Functional Analysis, Tata McGraw-Hill Publ. Co. Ltd., Delhi (1977).
6.Jain, P.K. and Ahmad, Khalil, Metric Spaces, Narosa Publishing House (1996).
7.Copson, E.T. Metric Spaces, Universal Book Stal, Delhi (1989).
8.Berberian, S. Introduction to Hilbert Space, Oxford University Press, Oxford (1961).
9.Edwards, R.E. Functional Analysis Theory and Applications, Dover Publications, Inc. (1995).

Elective Papers Group – A (Any One)

MSMT-404a: MAGNETO FLUID DYNAMICS - II

Duration of Paper: 03 Hours **Max. Marks: 70**

Note: Each theory paper is divided in three parts i.e. Section – A, B and C .
Section A will consist of 10 compulsory questions. There will be two questions from each unit and answer (30 words). Each question carries 2 marks.
Section B will consist of 10 questions. Two questions from each unit and the examinee will answer (250 words) one question from each Unit. Each question carries 4 marks.
Section C will consist of 5 questions, one from each unit. The examinee will answer any 03 questions (with answer limit of 500 words). Each question carries 10 marks.

Unit 1: Two dimensional MHD boundary layer equations for flow over a plane surface for fluids of large electrical conductivity. MHD boundary lawyer flow past a semi infinite rigid flat plate in an aligned and Transverse magnetic field. Two-dimensional thermal boundary layer equations for flow over a plane surface.

Unit 2: MHD waves, waves in an infinite fluid of infinite electrical conductivity, Alfven waves. Reflection and Refraction of Alfven waves. MHD waves in a compressible fluid.

Unit 3: MHD waves in the presence of dissipative effects. Hydromagnetic shock waves, stationary plane shock waves in the absence of a magnetic field.
Unit 4: plane hydromagnetic shock waves, plane shock waves advancing into a stationary gas. MFD Applications: MFD ejectors, MFD accelerators, MFD Lubrication, MFD thin Airfoil, MFD Power generation.

Unit 5: Motion of a charged particle in uniform static electric and magnetic fields. Motion of a charged particle in crossed electric and magnetic fields. Magnetic moment, Particle drifts in an inhomogeneous magnetic field. Drifts produced by a field of force.

BOOKS RECOMMENDED :

1.Bansal, J.L.: Magnetofluiddynamics of Viscous fluids, Jaipur Publishing House, Jaipur, India
2.Farraro, V.C.A. and Plumpton, C.: Magnetofluidmecbanics Jeffereys, A.; Magnetohydrodynamics
3.Cowing, T.G.: Magnetohydrodynamics
4.Cramer, K.R. and Pai S.I.: Magnetofluiddynamics for Engineers and Physicists, Scripta Publishing Company, Washington, D.C., 1973.
5.Pai, S.I.: Magneto Geodynamics & Plasma Dynamics, Springer-Verlag, New York, 1962.
6.Shereliff, J.A.: Magnetohydrodynamics, Pergamon Press, London, 1965.
7.Charlton, P.: Text Book on Fluid Dynamics, CBS Publications, Delhi, 1985.
8.Rathy, R.K.: An Introduction to fluid dynamics Oxford & IBH Publishing Company, New Delhi, 1976.

Elective Papers Group – A (Any One)

MSMT-404b: LINEAR OPERATORS IN HILBERT SPACE - II

Duration of Paper: 03 Hours **Max. Marks: 70**

Note: Each theory paper is divided in three parts i.e. Section – A, B and C .
Section A will consist of 10 compulsory questions. There will be two questions from each unit and answer (30 words). Each question carries 2 marks.
Section B will consist of 10 questions. Two questions from each unit and the examinee will answer (250 words) one question from each Unit. Each question carries 4 marks.
Section C will consist of 5 questions, one from each unit. The examinee will answer any 03 questions (with answer limit of 500 words). Each question carries 10 marks.

Unit 1: Definition of a projection operator. Properties of projection operators. Operations involving projection operators, Monotone sequences of projection operators.

Unit 2: The aperture of two linear manifolds. Unitary operators Isometric operators. The Fourier-Plan-Cherel operator. Closed operators.

Unit 3: The general definition of an adjoint operator. Eigen vectors. Invariant subspaces and reducibility of linear operators. Symmetric operators. Isometric and unitary operators.

Unit 4: : The concept of the spectrum. The resolvent conjugation operators. The graph of an operator.

Unit 5: Matrix representation of unbounded symmetric operators. The operation of multiplication by the independent variable

BOOKS RECOMMENDED :

Akhiezer, N.I. and Glazman, I.M.: Theory of Linear Operation in Hilberts Space.

