SINGHANIA

UNIVERSITY

COURSE OUTLINE

MASTER OF SCIENCE IN MATHEMATICS

COURSE TITLE	Abstract Algebra
Course Code	MMATH20-101
Credits	5 (L: 4 ,T:1,5)
Faculty Name	Miss Meenu Nain
Program	Master of Science in Mathematics
Academic Year and Semester	w.e.f. 2024-25, 1st Semester

1. Course Description

Abstract Algebra is an **"essential program"** in Master of Science in Mathematics .The objective of this subject is to enable the students about Equivalence relations, subgroups, homeomorphisms, quotients, products, linear groups, permutation groups, and selected advanced topics.

2. Student Learning Outcomes :

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

1. Understand concepts of normal subgroup, quotient group, isomorphism, automorphism, conjugacy, G-sets, normal series, composition series, solvable group, nilpotent group and refinement theorem.

2. Learn about cyclic decomposition, alternating group A_n , simplicity of A_n for n$\geq$5, Sylow's theorem and its applications.

3. Understand concepts of modules, submodules, direct sum, R-homomorphism, quotient module, completely reducible modules, free modules, representation of linear mappings and their ranks.

4. Learn about similar linear transformation, triangular form, nilpotent transformation, primary decomposition theorem, Jordan form, rational canonical form and elementary divisors.

3. Required Textbook and Reference Material:

- Material will be provided by faculty.

4. Session Plan :

Session plan will be provided by faculty members according to the syllabus.

5. Evaluation:

COMPONENT	WEIGHTAGE	DETAILS
Assignment	10%	Sheet Work(A-4 Size sheet in a well mannered way)
Tests	10%	Test would be taken to assess the knowledge about topics related to daily basis classes.
Attendance & Classroom participation	10%	Students should have at least 75% attendance
Mid- Sem Exam	20%	Mid term exam must be cleared by students for appearing in final examination.
End- Sem Exam	50%	The end term exam must be cleared for appearing in next semester with a minimum passing criteria .

6. Academic Integrity:

- Please note that students involved in academic dishonesty will receive a **ZERO** grade on the particular component in which the infraction occurred.

● Academic dishonesty consists of misrepresentation by deception or by other fraudulent means. In an academic setting this may take the form of copying or use of unauthorized aids in tests, assignments, examinations, term papers, or cases; plagiarism; talking during in-class examinations; submission of work that is not your own without citation; submission of work generated by another person; aiding and abetting another student's dishonesty; and giving false information for the purpose of gaining credits.

7. No Network Policy

Students cannot operate any network enabled devices such as cell phones, e- tabs, I -pads or any other electronic network enabled devices inside the classroom during the sessions unless specifically instructed by the faculty. In case you are compelled to carry it in person, you may keep it in the switched off mode. Anyone found to

operate such devices during the session timings will be penalized as per the rules. No discussion or negotiation will be entertained at all with respect to this.

COURSE TITLE	COMPLEX ANALYSIS
Course Code	MMATH20-102
Credits	5 (L: 4 ,T:1 ,5)
Faculty Name	Miss Meenu Nain
Program	Master of Science in Mathematics
Academic Year and Semester	w.e.f. 2024-25, 1st Semester

1. Course Description

Mathematics (Advanced Calculus) is an essential program in Physical Science . The objective of this subject is to enable the students With regard to residues, special emphasis is given to their use in evaluating real improper integrals, finding inverse Laplace transforms, and locating zeros of functions. Conformal mapping find its use in solving boundary value problems that arise in studies of heat conduction, fluid flow and elastodynamics.

2. Student Learning Outcomes :

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

1. Understand the concepts of limit, continuity, differentiation and integration for functions defined over a complex plane as well as for the elementary functions.
2. Solve the complex integrals of various kinds through the applications of relevant theorems, formulae and power series expansions.
3. Analyse the complex functions with singularities for zeroes and residues at poles and apply the results to solve the improper integrals.
4. Solve complex improper integrals through the indentation, transformation/mapping of integration paths so as to avoid singularities and branch points/cuts.

3. Required Textbook and Reference Material:

- Material will be provided by faculty.

4. Session Plan :

Session plan will be provided by faculty members according to the syllabus.

5. Evaluation:

COMPONENT	WEIGHTAGE	DETAILS
Assignment	10%	Sheet Work(A-4 Size sheet in a well mannered way)
Tests	10%	Test would be taken to assess the knowledge about topics related to daily basis classes.
Attendance & Classroom participation	10%	Students should have at least 75% attendance
Mid- Sem Exam	20%	Mid term exam must be cleared by students for appearing in final examination.
End- Sem Exam	50%	The end term exam must be cleared for appearing in next semester with a minimum passing criteria .

6. Academic Integrity:

● Please note that students involved in academic dishonesty will receive a **ZERO** grade on the particular component in which the infraction occurred.

