



Ramakrishna Mission Vivekananda Educational and Research Institute



**Deemed-to-be-University as declared by Govt. of India
(Formerly Ramakrishna Mission Vivekananda University)
Accredited by NAAC with A++ grade**



Department of Mathematics

PROSPECTUS 2023



यथा शिखा मयूराणां नागानां मणयो यथा ।
तथा वेदाङ्गशास्त्राणां गणितं मूर्धनि स्थितम् ॥

**As are the crests on the heads of peacock,
as are the gems on the hoods of cobras,
so is mathematics, at the top of all sciences.**

Table of Contents

| | | |
|-----|--|-------|
| 01. | About the department | 7 |
| 02. | Details of programmes offered | 2-14 |
| 03. | Details of teaching staff | 15-18 |
| 04. | Academic infrastructure and other facilities | 18-24 |

About the Department



The Mathematics Department of RKMVERI offers MSc, PhD, and Postdoctoral degrees. The areas of research include Number Theory, Algebra, Geometry, and Functional Analysis. Here, the research atmosphere is perfect, with leading researchers providing students with ideal opportunities to pursue their interests.

The faculty members are leading researchers in their field and they provide individualized attention and mentorship. RKMVERI also offers ample scope for interdisciplinary studies with other departments like Physics and Computer Science. By becoming a member in the Mathematics Department at RKMVERI, one becomes part of a vibrant and collaborative community of scholars dedicated to advancing the frontiers of mathematical research and discovery.

Details of programmes offered

I. Master of Science(MSc.) in Mathematics



a) Programme Overview:

The MSc. programme in Mathematics in RKMVERI is comprehensive and rigorous, designed to provide students with a deep understanding of the subject. The salient features of the programme are -

- The two-year MSc Mathematics program is divided into four semesters, with a single credit being equivalent to 16 teaching hours.
- The core compulsory courses cover a range of topics, like analysis, number theory, algebra. One interdisciplinary/ applied mathematics elective course is offered. Elective courses cover areas like Advanced Complex Analysis, Design and analysis of algorithms, Cryptography, etc.
- The assessment process includes continuous and comprehensive evaluation like unit tests, quizzes, and regular exams. Hands-on training using LaTeX to prepare scientific documents is also given. Also students can collaborate with faculty and research scholars to strengthen their understanding.

b) Programme Outcomes:

- Equip the student with skills to analyze problems, formulate an hypothesis, evaluate and validate results, and draw reasonable conclusions thereof.
- Prepare students for pursuing research or careers in industry in mathematical sciences and allied fields
- Collaborating with esteemed faculties and research scholars, students can broaden their knowledge and skills through joint projects and research, strengthening their understanding of the concepts of Mathematics.

c) Programme Specific Outcomes:

- Understanding of the fundamental axioms in mathematics and capability of developing ideas based on them.
- Provide advanced knowledge on topics in pure mathematics, empowering the students to pursue higher degrees at reputed academic institutions.
- Strong foundation on algebraic topology and representation theory which have strong links and application in theoretical physics, in particular string theory
- Good understanding of number theory which can be used in modern online cryptographic technologies.
- Assist students in preparing (personal guidance, books) for competitive exams e.g. NET, GATE, etc.

d) MSc course structure:

Semester 1

- Course No 1. - M 200 : Introduction to Analysis (4 credits)
- Course No 2. - M 201 : Algebra 1 (4 credits)
- Course No 3. - M 209 : Elementary Number Theory / M 213 : Discrete Mathematics (4 credits)
- Course No 4. - M 204 : Linear Algebra (4 credits)
- Course No 5. - M 215 : Set theory and Methodology of Mathematics (2 credits)

Semester 2

- Course No 6. - M 203 : Complex Analysis (4 credits)
- Course No 7. - M 210 : Algebra 2 (4 credits)
- Course No 8. - M 202 : Topology 1 (4 credits)
- Course No 9. - M 205 : Analysis I (Fourier Analysis) (4 credits)

Semester 3

- Course No 10. - M 211 : Functional Analysis (4 credits)
- Course No 11. - M 207 : Linear Algebra 2 (4 credits)
- Course No 12. - Elective 1 (4 credits)
- Course No 13. - M 206 : Real Analysis 2 (4 credits)

Semester 4

- Course No 15. - M 212 : Topology 2 (4 credits)
- Course No 16. - Elective 2 (4 credits)
- Course no. 17. - Elective 3 (4 credits)
- Course No 18. - M 400 : Project (4 credits)

Note: Among the three electives in the course, one must be an Interdisciplinary/Applied Math elective.