Translated from the Russian by Merlyind Nestell, Vingar Pub. Co., New York.

Elective Papers Group – A (Any One)

MSMT-404c: LAMINAR VISCOUS FLOW THEORY - II

Duration of Paper: 03 Hours **Max. Marks: 70**

Note: Each theory paper is divided in three parts i.e. Section – A, B and C .
Section A will consist of 10 compulsory questions. There will be two questions from each unit and answer (30 words). Each question carries 2 marks.
Section B will consist of 10 questions. Two questions from each unit and the examinee will answer (250 words) one question from each Unit. Each question carries 4 marks.
Section C will consist of 5 questions, one from each unit. The examinee will answer any 03 questions (with answer limit of 500 words). Each question carries 10 marks.

Unit 1: Laminar Boundary layers.Two dimensional incompressible boundary layer equations. The boundary layer on a flat plate (Blasuis-Topfer-solution), boundary layer parameters.

Unit 2: Similar Solutions of boundary layer equations. Wedge flow, Flow in a convergent channel. Flow in the wake of flat plate. Two dimensional Plane jet flow. Prandtl-Mises transformation and its application to plane jet flow.

Unit 3: Boundary layer separation. Boundary layer on a symmetrically placed cylinder (Blasius series solution) Gortler new series method. Axially symmetrical boundary layer. Mangler's transformation.

Unit 4: Thermal boundary layers in two dimensional incompressible flow, Crocco's integrals. Forced convection in a laminar boundary layer on a flat plate. Free convection from a heated vertical plate.

Unit 5: Karman momentum and kinetic energy integral equations. The Von karman and K Pohlhausen's approximate method for boundary layer over a flat plate. Thermal energy integral equation.

BOOKS RECOMMENDED:

Schliching H.: Boundary Layer Theory, McGraw Hill.

Pai, S.I.: Viscous Flow Theory, Vol.I, Laminar Flow, D.Van Nostrand Company, New York, 1956.

Bamal, J.L.: Viscous Fluid Dynamics, Oxford and IBH, 2004.

Elective Papers Group – A (Any One)

MSMT-404d: PROBABILITY AND STATISTICAL DISRIBUTIONIS-II

(Only for Non-Statistics students of B.Sc. Final)

Duration of Paper: 03 Hours **Max. Marks: 70**

Note: Each theory paper is divided in three parts i.e. Section – A, B and C .
Section A will consist of 10 compulsory questions. There will be two questions from each unit and answer (30 words). Each question carries 2 marks.
Section B will consist of 10 questions. Two questions from each unit and the examinee will answer (250 words) one question from each Unit. Each question carries 4 marks.
Section C will consist of 5 questions, one from each unit. The examinee will answer any 03 questions (with answer limit of 500 words). Each question carries 10 marks.

Unit 1: : Poisson distribution. Geometrical distribution. Negative Binomial Distribution,the Power series distribution. The properties and interrelation of these distribution.

Unit 2: Continuous distributions: Continuous uniform distribution, exponential distribution, Gamma distribution, Beta I and II kind distributions, Cauchy distribution, Normal distribution and Double exponential distribution.

Unit 3: Probability distribution of functions of random variables: Moment generating, cumulative distribution and transformation techniques to find distribution of function of random variables.

Unt 4: Truncated distributions, Compound (or composite) distributions and Sampling distributions:
Truncated distribution: Definition of Truncated distribution, Truncated Binomial, Poisson and Normal distributions.
Compound distributions: Definition, practical situation and applications of compound distributions.

Unit 5: Sampling distributions: Random sample, parameter and statistic, standard error, Sampling Distribution of sample mean $\bar{x}$ and variance s^2 from normal population. Chi-square, t and F distributions.
Methods of estimation of parameters: Method of Maximum Likelihood, Method of Moments and Method of Least squares.

BOOKS RECOMMENDED:

01. Mathematical Statistics By Parimal Mukhopadhyay (Books and Allied (P.) Ltd.,
02. An Introduction to Probability and Statistics By Vijay K. Rophtgi & A.K. Mod. Ehsanes Saleh.
03. Fundamental of Mathematical Statistics By S.C.Gupta and V.K. Kapoor (Sultan Chand & Sons).

Elective Papers Group – B (Any One)

MSMT-405a: GENERALIZED FUNCTIONS - II

Duration of Paper: 03 Hours **Max. Marks: 70**

Note: Each theory paper is divided in three parts i.e. Section – A, B and C .
Section A will consist of 10 compulsory questions. There will be two questions from each unit and answer (30 words). Each question carries 2 marks.
Section B will consist of 10 questions. Two questions from each unit and the examinee will answer (250 words) one question from each Unit. Each question carries 4 marks.
Section C will consist of 5 questions, one from each unit. The examinee will answer any 03 questions (with answer limit of 500 words). Each question carries 10 marks.