● Academic dishonesty consists of misrepresentation by deception or by other fraudulent means. In an academic setting this may take the form of copying or use of unauthorized aids in tests, assignments, examinations, term papers, or cases; plagiarism; talking during in-class examinations; submission of work that is not your own without citation; submission of work generated by another person; aiding and abetting another student's dishonesty; and giving false information for the purpose of gaining credits.

7. No Network Policy

Students cannot operate any network enabled devices such as cell phones, e- tabs, I -pads or any other electronic network enabled devices inside the classroom during the sessions unless specifically instructed by the faculty. In case you are compelled to carry it in person, you may keep it in the switched off mode. Anyone found to operate such devices during the session timings will be penalized as per the rules. No discussion or negotiation will be entertained at all with respect to this.

COURSE TITLE	ORDINARY DIFFERENTIAL EQUATIONS
Course Code	MMATH20-103
Credits	5 (L: 4 ,T:1 ,5)
Faculty Name	Miss Meenu Nain
Program	Master of Science in Mathematics
Academic Year and Semester	w.e.f. 2024-25, 1st Semester

1. Course Description

ORDINARY DIFFERENTIAL EQUATIONS is an **essential/core program** in Master of Science in Mathematics . The objective of this subject is to enable the students to study the existence and uniqueness theory of solutions of initial value problems, to familiarize with system of linear and non-linear, homogeneous and non-homogeneous differential equations with constant or variable coefficients, to study theory of homogeneous and non-homogeneous linear differential equations of higher order in detail and to understand the dependence of solution on initial parameters.

2. Student Learning Outcomes :

At the end of this course, students should be able to:
1. Understand concepts of an initial value problem and its exact and approximate solutions, existence of solutions, uniqueness of solutions and continuation of solutions of an initial value problem of order one. Apply the knowledge to prove specified theorems and to solve relevant exercises
2. Learn about system of linear differential equations of first order and its preliminary concepts, homogeneous and non-homogeneous linear systems, existence and uniqueness theory, fundamental matrix, theory of adjoint systems, linear systems with constant coefficients and with periodic coefficients. Attain the skill to obtain fundamental matrix of such a given linear system to demonstrate problem solving.
3. Have deep understanding of theory of linear differential equations of higher order by getting knowledge of basic theory, Wronskian theory and fundamental sets, adjoint equations and standard theorems related to these topics. Apply methods of reduction of order and variation of parameters to solve linear and non-linear differential equations respectively and to solve higher order linear differential equations with constant coefficients.
4. Understand system of differential equations and its existence theory, dependence of solution of an IVP on initial parameters, extremal solutions, upper and lower solutions so as to be able to develop research aptitude in this area.

3. Required Textbook and Reference Material:

● Material will be provided by faculty.

4. Session Plan :
● Session plan will be provided by faculty members according to the syllabus.

5. Evaluation:

COMPONENT	WEIGHTAGE	DETAILS
Assignment	10%	Sheet Work(A-4 Size sheet in a well mannered way)
Tests	10%	Test would be taken to assess the knowledge about topics related to daily basis classes.
Attendance & Classroom participation	10%	Students should have at least 75% attendance
Mid-Sem Exam	20%	Midterm exam must be cleared by students for appearing in final examination.

End- Sem Exam	50%	The end term exam must be cleared for appearing in next semester with a minimum passing criteria .

6. Academic Integrity:

● Please note that students involved in academic dishonesty will receive a **ZERO** grade on the particular component in which the infraction occurred.

● Academic dishonesty consists of misrepresentation by deception or by other fraudulent means. In an academic setting this may take the form of copying or use of unauthorized aids in tests, assignments, examinations, term papers, or cases; plagiarism; talking during in-class examinations; submission of work that is not your own without citation; submission of work generated by another person; aiding and abetting another student's dishonesty; and giving false information for the purpose of gaining credits.

7. No Network Policy

Students cannot operate any network enabled devices such as cell phones, e- tabs, I -pads or any other electronic network enabled devices inside the classroom during the sessions unless specifically instructed by the faculty. In case you are compelled to carry it in person, you may keep it in the switched off mode. Anyone found to operate such devices during the session timings will be penalized as per the rules. No discussion or negotiation will be entertained at all with respect to this.

COURSE TITLE	REAL ANALYSIS
Course Code	MMATH20-104
Credits	5 (L: 4 ,T:1 ,5)
Faculty Name	Miss Meenu Nain
Program	Master of Science in Mathematics
Academic Year and Semester	w.e.f. 2024-25, 1st Semester

1.Course Description

REAL ANALYSIS is an **essential program** in Master of Science in Mathematics. The course aims to familiarize the learner with Riemann-Stieltjes integral, uniform convergence of sequences and series of functions, functions of several variables and power series.

2. Student Learning Outcomes :

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

1. Understand the concept of Riemann-Stieltjes integral along its properties; integration of vector-valued functions with application to rectifiable curves.

2. Understand and handle convergence of sequences and series of functions; construct a continuous nowhere-

differentiable function; demonstrate understanding of the statement and proof of Weierstrass approximation theorem.