Elective Courses offered:

Interdisciplinary/Applied Mathematics electives

- M214: Cryptography
- CS221: Design and Analysis of Algorithms
- CS 244: Introduction to Optimization Techniques
- AM200: Nonlinear Dynamics and Asymptotic Analysis
- AM 201: Numerical Algorithms
- CS312: Approximation and Online Algorithms
- CS312: Computing for Data Science

General Electives

- M 300: Coding Theory
- M 301: Advanced Complex Analysis
- M 302: Harmonic Analysis
- M 303: Probability Theory
- M 304: Distribution Theory
- M 305: Operator Algebras
- M307: Analytic Number Theory
- M306: Algebraic Number Theory
- M 308: Differential Geometry
- Elective M 311: Algebra 3
- Elective M 312: Commutative Algebra
- Elective M 313: Algebraic Geometry
- M 322: Geometric Topology
- M 323: Lie groups and Lie Algebras
- M 324: Advanced Differential Geometry
- M 325: Complex Manifolds and Riemann Surfaces
- M 326: Complex Dynamics

Note: Please refer to the official website
(<https://maths.rkmvu.ac.in/msc-programme/>) for the detailed
coursewise syllabus and important updates.



d) Admission details:

Programme intake -

Around **30** students are offered admission to the MSc programme.

Programme eligibility -

- BSc(Hons) in Mathematics/Physics/Statistics or B.Math/ B.Stat/ B.E./ B.Tech to be completed by the end of the current academic-year or who have completed such courses during the previous year.
- Students who have secured 60% or more (in Honors/Major subjects) till the end of their penultimate year of undergraduate studies may appear for the entrance test. There is a relaxation of 5% for SC/ST candidates.

Admission process-

All candidates are required to appear for an entrance test. The details of the process are as follows:

- **Entrance Test** : Last week of **May 2023** (tentative)
- **Mode of Entrance Test** : Offline
- **Application fee** : Rs 300.00
- **How to apply -**
 - New applicants have to first register (<https://isr.rkmvu.ac.in/admission/register>) on the Online Admission Portal, then login and fill up the online application form.
 - Online Admission Portal : <https://isr.rkmvu.ac.in/admission>
 - **Admit Card**: will be available for download when the dates for Admission Test / Interview are announced. Check the Website / Admission Portal regularly for updates.

- **Venue of Entrance Test :**

***Belur Main Campus (just at the entrance of Belur Math)
Ramakrishna Mission Vivekananda Educational and Research Institute
Belur Math, Howrah 711202, West Bengal***

- **Syllabus for Entrance Test:** Undergraduate level Real Analysis, Abstract Algebra, Linear Algebra, Vector Calculus
- **Interview:** Shortlisted candidates will be called for an interview. Date and time of interview will be announced later.
- **Note:**
 - Students from outside West Bengal desiring to appear for the written admission test in venues near their places of residence may send a separate request by email to: **maths@gm.rkmvu.ac.in**. Arrangements will be made as far practicable to conduct their exams in the Centres of Ramakrishna Mission nearest to their place.
 - All queries regarding the admission process may be emailed to **maths@gm.rkmvu.ac.in**

Note: Please refer to the official website
(<https://maths.rkmvu.ac.in/msc-maths-admission/>) for further details
and important updates.



e) Academic fees structure

- Academic fee (includes Fee for Tuition/Exam/ID-card, etc.) for each Semester : INR 18,000/-
- Refundable Caution Deposit : INR 3000/-
- **(For Newly Admitted Students)** Fees payable at the time of admission : $18,000 + 3000 = \text{INR } 21,000$ /- (Admission fees must be paid within last date as mentioned in the admission instruction)
- **Note :-**
 - Application fee, Admission fees, and Course fee (Certificate courses) are to be paid through the **Online Admission Portal** (<https://isr.rkmvu.ac.in/admission>).
 - All Student fees (like, Semester fees, Exam related fee, Misc. fee, etc.) are to be paid through the Student Portal (<https://isr.rkmvu.ac.in/student>).

