Ramakrishna Mission Vidyamandira
Belur Math, Howrah - 711 202

Academic Internship
Offered by
Chemistry Department

1. Design approaches and tools for DNA based nanostructure.

Prerequisite: Under-graduate 2nd year (or higher) student majoring in Chemistry/ Physics/ Microbiology, with a completed course in elementary thermodynamics.

Mode (Online / Offline / Hybrid): **Online**
Tentative Timeline: 02.06.2025-21.06.2025 (6pm-8pm)

Number of students: 2

Aims & objectives:
DNA nanostructure design is an emerging field at the intersection of nanotechnology, molecular biology, and material science. The unique ability of DNA to self-assemble into predictable and programmable structures, governed by Watson-Crick base pairing, enables the creation of nanoscale architectures with unprecedented precision. Researchers have developed various strategies, such as DNA origami, tile-based assemblies, and hybrid nanostructures, to engineer complex 2D and 3D shapes for applications in biosensing, drug delivery, and nanoelectronics. Recent advancements in computational modeling and synthesis techniques have allowed for more intricate designs, offering enhanced stability and functionality. The internship will provide an overview of the principles behind DNA nanostructure design, the methods used to construct these systems, and their potential impact.

Upon successful completion of the DNA nanostructure design course, students will be able to:

Understand Fundamental Principles: Demonstrate a strong grasp of the chemical and structural properties of DNA and how these properties are harnessed to design nanoscale structures.

Apply Self-Assembly Techniques: Use principles of Watson-Crick base pairing and molecular recognition to design and predict the self-assembly of DNA nanostructures.

Integrate Computational Tools: Employ computational software to model and optimize the design of DNA nanostructures, ensuring their stability and functionality.

Explore Real-World Applications: Identify potential applications of DNA nanostructures in fields such as drug delivery, bio sensing, and Nano-electronics, and propose solutions to challenges in these areas.

Critically Assess Current Research: Review and critique recent literature in the field of DNA nanotechnology, demonstrating an understanding of cutting-edge developments and future trends.

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

Internship Code: CEMAS1

Possible Instructor: Dr. Anirban Samanta, Assistant Professor, Department of Chemistry,
Ramakrishna Mission Vidyamandira.

2. Symbolic computation for chemists: introduction and basics.

Prerequisite: Any Chemistry / Physics (Hons./ Major) student with Mathematics in Higher Secondary level.

Mode (Online / Offline / Hybrid): **Online**
Tentative Timeline: First two weeks of June (Afternoon/ evening)

Number of students: 3

Aims & objectives: Symbolic computation deals with how to use various mathematical and computational software to solve/ calculate/visualize equations/quantities/data. At the end of the course a student is expected to learn to run software like XPPAUT, GNUPLOT (or ORIGIN) Mathematica which would immensely help them in any chemistry based career.

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

Internship Code: CEMSSR1

Possible Instructor: Dr. Syed Shahed Riaz, Assistant Professor, Department of Chemistry, Ramakrishna Mission Vidyamandira.

3. Mathematical biology: Introduction and basics.

Prerequisite: Any Chemistry / Physics (Hons./ Major) student with Mathematics in Higher Secondary level.

Mode (Online / Offline / Hybrid): **Online**
Tentative Timeline: First two weeks of June (Afternoon/ evening)

Number of students: 3

Aims & objectives: Mathematical biology: introduction and basics. Mathematical biology deals with modeling biological phenomena. The course intends to introduce and teach analytical and computational tools that are routinely employed in such modeling. At the end of the course the students are expected to learn how to apply linear stability analysis to predict and model phenomena in systems far from equilibrium, and how to solve nonlinear differential equations using available software like XPPAUT.

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

Internship Code: CEMSSR2

Possible Instructor: Dr. Syed Shahed Riaz, Assistant Professor, Department of Chemistry, Ramakrishna Mission Vidyamandira.