3. Understand differentiability and continuity of functions of several variables and their relation to partial derivatives; apply the knowledge to prove inverse function theorem and implicit function theorem.

4. Learn about the concepts of power Series, exponential & logarithmic functions, trigonometric functions, Fourier series and Gamma function; apply the knowledge to prove specified theorems.

3. Required Textbook and Reference Material:

- Material will be provided by faculty.

4. Session Plan :
- Session plan will be provided by faculty members according to the syllabus.

5. Evaluation:

COMPONENT	WEIGHTAGE	DETAILS
Assignment	10%	Sheet Work(A-4 Size sheet in a well mannered way)
Tests	10%	Test would be taken to assess the knowledge about topics related to daily basis classes.
Attendance & Classroom participation	10%	Students should have at least 75% attendance
Mid-Sem Exam	20%	Midterm exam must be cleared by students for appearing in final examination.
End- Sem Exam	50%	The end term exam must be cleared for appearing in next semester with a minimum passing criteria .

6. Academic Integrity:

- Please note that students involved in academic dishonesty will receive a **ZERO** grade on the particular component in which the infraction occurred.

● Academic dishonesty consists of misrepresentation by deception or by other fraudulent means. In an academic setting this may take the form of copying or use of unauthorized aids in tests, assignments, examinations, term papers, or cases; plagiarism; talking during in-class examinations; submission of work that is not your own without citation; submission of work generated by another person; aiding and abetting another student's dishonesty; and giving false information for the purpose of gaining credits.

7. No Network Policy

Students cannot operate any network enabled devices such as cell phones, e- tabs, I -pads or any other electronic network enabled devices inside the classroom during the sessions unless specifically instructed by the

faculty. In case you are compelled to carry it in person, you may keep it in the switched off mode. Anyone found to operate such devices during the session timings will be penalized as per the rules. No discussion or negotiation will be entertained at all with respect to this.

COURSE TITLE	TOPOLOGY
Course Code	MMATH20-105
Credits	5 (L: 4 ,T:1 ,5)
Faculty Name	Miss Meenu Nain
Program	Master of Science in Mathematics
Academic Year and Semester	w.e.f. 2024-25, 1st Semester

1. Course Description

TOPOLOGY is an essential program in Master of Science in Mathematics. The main objective of this course is to introduce basic concepts of point set topology, basis and sub basis for a topology. Further, to study continuity, homeomorphisms, open and closed maps, product and quotient topologies and introduce notions of filters and compactness of spaces.

2. Student Learning Outcomes :

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

1. Know about topological spaces, understand neighbourhood system of a point and its properties, interior, closure, boundary, limit points of subsets, and base and subbase of topological spaces; apply the knowledge to solve relevant exercises.
2. Learn about first and second countable spaces, separable and Lindelof spaces, continuous functions, separation axioms and their properties.
3. Know about quotient topology; demonstrate understanding of the statements and proofs of Embedding theorem and Urysohn's Lemma.
4. Know about filters and compactness in topological spaces and apply the knowledge to prove specified theorems.

3. Required Textbook and Reference Material:

● Material will be provided by faculty.

4. Session Plan :
● Session plan will be provided by faculty members according to the syllabus.

5. Evaluation:

COMPONENT	WEIGHTAGE	DETAILS
Assignment	10%	Sheet Work(A-4 Size sheet in a well mannered way)

Tests	10%	Test would be taken to assess the knowledge about topics related to daily basis classes.
Attendance & Classroom participation	10%	Students should have at least 75% attendance
Mid-Sem Exam	20%	Midterm exam must be cleared by students for appearing in final examination.
End- Sem Exam	50%	The end term exam must be cleared for appearing in next semester with a minimum passing criteria .

6. Academic Integrity:

- Please note that students involved in academic dishonesty will receive a **ZERO** grade on the particular component in which the infraction occurred.

● Academic dishonesty consists of misrepresentation by deception or by other fraudulent means. In an academic setting this may take the form of copying or use of unauthorized aids in tests, assignments, examinations, term papers, or cases; plagiarism; talking during in-class examinations; submission of work that is not your own without citation; submission of work generated by another person; aiding and abetting another student's dishonesty; and giving false information for the purpose of gaining credits.

7. No Network Policy

Students cannot operate any network enabled devices such as cell phones, e- tabs, I -pads or any other electronic network enabled devices inside the classroom during the sessions unless specifically instructed by the faculty. In case you are compelled to carry it in person, you may keep it in the switched off mode. Anyone found to operate such devices during the session timings will be penalized as per the rules. No discussion or negotiation will be entertained at all with respect to this.

COURSE TITLE	Practical-I
Course Code	MMATH20- 106
Credits	P:2
Faculty Name	Miss Meenu Nain
Program	Master of Science in Mathematics
Academic Year and Semester	w.e.f. 2024-25, 1st Semester

1.   Course Description

 Practical-I is an essential program in Master of Science in Mathematics. This is a laboratory course and objective of

this course is to acquaint the students with the practical use and to train for writing codes in ANSI-C for problem solving. Also, some problem solving techniques based on papers MMATH20-101 to MMATH20-105 will be taught.