II. PhD in Mathematics



a) Programme Overview:

The PhD programme in Mathematics in RKMVERI is a vibrant research programme aimed at grooming future mathematicians. The process of admission is also very rigorous and students desirous to take admission should have either qualified NET examination with a good rank or should have to be eligible for NBHM fellowship. Only full time scholars are admitted to the programme. The students must have to compulsorily complete course works, which includes, among others, a compulsory course on **Research Methodology**, where they will be tested in terms of their ability to use software for literature survey (MathSciNet) and prepare latex documents. The evaluation process consists of regular updates of research progress through presentations, viva voce, etc

b) Programme Outcomes:

- Upon completion of the programme, should have undergone relevant (taught) courses required for undertaking specialized research.
- Students will be capable of Identifying unsolved yet relevant problems in a specific field.
- They will be able to articulate ideas and strategies for addressing a research problem. Also they will be able to disseminate research to a broader audience

c) Programme Specific Outcomes:

- Generate publications in reputed mathematical journals.
- Provide scope for interaction with international researchers and developing collaborations.
- Provide opportunities to research students for communication (and discussion) of advanced mathematical topics to undergraduate and graduate students.

d) Admission details:

Programme intake -

Subject to availability of seats (depends on availability with the faculty members)

Programme eligibility -

- MSc in Mathematics. Students who have secured **60% or more** till the end of their penultimate year of masters' level studies may appear.
- Applicants must have also qualified at one of the following national level written examinations with the mentioned results:
 - National Board of Higher Mathematics (NBHM) Junior Research Fellowship
 - CSIR/UGC-NET Junior Research Fellowship with Rank between 1 and 80

Exceptional students from other disciplines and/or exceptional undergraduates in Mathematics may also be considered, exclusively at the discretion of the Department faculty.

Admission process-

Applicants with fellowships CSIR/UGC-NET or NBHM JRF, and satisfying the criteria as mentioned in the 'Eligibility' section will be selected on the basis of a rigorous viva-voce examination to be conducted by the Department.

- **Application fee** : Rs 500.00
- **Last date to apply online :-** To be notified later
- **How to apply :-**
 - Online Admission Portal : <https://isr.rkmvu.ac.in/admission>
 - New applicants have to first register on the portal, then login and fill up the online application form.
 - **Download the Admit Card:** Once Application-form is successfully submitted and application-fee is paid, Admit Card (also Receipt and Application-summary) will be available for download from the '[Dashboard](#)' of the same Portal.
- **Note :-**
 - Only full-time scholars will be admitted for the PhD programme. No application for part-time PhD will therefore be entertained.
 - All queries regarding the admission process may be emailed to maths@gm.rkmvu.ac.in

Kindly refer to the official website (<https://maths.rkmvu.ac.in/phd-in-mathematics/>) for further details and important updates.

e) Academic fees structure

- Admission-cum-registration fee (one time) : Rs. 3000/-
- Programme fee for each Semester (6 months) : Rs. 18000/-
- Refundable Caution deposit (one time) : Rs. 3000/-

Total fees to be paid during admission: $3000/- + 18000/- + 3000/- = \text{Rs. } 24000 \text{ /-}$.

Total fees to be paid at the beginning of every subsequent semester (6 months) : Rs. 18000/-

- **Note -**

- Application fee, Admission fees, and Course fee (Certificate courses) are to be paid through the **Online Admission Portal** (<https://isr.rkmvu.ac.in/admission>).
- All Student fees (like, Semester fees, Exam related fee, Misc. fee, etc.) are to be paid through the Student Portal (<https://isr.rkmvu.ac.in/student>).

Academic fees refund policy (same for MSc and PhD)

If the student chooses to withdraw from the program in which he/she is enrolled, the refund of the paid fees will be made as per the following UGC guidelines. See below for details.

| No | Percentage of Refund of Academic fees (excluding caution deposit) | Point of time when notice of withdrawal of admission is submitted to the University |
|----|---|---|
| 1 | 100 % * | 15 days or more BEFORE the formally-notified last date of admission |
| 2 | 90 % | less than 15 days BEFORE the formally-notified last date of admission |
| 3 | 80 % | 15 days or less, AFTER the formally-notified last date of admission |
| 4 | 50 % | 30 days or less, AFTER the formally-notified last date of admission |
| 5 | 0 % | More than 30 days AFTER the formally-notified last date of admission |

