Abstract

The Director, IIT Ropar appointed a committee in December 2013 to review the Department of Mathematics of the Institute. This report is the outcome of that review.

Members of The Review Committee

Professor I. B. S. PASSI

IISER Mohali, Punjab

Professor B. S. Panda

IIT Delhi, New Delhi

A meeting of the review committee was held on 25th January 2014 at conference room, IIT Ropar. The committee had a detailed discussion with Prof. P. K. Raina, Dean (A&R), IIT Ropar and the faculty of the department of mathematics. Dr. M. Prabhakar, Coordinator, Department of mathematics gave a presentation highlighting the activities of the department since the inception, i.e. the academic year 2009-10.

Report

Indian Institute of Technology Ropar was established in 2008. The Department of Mathematics at IIT Ropar started in the year 2009 with just one faculty. The present faculty strength is six. The details of the faculty and their research areas are listed below:

Name of faculty/Designation	Year of Joining IIT Ropar	PhD from	Area of research
Dr. Madeti Prabhakar Coordinator & Assistant Professor	2009	IIT Delhi	Low-dimensional Topology, Knot theory
Dr. Manoranjan Mishra Assistant Professor	2010	IISC Bangalore	Fluid dynamics, Scientific computing
Dr. Subash Chandra Martha Assistant Professor	2010	IIT Guwahati	Fluid dynamics, Mathematical modelling on water waves Phenomena, Integral equation
Dr. Manju Khan Assistant Professor	2010	IIT Delhi	Algebra
Dr. Arvind Kumar Gupta Assistant Professor	2010	IIT Roorkee	Continuum and lattice hydrodynamic modelling, Exclusion processes & Driven diffusion systems
Dr. Partha Sharathi Dutta Assistant Professor	2013	IIT Kharagpur	Nonlinear Dynamics, Mathematical Biology, Theoretical Ecology

The programmes offered by IIT Ropar are presently classified as undergraduate and postgraduate programmes. This classification is based primarily on entry/admission qualification of students rather than the level of degree offered. Department of Mathematics offers many Mathematics courses to both undergraduate and postgraduate students.

PhD Programme offered by the Department of Mathematics

The Department of Mathematics apart from establishing a robust teaching environment also runs a well designed PhD programme. The academic programme leading to the PhD degree is broad based and involves a minimum course credit requirement, comprehensive examination, synopsis seminar and thesis submission.

All students admitted to the PhD programme are eligible for institute teaching assistantship/assistantship from other funding agencies.

All candidates enrolled for the PhD programme are required to complete the following credit

requirements towards course work:

Particulars	Credits Requirement
PhD in Science for candidates with M.Sc / MA degree	15
PhD in Science for candidates with BE / B.Tech Degree	20

The performance of the students is monitored with a grading system listed below:

Table 1: Grades with their description

Grade	Grade Points	Description
A	10	Outstanding
A (-)	9	Excellent
B	8	Very good
B (-)	7	Good
C	6	Average

After the successful completion of course work the students is required to appear the comprehensive examinations.

Research Facilities

Computational Lab facilities, Computational Fluid Dynamics lab (with one workstation of Two 2.4 Ghz Quad-Core Intel Xeon processor and Two IMac desktop of i5 Quad core with 3.1Ghz processor) has been developed with the help of DST sponsored project No. SR/FTP/MS-019/2010.

A PG laboratory for 20 PhD students is under construction. Expected date of completion is May 2014.

PhD courses offered by the Department
MAL601 Differential Equations: (4-0-0) 4 Credits
MAL602 Advanced Analysis: (4-0-0) 4 Credits
MAL603 Topics in Numerical Analysis: (3-0-2) 4 Credits
MAL604 Water Wave Theory: (3-0-2) 4 Credits
MAL701 Algebric Topology: (Pre-requisite: General Topology): (4-0-0) 4 Credits
MAL702 Introduction to Knot Theory: (3-0-0)
MAL703 Computational Partial Differential Equations: (3-0-2) 4 Credits
MAL704 Hydrodynamic Stability Theory: (3-0-2) 4 Credits
MAL705 Rings and Modules: (3-0-0) 3 Credits
MAL706 Group Rings: (3-0-0) 3 Credits
MAL707 Hyperbolic Conservation Laws: (3-0-2) 4 Credits