2. **Student Learning Outcomes :**

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

1. Solve practical problems related to theory courses undertaken in the Semester-I from application point of view.
2. Know syntax of expressions, statements, structures and to write source code for a program in C.
3. Edit, compile and execute the source program for desired results.
4. Debug, verify/check and to obtain output of results.

3. Required Textbook and Reference Material:

- Material will be provided by faculty.

4. Session Plan :

- Session plan will be provided by faculty members according to the syllabus.

5. Evaluation:

COMPONENT	WEIGHTAGE	DETAILS
Assignment	10%	Sheet Work(A-4 Size sheet in a well mannered way)
Tests	10%	Test would be taken to assess the knowledge about topics related to daily basis classes.
Attendance & Classroom participation	10%	Students should have at least 75% attendance
Mid-Sem Exam	20%	Midterm exam must be cleared by students for appearing in final examination.
End- Sem Exam	50%	The end term exam must be cleared for appearing in next semester with a minimum passing criteria .

6. Academic Integrity:

- Please note that students involved in academic dishonesty will receive a **ZERO** grade on the particular component in which the infraction occurred.

● Academic dishonesty consists of misrepresentation by deception or by other fraudulent means. In an academic setting this may take the form of copying or use of unauthorized aids in tests, assignments, examinations, term papers, or cases; plagiarism; talking during in-class examinations; submission of work that is not your own without citation; submission of work generated by another person; aiding and abetting another student's dishonesty; and giving false information for the purpose of gaining credits.

7. No Network Policy
Students cannot operate any network enabled devices such as cell phones, e- tabs, I -pads or any other

electronic network enabled devices inside the classroom during the sessions unless specifically instructed by the faculty. In case you are compelled to carry it in person, you may keep it in the switched off mode. Anyone found to operate such devices during the session timings will be penalized as per the rules. No discussion or negotiation will be entertained at all with respect to this.

COURSE TITLE	Seminar-I
Course Code	MMATH20- 107
Credits	S: 2 on internal basis
Faculty Name	Miss Meenu Nain
Program	Master of Science in Mathematics
Academic Year and Semester	w.e.f. 2024-25, 1st Semester

1. Course Description

Seminar-I is an essential program in Master of Science in Mathematics . The objectives of this course are self study, understanding a topic in detail, comprehension of the subject/topic, investigating a problem, knowledge of ethics, effective communication and life-long learning.

.

2. Student Learning Outcomes :

At the end of this course, students should be able to:
1. Identify an area of interest and to select a topic therefrom realizing ethical issues related to one's work and unbiased truthful actions in all aspects of work and to develop research aptitude.
2. Have deep knowledge and level of understanding of a particular topic in core or applied areas of Mathematics, imbibe research orientation and attain capacity of investigating a problem.
3. Obtain capability to read and understand mathematical texts from books/journals/e-contents, to communicate through write up/report and oral presentation.
4. Demonstrate knowledge, capacity of comprehension and precision, capability to work independently and tendency towards life-long learning.

3. Required Textbook and Reference Material:

● Material will be provided by faculty.

4. Session Plan :
● Session plan will be provided by faculty members according to the syllabus.

5. Evaluation:

COMPONENT	WEIGHTAGE	DETAILS
Assignment	10%	Sheet Work(A-4 Size sheet in a well mannered way)

Tests	10%	Test would be taken to assess the knowledge about topics related to daily basis classes.
Attendance & Classroom participation	10%	Students should have at least 75% attendance
Mid-Sem Exam	20%	Midterm exam must be cleared by students for appearing in final examination.
End- Sem Exam	50%	The end term exam must be cleared for appearing in next semester with a minimum passing criteria .

6. Academic Integrity:

● Please note that students involved in academic dishonesty will receive a **ZERO** grade on the particular component in which the infraction occurred.

● Academic dishonesty consists of misrepresentation by deception or by other fraudulent means. In an academic setting this may take the form of copying or use of unauthorized aids in tests, assignments, examinations, term papers, or cases; plagiarism; talking during in-class examinations; submission of work that is not your own without citation; submission of work generated by another person; aiding and abetting another student's dishonesty; and giving false information for the purpose of gaining credits.

7. No Network Policy

Students cannot operate any network enabled devices such as cell phones, e- tabs, I -pads or any other electronic network enabled devices inside the classroom during the sessions unless specifically instructed by the faculty. In case you are compelled to carry it in person, you may keep it in the switched off mode. Anyone found to operate such devices during the session timings will be penalized as per the rules. No discussion or negotiation will be entertained at all with respect to this.