Note :-

- * In case of (1) in the table above, the University shall deduct 5 % of the Academic fee or Rs. 5000/- (whichever is lower), as processing charges from the refundable amount.
- Any fee dues or fine amount will be deducted from the total refundable amount (including caution deposit) before fee refund is processed.
- Application and Entrance Test fees, wherever applicable, once remitted shall NOT be refunded under any circumstances.
- The refund information given above is indicative only and RKMVERI reserves the right to make changes as per the notifications received from the concerned statutory/regulatory authorities from time to time. Any changes in the above will be updated on the RKMVERI website.
- Student needs to submit an Admission withdrawal letter to the concerned Head of the Department or the Dean of the Faculty-center, and the same letter with HoD/Dean's signature is to be submitted to the Registrar's Office (for Belur students) or the Off-Campus Faculty-Centre office for processing the fees refund.



Details of teaching staffs

I. Regular Faculties



Amit Samanta
PhD - IISC, Bangalore
Experience - 2 years

My broad research area is Harmonic analysis. Some of my research interests are : Support theorems, Wiener-Tauberian theorem, Eigenfunction characterization for invariant differential operators on the Heisenberg group, Toeplitz operators, Uncertainty type principles, Bochner-Riesz means.



Ashish Gupta
PhD - University of Melbourne, Australia
Experience - 11 yrs

Modules over Noetherian Algebras: I'm interested in the representation theory of noncommutative noetherian rings whose examples include group algebras, quantum groups, and rings of differential operators. This involves the study of modules and in particular so-called simple modules, invariants of modules such as GK dimension, finite vs infinite dimensional modules. The theory of PI rings, prime and primitive ideals also come into the picture. Research students have worked on representations of quantum algebras at roots of unity.



Debaldev Jana
PhD - Jadavpur University, Kolkata
Experience - 6.5 yrs

Applied Mathematics with special reference to application of Nonlinear Dynamics in Biological Systems, Ecological systems. Related area: Numerical simulation, data analysis



Shameek Paul
PhD - TIFR, Mumbai
Experience - 5.5 yrs

Algebraic Geometry





Sukumar Das
Adhikari
PhD - IMSC, Chennai
Experience - 31 yrs

Number Theory and Combinatorics



Stephan Baier
PhD - Free University
of Berlin, Germany
Experience - 15 yrs

I am working in the field of analytic number theory. My main interests lie in the areas of prime number distribution, the large sieve, Diophantine approximation, L-functions associated to elliptic curves and quantitative results on rational points on varieties. During the last years I was mainly focused on extensions of results in Diophantine approximation to number and function fields.



Br. Dripta Mj
PhD - University college,
Dublin
Experience - 4 yrs.

Development of mathematical, statistical and computational modelling. Machine learning applications in biomedical problems. Analyzing interaction of waves with wind and wave energy extraction systems and their implications. Integrating modelling and data to solve problems arising in a variety of environmental and engineering settings.



Sagnik
Chakraborty
PhD - TIFR, Mumbai
Experience - 3 yrs

I work in commutative algebra and some of its closely related topics in algebraic geometry. It is basically a study of commutative rings; most notably, polynomial rings over fields and their quotients, formally known as affine algebras.

II. Adjunct Faculties



M. Ram Murty
PhD - MIT, USA
Affiliation - Queen's
University at Kingston,
Canada

Number Theory

V Kumar Murty
PhD -
Affiliation - University
of Toronto



Analytic Number Theory, Algebraic Number
Theory, Arithmetic Algebraic Geometry, and
Information Security.



Indranil Biswas
PhD - University of
Mumbai
Affiliation - TIFR,
Mumbai

Algebraic geometry, Differential geometry,
and Deformation quantization

V. Balaji
PhD - Madras
University
Affiliation - CMI,
Chennai



Algebraic Geometry and Representation
Theory



D. S. Nagaraj
PhD -
Affiliation - IMSC,
Chennai

Algebraic Geometry and Algebraic
Number theory

Academic infrastructure and other facilities

I. Central Library



Explore boundless knowledge at RKMVERI Central Library. Established in 2005, our modern research hub houses 41,887 books, including general and reference materials. Access 11 international full-text e-resources, such as APS journals and MathSciNet, along with e-books through the 'e-Shodh Sindhu Consortium.' With 14 internet-connected computers, an online catalog, and an open access policy, we offer seamless browsing and book issuance. Enjoy a noise-free reading zone and a dedicated Career Guidance Section. Join us in unlocking a world of learning opportunities

