

PhD Programme

Programme Description

The PhD programme in Mathematics aims to introduce students to different areas of research in mathematics. Students of the PhD programme will be expected to contribute new results to their areas of study via original research undertaken.

A secondary aim of the PhD programme is also to create an environment that will enable research students to learn and immerse themselves into the pedagogical aspects of mathematics.

The PhD programme in Mathematics will train scholars in original research. It will enable the students to be able to think and do the research independently. The PhD scholars will also be encouraged to observe and participate in teaching of Mathematics at the undergraduate level to ensure familiarity with pedagogical aspects of Mathematics.

PhD scholars will also be encouraged to explore research methodology and areas of mathematics that intersect with and borrow from other disciplines, specially those available in AUD.

Programme Structure

Scholars admitted to the **PhD programme** in Mathematics, who are not MPhil degree holders in Mathematics will have to do the same course work prescribed for MPhil students. Even those PhD scholars who have an MPhil in Mathematics may be asked to do some course work if the Research Studies Committee (RSC) of the School of Liberal Studies (SLS) feels that his or her research topic requires course work of a particular kind. The nature of the course work to be carried out by such a scholar shall be determined by the RSC.

Once the coursework is completed a student admitted to the PhD programme will work on the dissertation which will be the student's original work in the chosen area. A PhD scholar will also be encouraged to do the teaching practicum as prescribed for MPhil scholars.

Broad research themes

The broad research areas are Algebra, Analysis, Algebraic Number Theory and Mathematical modelling and Simulation. Within these broad areas, research can be pursued in sub-areas such as Group Theory, Ring Theory, Linear Algebra, Complex Analysis, Valuation Theory, Artificial Neural Networks and Mathematical Modelling.

PhD level courses

S. No.	Course Name	Core/Elective	Credits
1.	Group Theory	Core	2
2.	Commutative Algebra	Core	2
3.	Linear Algebra and Matrix Theory	Core	2
4.	Algebraic Number Theory	Core	2
5.	Module Theory	Core	2
6.	Functional Analysis	Core	2
7.	Differential and Integral Equations	Core	2
8.	Geometric Function Theory	Core	2
9.	Generalized Hypergeometric	Core	2

	Functions and Fractional Calculus		
10.	Topology	Core	2
11.	Operator Theory	Core	2
12.	Representation Theory of Finite Groups	Elective	3
13.	Advanced Group Theory	Elective	3
14.	Generalized Inverses and Applications	Elective	3
15.	Valuation Theory	Elective	3
16.	Group Rings	Elective	3
17.	Lie Algebras	Elective	3
18.	Fractional Differential Equations	Elective	3
19.	Mathematical Inequalities	Elective	3
20.	Mathematical Modelling	Elective	3
21.	Numerical Analysis	Elective	3

The list of Core and Elective Courses can be expanded depending on research interests of the Mathematics Faculty. Each year, four courses will be offered from the two categories listed below with the caveat that at least one course each will certainly be offered from each of the two categories listed below.

Category 1: core courses 1-5, Category 2: core Courses 6-11.

Eligibility

Candidates seeking admission in PhD programme must have completed MA/MSc from a recognised University/Institute in Mathematics or a related subject with 55% marks or an equivalent grade. A relaxation in marks of 5% or an equivalent relaxation of grade is allowed for those belonging to SC/ST/OBC (non creamy layer, Delhi)/ differently-abled categories (DOPT/UGC list).

Meeting the eligibility criteria alone will not ensure admission.

Faculty

1. Geetha Venkatraman (DPhil, University of Oxford), Professor

Geetha did her MA and DPhil (doctorate) in Mathematics at the University of Oxford.