COURSE TITLE	ADVANCED ABSTRACT ALGEBRA
Course Code	MMATH20-201
Credits	5 (L: 4 ,T:1,5)
Faculty Name	Miss Meenu Nain
Program	Master of Science in Mathematics
Academic Year and Semester	w.e.f. 2024-25, 2nd Semester

1. **Course Description:**

ADVANCED ABSTRACT ALGEBRA is an essential program in Master of Science in Mathematics . As suggested by the name of the course itself, some of the advanced topics of abstract algebra will be taught to the students in this course including field extensions, finite fields, normal extensions, finite normal extensions as splitting fields. A study of Galois extensions, Galois groups of polynomials, Galois radical extensions shall also be made.

2. **Student Learning Outcomes :**

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

   1. Understand concepts of irreducible polynomial, Eisenstein criterion, field extension, algebraic and transcendental extension, algebraically closed field.
   2. Have deep understanding of Splitting fields, normal extension, multiple roots, prime field, finite field and separable extension.
   3. Learn about automorphism groups, fixed field, Dedekind lemma, fundamental theorem of Galois theory, roots of unity, Cyclotomic polynomial and cyclic extension.
   4. Have deep understanding of polynomials solvable by radicals, symmetric functions, ruler and compass construction.

3. Required Textbook and Reference Material:

   ● Material will be provided by faculty.

4. Session Plan :
   ● Session plan will be provided by faculty members according to the syllabus.

5. Evaluation:

COMPONENT	WEIGHTAGE	DETAILS
Assignment	10%	Sheet Work(A-4 Size sheet in a well mannered way)
Tests	10%	Test would be taken to assess the knowledge about topics related to daily basis classes.
Attendance & Classroom participation	10%	Students should have at least 75% attendance
Mid-Sem Exam	20%	Midterm exam must be cleared by students for appearing in final examination.
End- Sem Exam	50%	The end term exam must be cleared for appearing in next semester with a minimum passing criteria .

6. Academic Integrity:

 ● Please note that students involved in academic dishonesty will receive a **ZERO** grade on the particular component in which the infraction occurred.

● Academic dishonesty consists of misrepresentation by deception or by other fraudulent means. In an academic setting this may take the form of copying or use of unauthorized aids in tests, assignments,

examinations, term papers, or cases; plagiarism; talking during in-class examinations; submission of work that is not your own without citation; submission of work generated by another person; aiding and abetting another student's dishonesty; and giving false information for the purpose of gaining credits.

7. No Network Policy

Students cannot operate any network enabled devices such as cell phones, e- tabs, I -pads or any other electronic network enabled devices inside the classroom during the sessions unless specifically instructed by the faculty. In case you are compelled to carry it in person, you may keep it in the switched off mode. Anyone found to operate such devices during the session timings will be penalized as per the rules. No discussion or negotiation will be entertained at all with respect to this.

COURSE TITLE	COMPUTER PROGRAMMING with MATLAB
Course Code	MMATH20-202
Credits	5 (L: 4 ,T:1,5)
Faculty Name	Miss Meenu Nain
Program	Master of Science in Mathematics
Academic Year and Semester	w.e.f. 2024-25, 2nd Semester

1. **Course Description:**

COMPUTER PROGRAMMING with MATLAB is an essential program in Master of Science in Mathematics. This course is designed to train the students in the computer programming. The objective of this course is to develop a skill of writing codes in MATLAB or equivalent Open Source software for solving different types of mathematical problems which arise in the areas of Mathematical/Physical/Life/Social Sciences and Engineering.

2. Student Learning Outcomes :

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

   1. Get familiar with the importance and working of MATLAB as computation platform through the knowledge of characters, variables, operators, functions and expressions as used for elementary operations in matrix algebra along with the editing, load/save data and compilation/execution/quitting of source programs.
   2. Learn the process of writing a source program in MATLAB as high-level language making use of the statements for input/output, conditional/non-sequential processing involving functions, arrays and structures.

3. Learn the plotting of the curves and surfaces, which can be edited, modified, accumulated, handled, printed, exported and used to creating movies.

4. Write source programs with objects, variables, expressions, abstract functions, math functions in symbolic form and their subsequent use for the operations/ concepts/ problems in calculus, linear algebra and differential equations.

3. Required Textbook and Reference Material:

- Material will be provided by faculty.

4. Session Plan :

- Session plan will be provided by faculty members according to the syllabus.

5. Evaluation:

COMPONENT	WEIGHTAGE	DETAILS
Assignment	10%	Sheet Work(A-4 Size sheet in a well mannered way)
Tests	10%	Test would be taken to assess the knowledge about topics related to daily basis classes.
Attendance & Classroom participation	10%	Students should have at least 75% attendance
Mid-Sem Exam	20%	Midterm exam must be cleared by students for appearing in final examination.
End- Sem Exam	50%	The end term exam must be cleared for appearing in next semester with a minimum passing criteria .

6. Academic Integrity:

- Please note that students involved in academic dishonesty will receive a **ZERO** grade on the particular component in which the infraction occurred.

● Academic dishonesty consists of misrepresentation by deception or by other fraudulent means. In an academic setting this may take the form of copying or use of unauthorized aids in tests, assignments, examinations, term papers, or cases; plagiarism; talking during in-class examinations; submission of work that is not your own without citation; submission of work generated by another person; aiding and abetting another student's dishonesty; and giving false information for the purpose of gaining credits.