II. State-of-the-art video-conference facilities & seminar halls



Experience cutting-edge communication and collaboration at RKMVERI with our state-of-the-art video-conference facilities and seminar halls. Equipped with advanced technology, these spaces provide an immersive environment for hosting virtual meetings, webinars, and academic conferences. Seamlessly connect with experts and scholars from around the world, fostering a global learning community. Our top-notch facilities ensure high-quality audio and video transmission, enabling engaging and interactive sessions. Whether you're presenting research findings or engaging in discussions, our video-conference facilities and seminar halls provide the ideal platform for intellectual exchange and knowledge sharing.

III Hostel facility



Hostel facility is available for a limited number of students who are serious and willing to abide by the hostel discipline. A rather rigorous procedure is followed for selection of students with the involvement of the parents in the process for better coordination. Students have to apply separately for hostel facility during admission (Hostel Application form can be obtained from Admission office). The students selected for the hostel will be informed separately.

a) Hostel fees

Details of hostel fees are given below:

- Hostel Room accommodation charges per month = Rs.1000 /-
- Mess charges per month = Rs.2500 /-
- Total amount payable in a semester (for 6 months) = Rs. $(1000 + 2500) \times 6 =$ Rs.21000/-

Caution Deposit (payable while taking admission to hostel) = Rs.3000/- (refundable/adjustable at the time of leaving hostel on completion of the academic programme after deduction, if any, due to damages, wear & tear, etc.)

Note:-

- Hostel and Mess fees for each semester should be paid at the beginning of each semester within 10 days of commencement of classes in that semester.
- If any hostel-inmate does not avail the hostel facility for any reason (for example, absence due to project work, illness, etc.) for a period of 7 days or more the student may obtain exemption from the mess charges for that duration (calculated on daily basis). This exemption should be claimed officially through a letter to the Registrar along with appropriate supporting documents.
- Such exempted mess charges, if any, will be adjusted for the hostel and mess fees payable for the next succeeding semester fee or refunded in case of the exemption being during the final semester after which the student leaves the hostel.

Refund policy

- If a hostel-inmate leaves the Hostel WITHIN one month of hostel admission, the applicable refund is: 50% of Hostel & Mess fee paid for the semester plus 100% of Caution deposit.
- If a hostel-inmate leaves the Hostel AFTER one month of hostel admission, the applicable refund is: 100% of Caution deposit.
- After taking hostel admission if a hostel-inmate leaves it anytime in the subsequent semesters (that is after admitting to hostel in 1st semester, if student leaves it in 2nd semester or 3rd semester, etc.), irrespective of whether that semester hostel fees is paid or not, the applicable refund is: 100% of Caution deposit.
- Any fine amount shall be deducted from the refundable amount.

IV Games and sports facilities



Indoor games -

Indoor games like Carrom and table tennis are available at the institute, providing students with the opportunity to relax, unwind and enjoy friendly competition with their peers.



Gymnasium -

RKMVERI acknowledges the significance of physical well-being and provides a gymnasium on campus. The gymnasium is equipped with various exercise equipment, allowing students to maintain their fitness levels and engage in regular workouts.

Playground -

RKMVERI values physical fitness and offers a well-equipped playground where students can participate in various sports activities like football, volleyball, cricket, promoting an active lifestyle and fostering teamwork.

V Prayer cum meditation hall

The institute has a dedicated prayer cum meditation hall where students can gather for daily chanting and evening prayers. This serene space provides a conducive environments for students to engage in spiritual practises and seek solace.



VI Other facilities

- Computer labs/ internet facility throughout the week
- Campus wide network facility with wi-fi
- High Speed Internet (Gigabit OFC link by National Knowledge Network)
- Medical Facility -

A medical centre - *Vivekananda Clinic* has been set up inside the institute campus and it caters to the primary medical needs of all the institute members.



Visit us at



<https://maths.rkmvu.ac.in/>
<https://rkmvu.ac.in/>

Contact us at



maths@gm.rkmvu.ac.in



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