Unit 1: Elementary solutions of differential equations with constant coefficients.

Unit 2: Fourier Transforms of generalized functions. Fourier transform of test function,

Unit 3: . Fourier transforms of generalized functions of several variables. Fourier transform and Differential Equations.

Unit 4: Generalized functions concentrated on smooth monifolds of lower dimension. Generalized functions associated with Quadratic form.

Unit 5: Generalized Homogeneous functions, Arbitrary functions raised to a power.

BOOKS RECOMMENDED :

Gellifand, I.M. and Shilvo, G.C.: Generalized functions, Vol. I. Acad. Press. 1964.

Fredman, A.: Generalized Functions and Partial Differential Equations,

Prentice Hall. Inc., Englewood Cliffs, N.J., U.S.A., 1963.

Elective Papers Group – B (Any One)

MSMT-405b: FUNDAMENTALS OF OPERATIONS RESEARCH - II

Duration of Paper: 03 Hours **Max. Marks: 70**

Note: Each theory paper is divided in three parts i.e. Section – A, B and C .
Section A will consist of 10 compulsory questions. There will be two questions from each unit and answer (30 words). Each question carries 2 marks.
Section B will consist of 10 questions. Two questions from each unit and the examinee will answer (250 words) one question from each Unit. Each question carries 4 marks.
Section C will consist of 5 questions, one from each unit. The examinee will answer any 03 questions (with answer limit of 500 words). Each question carries 10 marks.

Unit 1: Inventories: Economic lot-size model with known demand and its extension allowing backlogging of demand concept of price break, simple probabilistic models.

Unit 2: Replacement problems: Replacement of item that deteriorate, replacement of items that fail completely.

Unit 3: Replacement Problems: Group replacement policy, individual replacement policy, mortality tables, staffing problems.

Unit 4: Queing theory-Ques with Poisson input and exponential service time, the queue length, waiting time and busy period in steady state case.

Unit 5: Queing theory: Model with service in phase, multiserver queueing models.

BOOKS RECOMMENDED:

Kanti Swaroop, Gupta, Man Mohan: Operations Research, Sultan Chand and Sons.

Goel and Mittal: Operations Research, Pragati Prakashan

Mittal, K.V.: Optimizadon Methods in O.R. and S. Analysis

Sharma, S.D.: Operations Research

Loomba, N.P.: Linear Programming

Satty, T.L.: Mathematical Methods of Operations Research.

Elective Papers Group – B (Any One)

MSMT-405c: INTEGRAL EQUATIONS AND BOUNDARY VALUE PROBLEMS - II

Duration of Paper: 03 Hours **Max. Marks: 70**

Note: Each theory paper is divided in three parts i.e. Section – A, B and C .
Section A will consist of 10 compulsory questions. There will be two questions from each unit and answer (30 words). Each question carries 2 marks.
Section B will consist of 10 questions. Two questions from each unit and the examinee will answer (250 words) one question from each Unit. Each question carries 4 marks.
Section C will consist of 5 questions, one from each unit. The examinee will answer any 03 questions (with answer limit of 500 words). Each question carries 10 marks.

Unit 1: . Fredholm integral equations with degenerate kernels.

Unit 2: Fredholm's equation as limit of a finite system of linear equations. Fredholm's two fundamental relations. Hadamard's theorem. Fredholm Fundamental theorems.

Unit 3: Green's function for Ordinary differential equation. Application of Integral transform in Boundary Value Problems. Applications of Integral Equation.

Unit 4: Some special types of integral equations. Application of Laplace Transform to determine the solution of Volterra integral equation with convolution type kernels.

Unit 5: Application of Fourier transform to determine the solutions of singular integral equations. Integro-differential equation.

BOOKS RECOMMENDED:

W.V.Lovaitt: Linear Integral Equation, Dover Publications, 1950.

Krasnov, Kiselev and MakrankoL Problem and Exercises in Integral Equations, Translated by G. Yankovsky, Mir Publishers, Moscow, 1971.

Mikhlim, S.G.: Integral Equations, Pergamon, Oxford, 1957

Triconi, F.D.: Integral Equations, Interscience, New York, 1957.

Pundir, S.K. and Pundir, R. Integral equations and Boundary Value Problems, Pragati Prakashan, Meerut (U.P.)

Chandramouli, A.B.: Integral Equations with Boundary Value Problems, Shiksha Sahitya Prakashan, Meerut (U.P.)