7. No Network Policy

Students cannot operate any network enabled devices such as cell phones, e- tabs, I -pads or any other electronic network enabled devices inside the classroom during the sessions unless specifically instructed by the faculty. In case you are compelled to carry it in person, you may keep it in the switched off mode. Anyone found to operate such devices during the session timings will be penalized as per the rules. No discussion or negotiation will be entertained at all with respect to this.

COURSE TITLE	DIFFERENTIAL EQUATIONS
Course Code	MMATH20-203
Credits	5 (L: 4 ,T:1,5)
Faculty Name	Miss Meenu Nain
Program	Master of Science in Mathematics
Academic Year and Semester	w.e.f. 2024-25 2nd Semester

1. **Course Description:**

DIFFERENTIAL EQUATIONS is an essential program in Master of Science in Mathematics. The objectives of this course are to learn about oscillations of second order differential equations, solving boundary value problems, critical points of linear and non-linear system of differential equations and to determine types and stability of those critical points and systems.

2. Student Learning Outcomes :

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

1. Understand preliminary, oscillation and Sturm' theory of second order ordinary differential equations and comparison theorems. Apply this knowledge to solve problems of checking second order ODEs for oscillatory, finding common zeros and applying Prüffer transformation.
2. Have good understanding of boundary value problems of second order, their classification and solution. Appreciate the concept of Green's function. Attain skills to solve boundary value problems which find great applications in areas of applied mathematics, science and engineering.
3. Know critical points of linear and non-linear system of differential equations, their types and stability. Understand concepts of potential energy function, limit cycles, semi orbit and limit sets. Apply the gained knowledge to determine type and stability of critical points and check for existence of limit cycles of given systems. Have a foundation to understand area of non-linear analysis of dynamical systems where mathematics and space science connect to each other.
4. Understand stability of linear, quasi-linear and non-linear systems. Learn to apply Lyapunov direct method to determine stability of such systems for investigating and solving problems.

3. Required Textbook and Reference Material:

- Material will be provided by faculty.

4. Session Plan :
- Session plan will be provided by faculty members according to the syllabus.

5. Evaluation:

COMPONENT	WEIGHTAGE	DETAILS
Assignment	10%	Sheet Work(A-4 Size sheet in a well mannered way)
Tests	10%	Test would be taken to assess the knowledge about topics related to daily basis classes.
Attendance & Classroom participation	10%	Students should have at least 75% attendance
Mid-Sem Exam	20%	Midterm exam must be cleared by students for appearing in final examination.
End- Sem Exam	50%	The end term exam must be cleared for appearing in next semester with a minimum passing criteria .

6. Academic Integrity:

- Please note that students involved in academic dishonesty will receive a **ZERO** grade on the particular component in which the infraction occurred.

● Academic dishonesty consists of misrepresentation by deception or by other fraudulent means. In an academic setting this may take the form of copying or use of unauthorized aids in tests, assignments, examinations, term papers, or cases; plagiarism; talking during in-class examinations; submission of work that is not your own without citation; submission of work generated by another person; aiding and abetting another student's dishonesty; and giving false information for the purpose of gaining credits.

7. No Network Policy

Students cannot operate any network enabled devices such as cell phones, e- tabs, I -pads or any other electronic network enabled devices inside the classroom during the sessions unless specifically instructed by the faculty. In case you are compelled to carry it in person, you may keep it in the switched off mode. Anyone found to operate such devices during the session timings will be penalized as per the rules. No discussion or negotiation will be entertained at all with respect to this.

COURSE TITLE	MEASURE AND INTEGRATION
Course Code	MMATH20-204
Credits	5 (L: 4 ,T:1,5)
Faculty Name	Miss Meenu Nain
Program	Master of Science in Mathematics
Academic Year and Semester	w.e.f. 2024-25 2nd Semester

1. Course Description:

MEASURE AND INTEGRATION is an essential program in Master of Science in Mathematics . The main objective is to familiarize with Lebesgue outer measure, measurable sets, measurable functions, Lebesgue integration, fundamental integral convergence theorems, functions of bounded variation, differentiation of an integral, absolutely continuous functions and Lp-spaces.

2. Student Learning Outcomes :

At the end of this course, students should be able to:
1. Understand the concepts of measurable sets and Lebesgue measure; construct a non- measurable set; apply the knowledge to solve relevant exercises.
2. Know about Lebesgue measurable functions and their properties; and apply the knowledge to prove Egoroff's theorem, Lusin's theorem and F.Riesz theorem.
3. Understand the requirement and the concept of the Lebesgue integral (as a generalization of the Riemann integration) along its properties and demonstrate understanding of the statement and proofs of the fundamental integral convergence theorems.
4. Know about the concepts of differentiation of monotonic function, functions of bounded variations, differentiation of an integral and absolutely continuous functions; apply the knowledge to prove specified theorems.

3. Required Textbook and Reference Material:

● Material will be provided by faculty.