Details of the PhD students

Semester wise selection	No. of PhD students Selected	No. of PhD students Joined
Second Semester 2009	1	Nil
First Semester 2010	5	5* (1 student left after 1 semester)
First semester 2011	2	1
Second Semester 2011	3	3
First Semester 2012	2	2
First Semester 2013	3	1
Second Semester 2013	2	2

Name of PhD student	Year of Joining	Name of the supervisor	Broad Area of Research
1. Vikash Siwach 2. Kirandeep Kaur	July 2010 January 2014	Dr. Madeti Prabhakar	Knot theory
1. Chinar Rana 2. Satyajit Pramanik 3. Tapan Hota	July 2010 January 2012 July 2012	Dr. Manoranjan Mishra	Fluid dynamics, Scientific computing
1. Srikumar Panda 2. Arun	July 2010 January 2012	Dr. Subash Chandra Martha	Fluid dynamics, Mathematical modelling on water waves Phenomena, Integral equation
1. Kuldeep Kaur 2. Koushik Biswas	July 2010 December 2013	Dr. Manju Khan	Algebra

1. Poonam Redhu	July 2012	Dr. Arvind Kumar Gupta	Continuum and lattice hydrodynamic modelling, Exclusion processes & Driven diffusion systems
2. Isha Dhiman	January 2012		
3. Yogita*	July 2012		
1. Yogita*	July 2012	Dr. Partha Sharathi Dutta	Nonlinear Dynamics, Mathematical Biology, Theoretical Ecology
2. Ramesh. A	July 2013		

UG courses offered by the Department of Mathematics

MAL111 Mathematics Laboratory, 2 (1-0-2) Core for CS, EE, ME

MAL112 Advanced Calculus, 3 (2-1-0) Core for EE,Compulsory elective for ME

MAL114 Linear Algebra, 3 (2-0-2) Core for EE, Compulsory elective for CS

MAL115 Real Analysis, 2 (2-0-0) Core for CS

MAL116 Introduction to Ordinary Differential Equations, 3 (3-0-0) Core for ME

MAL213 Introduction to Probability Theory and Stochastic Processes, 3 (3-0-0) Core for CS, EE, ME

MAL113 Vector Field Theory, 2 (2-0-0)

MAL211 Complex Analysis, 2 (2-0-0)

MAL214 Introduction to Functional Analysis, 3 (2-1-0)

MAL212 Modern Algebra, 3 (2-1-0)

MAL202 Operations Research, 3 (3-0-0)

MAL215 Fuzzy Logic and Applications, 3 (3-0-0)

Other UG Courses taught by Faculty of Mathematics Department

CSL105 Discrete Mathematical Structures, 4 (3-1-0) Core for CS
CSL304 / CSL454 Numerical and Scientific Computing, 5 (3-1-2)

For all courses, both UG and PG level offered by the department, feedback from the students is taken twice during each semester.

Library Facilities

The central library of IIT Ropar has a modest collection of books which faculty finds fairly satisfactory for its present needs. In addition, the library also facilitates access to a number of journals through its participation in consortia such as INDEST-AICTE. At present, users can consult more than 5300 books (available on shelves) and hundreds of journals (though electronic subscription).

Research activities and Publications

From the list of publications and the other research activities undertaken by the department, it comes out that the faculty and research scholars have been actively involved in research, regularly publishing articles in journals of repute and participating national and international conferences held in India and abroad.

The department has been running a visitor's programme and a seminar series. The department has also conducted an international level workshop on "Advanced school and discussion meeting on Knot Theory and its applications" during December 2013.

The performance of the department regarding its teaching and research output compares favorably with that of the departments of the institutes with similar standing.
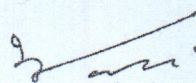
Future Plans

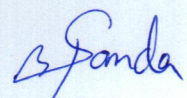From the discussions with the faculty it emerged that the department has the following plans for the future.

I. To start a four year BTech programme in Mathematics and Computing.

II. To start a two year Master programme in Mathematics.

III. To offer new courses for UG and PG with a view to train students handeling cutting edge technology used in industry.

IV. To organize quality improvement programmes for faculty members from various engineering colleges.

V. To have more interdisciplinary research within and outside the institute.

Recommendations :

The committee is strongly of the view that the institute should take urgent steps to start a two year Master programme in Mathematics and a four year BTech programme in Mathematics and Computing. This will naturally require augmenting the faculty strength and necessary computational lab with high performance workstations and various computational softwares.

I. B. S. Passi

B. S. Panda