Her area of research is finite group theory. She has published research in enumeration of finite groups, classification of finite groups using properties related to order of elements, conjugacy classes, subgroups etc. She is a coauthor of a research monograph titled *Enumeration of finite groups*, published by Cambridge University Press, UK. Sage Publications India will publish her second co-authored book, titled, *A Bridge to Mathematics*, later this year. She has also published several articles related to education, with an emphasis on undergraduate education. Apart from her interest in Group Theory and related areas she is deeply interested in popularising mathematics, mathematics education and issues related to women in mathematics. She has given several research talks and popular talks on mathematics in India and other countries to a varied audience ranging from middle and high school children, school teachers and mathematicians. For more details see:

<http://www.aud.ac.in/faculty/permanent-faculty/detail/87>

<https://aud-in.academia.edu/GeethaVenkataraman>

2. Ramneek Khassa (PhD, Punjab University), Assistant Professor

Ramneek She did her MSc and PhD in Mathematics from Panjab University, Chandigarh. Her area of research is valuation theory. She has published research papers in her area of research, the details of which can be found on the link below:

<http://aud.ac.in/faculty/permanent-faculty/detail/191>

3. Pranay Goswami (PhD, University of Rajasthan), Assistant Professor

Pranay completed his Doctoral degree from University of Rajasthan in 2011. His area of interest includes fractional differential and integral equations, univalent and multivalent functions, mathematical modelling. He has published several research papers in his areas of interests. Apart from that he is working as reviewer of several journals of national and international repute. For more details see:

<http://aud.ac.in/faculty/permanent-faculty/detail/168>

https://www.researchgate.net/profile/Pranay_Goswami

https://scholar.google.co.in/citations?user=2t_F1_sAAAAJ&hl=en

4. Balchand Prajapati (PhD, IIT Delhi), Assistant Professor

Balchand Prajapati did his MSc in Mathematics from Banaras Hindu University, Varanasi and PhD in Mathematics (Algebra) from Indian Institute of Technology, Delhi. Before joining AUD Balchand was a Visiting Faculty at Birla Institute of Technology and Science, Goa Campus. His area of research is rings and group rings. His research focuses on finding the structure of rings and group rings with the help of derivations and automorphisms. He has published several papers in his area of research. Currently he has a research project entitled "Derivation On Group Algebra And Its Application" funded by Department of Science and Technology, Govt. of India. For more details see:

<http://aud.ac.in/faculty/permanent-faculty/detail/167>

https://www.researchgate.net/profile/Balchand_Prajapati

5. Kranti Kumar (PhD, IIT Roorkee), Assistant Professor

Kranti Kumar completed his Doctoral degree in Mathematics from Indian Institute of Technology Roorkee in 2013. His research interest includes noise pollution modeling, traffic flow modeling, differential equations and Artificial Neural Networks. Currently he is working on the UGC sponsored research project entitled "Modeling and simulation of vehicular traffic flow problems". For more details see:

<http://aud.ac.in/faculty/permanent-faculty/detail/152>

https://www.researchgate.net/profile/Kranti_Kumar3/publications

<https://scholar.google.co.in/citations?user=sNjiB38AAAAJ&hl=en>

Fee structure

Rs. 1450 per credit for Course Work or Rs. 5510 per semester during Research/ Dissertation + Rs. 500 per semester for Student Welfare Fund + Rs. 5,000 as refundable Security Deposit.

SC/ST and Differently abled research scholars will be fully exempt from paying tuition fee. For others, partial/ full fee waivers are available based on income status.

Admission Procedure

Any candidate with a postgraduate degree in Mathematics or an allied subject from a recognised University can apply for admission and as per AUD rules.

At the time of the application the candidate will be expected to submit a statement of purpose.

Statement of Purpose (SOP): It should include a well articulated argument as to why the candidate wishes to pursue research at AUD. It should also include details on the area/s in mathematics in which the candidate wishes to pursue research. The SOP should not exceed 500 words. **Candidates' proposed research areas should be aligned with the specialisations of SLS (Mathematics) faculty.** Applicants are therefore encouraged to consult faculty profiles on the AUD website.

Entrance Test: SLS (Mathematics) will conduct two entrance exams. The first examination is common for candidates applying to both the MPhil programme and the PhD programme and will be based broadly on a Masters level curriculum in Mathematics. The second examination is meant only for candidates applying for the PhD programme. While the questions for this will also be based on a Masters curriculum, they will be exploratory in nature drawn from the areas of research in which supervision will be offered.

Interview: Only candidates qualifying in the written exam/s will be called for the interview. The interview shall be based broadly on a Master's level curriculum, the written exam/s and the statement of purpose submitted.

A provisional admission to the PhD programme will then be offered to the candidates on the basis of combined merit in the written entrance exams and interview with 75% weightage for written exam and 25% in interview.