4. Session Plan :
● Session plan will be provided by faculty members according to the syllabus.

5. Evaluation:

COMPONENT	WEIGHTAGE	DETAILS
Assignment	10%	Sheet Work(A-4 Size sheet in a well mannered way)

Tests	10%	Test would be taken to assess the knowledge about topics related to daily basis classes.
Attendance & Classroom participation	10%	Students should have at least 75% attendance
Mid-Sem Exam	20%	Midterm exam must be cleared by students for appearing in final examination.
End- Sem Exam	50%	The end term exam must be cleared for appearing in next semester with a minimum passing criteria .

6. Academic Integrity:

● Please note that students involved in academic dishonesty will receive a **ZERO** grade on the particular component in which the infraction occurred.

● Academic dishonesty consists of misrepresentation by deception or by other fraudulent means. In an academic setting this may take the form of copying or use of unauthorized aids in tests, assignments, examinations, term papers, or cases; plagiarism; talking during in-class examinations; submission of work that is not your own without citation; submission of work generated by another person; aiding and abetting another student's dishonesty; and giving false information for the purpose of gaining credits.

7. No Network Policy

Students cannot operate any network enabled devices such as cell phones, e- tabs, I -pads or any other electronic network enabled devices inside the classroom during the sessions unless specifically instructed by the faculty. In case you are compelled to carry it in person, you may keep it in the switched off mode. Anyone found to operate such devices during the session timings will be penalized as per the rules. No discussion or negotiation will be entertained at all with respect to this.

COURSE TITLE	MECHANICS OF SOLIDS
Course Code	MMATH20-205
Credits	5 (L: 4 ,T:1,5)
Faculty Name	Miss Meenu Nain
Program	Master of Science in Mathematics
Academic Year and Semester	w.e.f. 2024-25 2nd Semester

1. **Course Description:**

MECHANICS OF SOLIDS is an essential program in Master of Science in Mathematics . In this course, basic theory of mechanics of solids is introduced. First, the laws of transformations and tensors will be introduced. Mathematical theory of deformations, analysis of strain and analysis of stress in elastic solids will be learnt next. A student will also learn basic equations of elasticity and variational methods. In this course, the students will be exposed to the mathematical theory of elasticity and other techniques which find applications in areas of civil and mechanical engineering and Earth and material sciences. This course will expose a student to Applied Mathematics and will form a sound basis for doing research in the number of areas involving solid mechanics

2. **Student Learning Outcomes :**

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

   1. Understand the concept of tensors as a generalized form of directional entities and to explore their properties through the operations of algebra and calculus. Be familiar with affine transformation and infinitesimal deformation.
   2. Understand analysis of strain and stress tensors. Prepare a strong foundation to learn theory of elasticity to solve scientific problems.
   3. Relate strain tensor and stress tensor through anisotropic elastic moduli, subjected to reflection/rotational symmetries to define elastic isotropy, and using theorems/ principles to explore the role of these relations in strain energy, compatibility and uniqueness of solution.
   4. Learn variational methods to solve boundary value problems in elasticity. Learn to prove standard theorems related to theory of variational problems and to apply these techniques/methods by minimizing the potential / strain / complementary energies to solve scientific problems in mechanics of solids and get exposed to research problems in the field of elasticity.

3. Required Textbook and Reference Material:

● Material will be provided by faculty

4. Session Plan :
   ● Session plan will be provided by faculty members according to the syllabus.

5. Evaluation:

COMPONENT	WEIGHTAGE	DETAILS
Assignment	10%	Sheet Work(A-4 Size sheet in a well mannered way)
Tests	10%	Test would be taken to assess the knowledge about topics related to daily basis classes.

Attendance & Classroom participation	10%	Students should have at least 75% attendance
Mid-Sem Exam	20%	Midterm exam must be cleared by students for appearing in final examination.
End- Sem Exam	50%	The end term exam must be cleared for appearing in next semester with a minimum passing criteria .

6. Academic Integrity:

- Please note that students involved in academic dishonesty will receive a **ZERO** grade on the particular component in which the infraction occurred.

● Academic dishonesty consists of misrepresentation by deception or by other fraudulent means. In an academic setting this may take the form of copying or use of unauthorized aids in tests, assignments, examinations, term papers, or cases; plagiarism; talking during in-class examinations; submission of work that is not your own without citation; submission of work generated by another person; aiding and abetting another student's dishonesty; and giving false information for the purpose of gaining credits.

7. No Network Policy

Students cannot operate any network enabled devices such as cell phones, e- tabs, I -pads or any other electronic network enabled devices inside the classroom during the sessions unless specifically instructed by the faculty. In case you are compelled to carry it in person, you may keep it in the switched off mode. Anyone found to operate such devices during the session timings will be penalized as per the rules. No discussion or negotiation will be entertained at all with respect to this.