Elective Papers Group – B (Any One)

MSMT-405d: ADVANCED NUMERICAL ANALYSIS - II

Duration of Paper: 03 Hours **Max. Marks: 70**

Note: Each theory paper is divided in three parts i.e. Section – A, B and C .
Section A will consist of 10 compulsory questions. There will be two questions from each unit and answer (30 words). Each question carries 2 marks.
Section B will consist of 10 questions. Two questions from each unit and the examinee will answer (250 words) one question from each Unit. Each question carries 4 marks.
Section C will consist of 5 questions, one from each unit. The examinee will answer any 03 questions (with answer limit of 500 words). Each question carries 10 marks.

Unit 1 : Uniform minimax polynomial approximation, Chebyshev approximations, Chebyshev Expansion, Chebyshev Polynomials. Economization of Power Series.

Unit 2: : Solution of Boundary Value Problem: Finite Difference method. Finite Difference scheme for Linear and Non-Linear Boundary Value Problems. Numerical Solution of boundary value problems of the type $y'' = f(x\,y'), y'' = f(x, y, y')$ and $y'' = f(x, y)$.

Unit 3: Numerical Solution of Partial Differential Equations: Finite difference Approximation to partial derivatives. Numerical solution of linear Partial Differential Equations.

Unit 4: Solution of Laplace, poisson, one dimensional heat and wave equation by the method of separation of variables.

Unit 5 :..Shooting method for numerical solution of boundary value problems.

Books Recommended:

Jain, M.K.,Iyenger, SRK, Jain R.K.:: Numerical Methods for Scientists & Engineering Computations, Wiley Eastern Ltd.,

Jain, M.K. : Numerical Solution of Differential Equations, New Age International.

Shastry, S.S.: Introductory Methods of Numerical Analysis, Prentice Hall India Pvt., Ltd.,

Grewal, B.S. : Numerical Methods in Engineering & Science, Khanna Publishers.

Collatz, L.: Numerical Solution of Differential Equations, Tata McGraw-Hill.

D.S. Chouhan: Numerical Methods, JPH.

SKILL DEVELOPMENT COURSE

Sampling and Test of Significance

Types of Sampling: Random and non Random sampling.

Test of significance: Null hypothesis, Alternate hypothesis, level of significance, Degree of freedom, test calculation, critical values and conclusion.

Large sample test: Z Test, Standard error, critical values.

Small sample test: Student's t test and X^2 test.

SEMESTER- I

MSMT-101: Algebra – I
MSMT-102: Advanced Real Analysis
MSMT- 103: Differential Equations
MSMT-104: Special Functions
MSMT-105: Analytical Dynamics and Numerical Analysis - I

SEMESTER – II

MSMT- 201: Algebra – II
MSMT- 202: Measure Theory and Integration
MSMT- 203: Hydrodynamics
MSMT- 204: Classical Polynomials and Integral Transforms
MSMT- 205: Analytical Dynamics and Numerical Analysis - II

SEMESTER - III

MSMT- 301: Complex Analysis
MSMT- 302: Tensor Analysis
MSMT- 303: Functional Analysis – I
MSMT-304: Any one from Elective Course from **Group – 304**
MSMT-305: Any one from Elective Courses from **Group – 305**

SEMESTER – IV

MSMT-401: Topology
MSMT- 402: Differential Geometry
MSMT- 403: Functional Analysis – II
MSMT-404: Any one from Elective Courses from **Group – 404**
MSMT-405: Any one from Elective Courses from **Group – 405**

List of Skill Courses (SC) in Mathematics

MSMSC – 1 : Knowledge of Mathematical typing software

MSMSC – 2 : Knowledge of SPSS

MSM SC – 3 : Sampling and test of Significance – I

MSM SC – 4 : Knowledge of typing in latex

MSM SC- 5 : Knowledge of C Language

*List of Elective Papers (for Semester – III)

Group – 304	**Group – 305**
304a.Magnetofluid Dynamics - I	305a. Generalized Functions - I
304b.Linear Operators in Hilbert Space-I	305b.Fundamental of Operations Research-I
304c.Laminar Viscous Flow Theory-I	305c. Integral Equations and Boundary Value Problems-I
304d.Probability and Statistical Distributions-I	305d. Advanced Numerical Analysis – I

*List of Elective Papers (for Semester – IV)

Group – 404	**Group – 405**
404a.Magnetofluid Dynamics - II	405a. Generalized Functions - II
404b.Linear Operators in Hilbert Space-II	405b. Fundamental of Operations Research-II
404c.Laminar Viscous Flow Theory-II	405c. Integral Equations and Boundary Value Problems-II
404d.Probability and Statistical Distributions-II	405d. Advanced Numerical Analysis - II