



Ramakrishna Mission Vidyamandira  
Belur Math, Howrah - 711 202

**Academic Internship 2025**  
**Offered by**  
**Mathematics Department**

**1. Special theory of relativity**

**Prerequisite:**

- Basic properties of groups,
- Basic concept of vector space,
- Coordinate geometry
- Calculus.

**Mode (Online / Offline / Hybrid): Online**

**Tentative Timeline:**

- Dates: 14<sup>th</sup> -19<sup>th</sup> May, 2<sup>nd</sup> - 6<sup>th</sup> June;
- Time: 6:00 pm – 8:00 pm

**Number of students: 25**

**Aims & objectives:** By this internship the students will have a basic concept of postulates of special relativity, Lorentz transformation and its properties, Length contraction, Time dilation, Simultaneity, general Lorentz transformation. Students will also know about the famous equations  $E=mc^2$ ,  $c+c=c$ , concept of light cone and 4-vectors.

**Applicable for:** Open to all who satisfies the pre-requisites.

**Internship Code: MTMSM1**

**Possible Instructor:** Dr. Saugata Mitra, Assistant Professor, Department of Mathematics, Ramakrishna Mission Vidyamandira.

**2. Mathematical Modelling using Ordinary Differential Equations.**

**Prerequisite:**

- Single variable calculus - Continuity, differentiability.
- Working Knowledge of Integration.
- Basics of linear algebra - Eigen spaces.
- (Desired but not essential) Ability to code in any programming language.

**Mode (Online / Offline / Hybrid): Online**

**Tentative Timeline:**

- Dates: 16th May -11th June. Monday, Wednesday and Friday for 3 weeks
- Times: 6:00 pm – 7:30 pm.

**Number of students:** 10.

**Aims & objectives:** The Internship aims to train students to use ordinary differential equations to model some physical and real-world phenomena. The students will learn about phase planes and the different kinds of stabilities. They will start working with linear models and if time permits, they will explore non-linear models also. Programming using Scilab / Octave will be used to plot the results. Students not having prior knowledge of coding need not worry as the basic codes will be discussed during the Internship.

**Applicable for:** Open to all who satisfies the pre-requisites.

**Internship Code:** MTMAJD1

**Possible Instructor:** Dr. Arnab Jyoti Das Gupta, Assistant Professor, Department of Mathematics, Ramakrishna Mission Vidyamandira.

### 3. Studying Eigenvalues of Graphs

**Prerequisite:**

- a. Eigenvalues of a matrix
- b. Procedure to find eigenvalues from a matrix
- c. Interest in Graph theory

**Mode (Online / Offline / Hybrid):** Online

**Tentative Timeline:**

- a. Date: 15 May to 30 June, 1 day a week for 6 weeks.
- b. Time: 7.30pm to 9.30pm,

**Number of students:** 4.

**Aims & objectives:**

1. Learning basics of graphs
2. Studying different types of graphs
3. Studying Adjacency matrix of a graph
4. Studying different properties of adjacency eigenvalues.
5. Analyzing adjacency eigenvalues to determine structural properties of graphs.
6. Learning the procedure to find eigenvalues of basic graphs.
7. Computing eigenvalues of an operated graph in terms of original graphs.

**Applicable for:** Open to all who satisfies the pre-requisites.

**Internship Code:** MTMSKC1

**Possible Instructor:** Dr. Suvra Kanti Chakraborty, Assistant Professor, Department of Mathematics, Ramakrishna Mission Vidyamandira.

### 4. Continued fraction and related topics in Elementary Number Theory

**Prerequisite:**

1. Basic Ring Theory
2. Interest in Number theory

**Mode** (Online / Offline / Hybrid): **Online**

**Tentative Timeline:**

- a. Date: 15 May to 30 June; 1 day a week for 6 weeks.
- b. Time: 7.30pm to 9.30pm.

**Number of students:** 4

**Aims & objectives:**

1. Express any rational numbers as a (finite) continued fraction,
2. learn about infinite continued fractions and the properties of its convergents,
3. solve linear Diophantine equations and certain quadratic equations,
4. approximate irrational numbers by suitable rational numbers,
5. understand the correspondence between periodic continued fractions and quadratic irrationals,
6. apply the theory of continued fractions to solve Pell's equation,
7. appreciate the significance of "the Golden ratio".

**Applicable for:** Open to all who satisfies the pre-requisites.

**Internship Code:** **MTMRA1**

**Possible Instructor:** Dr. Ratnadeep Acharya, Assistant Professor, Department of Mathematics, Ramakrishna Mission Vidyamandira.