COURSE TITLE	Practical-II
Course Code	MMATH20-206
Credits	P: 2
Faculty Name	Miss Meenu Nain
Program	Master of Science in Mathematics
Academic Year and Semester	w.e.f. 2024-25 2nd Semester

1. **Course Description:**

Practical-II is an essential program in Master of Science in Mathematics. This course aims to train the students for practical implementations of the features of MATLAB/SCILAB/Octave programming, which they study as a theory course MMATH20-202. Also, implementation of some problem solving techniques, based on papers MMATH20-201 to MMATH20-205, should be learnt.

2. Student Learning Outcomes :

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

1.   Solve practical problems related to theory courses undertaken in the Semester-II from application point of view.
2.   Know syntax of expressions, statements, data types, structures, commands and to write source code for a program in MATLAB/SCILAB/Octave.
3.   Edit, compile/interpret and execute the source program for desired results.
4.   Debug, verify/check and to obtain output of results.

3. Required Textbook and Reference Material:

● Material will be provided by faculty.

4. Session Plan :
   ● Session plan will be provided by faculty members according to the syllabus.

5. Evaluation:

COMPONENT	WEIGHTAGE	DETAILS
Assignment	10%	Sheet Work(A-4 Size sheet in a well mannered way)
Tests	10%	Test would be taken to assess the knowledge about topics related to daily basis classes.
Attendance & Classroom participation	10%	Students should have at least 75% attendance
Mid-Sem Exam	20%	Midterm exam must be cleared by students for appearing in final examination.
End- Sem Exam	50%	The end term exam must be cleared for appearing in next semester with a minimum passing criteria .

6. Academic Integrity:

● Please note that students involved in academic dishonesty will receive a **ZERO** grade on the particular component in which the infraction occurred.

● Academic dishonesty consists of misrepresentation by deception or by other fraudulent means. In an academic setting this may take the form of copying or use of unauthorized aids in tests, assignments, examinations, term papers, or cases; plagiarism; talking during in-class examinations; submission of work that is not your own without citation; submission of work generated by another person; aiding and abetting another student's dishonesty; and giving false information for the purpose of gaining credits.

7. No Network Policy

Students cannot operate any network enabled devices such as cell phones, e- tabs, I -pads or any other electronic network enabled devices inside the classroom during the sessions unless specifically instructed by the faculty. In case you are compelled to carry it in person, you may keep it in the switched off mode. Anyone found to operate such devices during the session timings will be penalized as per the rules. No discussion or negotiation will be entertained at all with respect to this.

COURSE TITLE	BASIC MATHEMATICS-I
Course Code	OEM20-207
Credits	2 (L: 2,P:0,2)
Faculty Name	Miss Meenu Nain
Program	Master of Science in Mathematics
Academic Year and Semester	w.e.f. 2024-25 2nd Semester

1. **Course Description:**

BASIC MATHEMATICS-I is an open Elective program in Master of Science in Mathematics. The main objective of this course is to familiarize the students with some of the topics from Analysis and Algebra, namely, convergence of sequences and series, Fourier series, algebra of matrices, rank of a matrix, systems of linear equations, characteristic roots and characteristic vectors of a square matrix.

2. **Student Learning Outcomes :**

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

1. Understand convergence of sequences and series; attain the skill to handle the convergence of various infinite series.
2. Know about the Fourier series, conditions for Fourier expansion; attain the skill to compute Fourier series of various functions.
3. Know about the algebra of matrices, rank of a matrix; attain the skill to find the rank of matrices.
4. Solve systems of linear equations and find characteristic roots and characteristic vectors of a square matrix.

3. Required Textbook and Reference Material:

● Material will be provided by faculty.

4. Session Plan :
   ● Session plan will be provided by faculty members according to the syllabus.

5. Evaluation:

COMPONENT	WEIGHTAGE	DETAILS
Assignment	10%	Sheet Work(A-4 Size sheet in a well mannered way)
Tests	10%	Test would be taken to assess the knowledge about topics related to daily basis classes.
Attendance & Classroom participation	10%	Students should have at least 75% attendance
Mid-Sem Exam	20%	Midterm exam must be cleared by students for appearing in final examination.
End- Sem Exam	50%	The end term exam must be cleared for appearing in next semester with a minimum passing criteria .

6. Academic Integrity:

● Please note that students involved in academic dishonesty will receive a **ZERO** grade on the particular component in which the infraction occurred.

● Academic dishonesty consists of misrepresentation by deception or by other fraudulent means. In an academic setting this may take the form of copying or use of unauthorized aids in tests, assignments, examinations, term papers, or cases; plagiarism; talking during in-class examinations; submission of work that is not your own without citation; submission of work generated by another person; aiding and abetting another student's dishonesty; and giving false information for the purpose of gaining credits.

7. No Network Policy

Students cannot operate any network enabled devices such as cell phones, e- tabs, I -pads or any other electronic network enabled devices inside the classroom during the sessions unless specifically instructed by the faculty. In case you are compelled to carry it in person, you may keep it in the switched off mode. Anyone found to operate such devices during the session timings will be penalized as per the rules. No discussion or negotiation will be entertained at all with respect to this.