Master of Science in Applied Mathematics

Indian Institute of Technology Mandi

Programme Level	Post Graduate
Year of Commencement	2016
Minimum Duration	2 Years (4 Semesters)
Maximum Duration	3 Years (6 Semesters)
Senate Meeting Reference	9.3/18.5/20.4/**38.10**

Preamble : M.Sc. in Applied Mathematics programme at IIT Mandi is intended to give the students deep understanding of the principles of Mathematical sciences while expanding their knowledge in the allied areas through elective courses. The curriculum has been designed so as to prepare the students to take up a research career either in academia or in industries on completion of the program. The students will be equally equipped to take up professional career in Industries. The structure of the proposed programme has been designed drastically amended from the conventional M.Sc. (Mathematics) programs across the country by providing a balance among theory, application, and research components. The program is designed in such a way that students will have enough choices to learn their desired subjects by taking number of elective courses from and outside of the discipline. The curriculum focuses on an interdisciplinary approach wherein students learn theory and its applications (through fundamental core courses and engineering open elective courses) those are required for research in applied Mathematics and industry jobs:

- Broad based curriculum by the inclusion of a number of free and discipline electives, without compromising the core subjects.

- Theory and application oriented courses.

- Research oriented curriculum to increase thinking power' and 'Problem solving ability'.

- Adequate blend of theory and research.

- Learning of advanced Mathematical tools to solve engineering and real-life problems.

- Generates enough opportunities for industry jobs.

Semester-wise credit distribution :

Semester-I		Semester-II	
Real Analysis(MA-511)	4 Credit	Functional Analysis(MA-521)	4 Credit
Linear Algebra(MA-512)	4 Credit	Partial Differential Equation(MA-522)	4 Credit
Ordinary Differential Equation(MA-513)	4 Credit	Numerical Analysis(MA-523)	4 Credit
Computer Programming(MA-514)	3 Credit	Probability and Statistics(MA-524)	4 Credit
Computer Programming Lab(MA-514P)	2 Credit	Discipline Elective- I	4 Credit
Applied Mathematical Programming(MA-515)	4 Credit	Technical Communication(HS-541)	1 Credit
Total	21 Credit	Total	21 Credit

Semester-III		Semester-IV	
Discipline Elective - II	3 Credit	Discipline Elective - VII	3 Credit
Discipline Elective - III	3 Credit	Elective - VIII	3 Credit
Elective - IV	3 Credit	Elective - IX	3 Credit
Elective - V	3 Credit	Project (Part-2)	8 Credit
Elective - VI	3 Credit		
Project (Part-I)	6 Credit		
Total	21 Credit	Total	17 Credit

- **Credit Structure:** A student, to be awarded M.Sc. degree, must need to earn 80 credits.

- **Open Electives:** Open electives from outside the discipline of program should be at least of 6 credits.

- **Discipline Electives:** Discipline electives will be provided according to the requirement of the students and the availability of the faculties. The list of discipline electives are attached herewith.

- **Discipline Elective Courses:** The following existing senate approved courses can be offered as discipline electives. More elective courses will be added time to time as required.

List of Discipline Elective Courses

Course Numbers	Course Titles	Credits
MA-549(3)	Abstract Algebra	3
MA-552(3)	Number Theory	3
MA-780 (3)	Topics in Semigroup Theory	3
MA-550(3)	Statistical Data Analysis	3
MA-553(3)	Mathematical Foundations of Financial Engineering	3
MA-565(3)	Numerical Methods in Quantitative Finance	3
MA-608(3)	Computational Fluid Dynamics	3
MA-609(3)	Numerics of Partial Differential Equation	3
MA-651(3)	Optimization Techniques	3
MA-652(3)	Stability Theory of Differential Equations	3
MA-653(3)	Computational Financial Modelling	3
MA-654(3)	Financial Engineering	3
MA-656(3)	Stochastic Calculus for Financial Engineering	3
MA-704(3)	Dynamical System	3
MA-705(3)	Modeling Population Dynamics	3
MA-709(3)	Numerical Linear Algebra	3
MA-765(4)	Fractional Differential Equations	4
MA-516(4)	Topology	4
MA-611(4)	Statistical tools and Computing	4
MA-5XX(4)	Field Theory	4
MA-5XX(4)	Graph Theory	4
MA-528(4)	Measure Theory and Integration	4

Project: The project focuses on an interdisciplinary approach wherein students learn theory and its applications, those are required for research in Mathematics and industry jobs. Students need to complete 14 credit project in the third and fourth semester. We offer the research projects on the following topics:

1. Differential Equations

2. Mathematical Control Problems

3. Optimization,

4. Soft Computing

5. Machine Learning

6. Financial Mathematics

7. Dynamical Systems

8. Nonlinear Dynamics

9. Harmonic Analysis

10. Wavelet Analysis

11. Computational Fluid Dynamics

12. Numerical Methods for PDEs

13. Topology and Combinatorics

14. Algebraic Topology

15. Classical K-theory, Commutative Algebra

16. Statistical Time Series Analysis

17. Climate Modelling

18. Ecological Modelling

19. Deep Learning

20. Any Interdisciplinary Topics with applications in Mathematics

In project, students are expected to read research papers, advance mathematical courses and to do literary survey about research problems and their application to the real life problems. Also, some motivated students works on new research topic suggested by their project mentor.

Project Evaluation: A continuous evaluation process will be followed to evaluate the project/thesis work progress to award letter grades for the credits assigned to project/thesis component, as mentioned in the institute's Ordinance for M.Sc. programme.

Changes: We have reduced the credits of the final year project from 21 credits to 14 credits and have added two more courses as discipline electives. Adding two more courses as discipline elective will give an exposure to students about different areas of applied mathematics as per their interest. These changes will help the students to qualify the national level exams and get the extra knowledge in courses related to applied mathematics. Changes are highlighted in Blue.