Departmental review
10 April ~~26 – 28 March~~ 2014

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INDIAN INSTITUE OF TECHNOLOGY, ROORKEE

DEPARTMENTAL REVIEW TEMPLATE

1. **Name of Department/Center :** DEPARTMENT OF MATHEMATICS
2. **Reviewers :**
   1. PROF. A. K. NANDAKUMARAN
   2. PROF. RAJU K. GEORGE
3. **Date of Review:** APRIL 10, 2014.

GRID FOR ASSESSMENT

NOTE:

i. Please grade in the box provided for the following parameters in the range of 1-10 with 10 being the highest.
ii. Leave 'blank' for 'No Comment'.
iii. Kindly give your opinion on the strength and weakness of the Department/ Center and your suggestions for future growth.

I. ACADEMICS

I.1	Undergraduate	Score
1.	Curriculum	
	i. Curricular Structure	08
	ii. Course Syllabi	07
	iii. Flexibility	—
2.	Formal Academic Load on Students	07
	i. Teaching	06
	ii. Laboratory/Practical	06
	iii. Projects(minor/major)	
3.	Evaluation Process	08
	i. Continuing Evaluation	08
	ii. Mid-term Evaluation	08
	iii. End-term Evaluation	

4.	Academic Ambience	06
5.	Opportunity for Peer-Based Learning	05
6.	Opportunity for Further Learning(Breadth and Depth) i. Elective Courses Specialization ii. Minor with Major Discipline iii. Honors Programme in Major Discipline	06 — —
7.	E-Assisted Learning i. Availability of Library Resources and Major Search Engines (like Scopus, Web of Science) ii. Multi-Media Assisted Teaching	05 05
8.	In –Curriculum Research/Exploration Opportunity to Students	06
9.	Technical Societies/ Colloquium for Students i. Departmental Society ii. Student Chapter(s) of Professional Societies	— 04
10.	Faculty –Student Interaction	06
11.	Faculty Mentoring of Students PDSA/PRD	~~06/08~~
12.	Faculty Advisor System for Students/Class of Students	—
13.	Self Study Courses for Student	—
14.	Effective Teaching Mechanism for Enhanced Number of Students in Various Classes	06
15.	Effectiveness of Assisted Learning: Tutorial System for B.Tech Students/ Seminars	07

I.2	**Graduate Programmes (Masters)**	**Score**
1.	Curriculum i. Curricular Structure ii. Course Syllabi iii. Flexibility	07 06 —
2.	Formal Academic Load on Students i. Teaching ii. Laboratory/Practical iii. Seminar/Dissertation	07 06 06
3.	Evaluation Process i. Continuing Evaluation ii. Mid-Term Evaluation iii. End-Term Evaluation	07 08 08
4.	Academic Ambience	06
5.	Opportunity for Peer-Based Learning	05
6.	Opportunity for further Learning(Breadth and Depth) Elective Courses (Specialization Electives)	05
7.	E-Assisted Learning i. Availability of Library Resources and Major Search Engines (like Scopus, Web of Science)	05

	ii. Multi-Media Assisted Teaching	05
8.	In –Curriculum Research/Exploration Opportunity to Students	
9.	Technical Societies/ Colloquium for Students i. Departmental Society ii. Student Chapter(s) of Professional Societies	— 04
10.	Faculty –Student Interaction	06
11.	Faculty Mentoring/Supervising of Students	05
12.	Faculty Advisor System for Students/Class of Students	05
13.	Effectiveness of Assisted Learning: Home Assignments/Seminars/Presentations	07

1.3	**Doctoral (Ph.D) Programmes**	**Score**
1.	Pre-Ph.D Courses and Evaluation Process	07
2.	Comprehensive Courses Examination	08
3.	Breadth and Depth of Knowledge of Students	07
4.	Seminar/ Presentations and Technical Communication	06
5.	Average No. of Research Students/Faculty	09
6.	Average No. of Research Papers of Ph.D Students	09
7.	Average Duration to Complete Ph.D (years)	09

II. RESEARCH

		Score
1.	Research Ambience in the Department	06
2.	Research Awareness among Doctoral Students	07
3.	Competence Level of Doctoral Students for Research	07
4.	Quality of Research	06
5.	Quality of Publications	06
6.	Impact of Publications	06
7.	Relevance of Research to Knowledge Generation	07
8.	Societal Relevance of Research	08
9.	Exposure of Researchers to the International State of Art	07
10.	Student Exposure to Attending Quality Conferences/Symposia	05
11.	Growth in Ph.D Programme	09
12.	Quality of Research Infrastructure	05
13.	Utilization of Existing Research Infrastructure	09
14.	Department Initiative on Faculty Hiring	06
15.	Breadth and Depth of Research in the Department	06
16.	Research Intensity of Faculty Members	08

Futuristic Areas For Hiring Faculty Members

ALGEBRA, ADVANCED ANALYSIS
PDE (Theoretical)

Research Areas for Improvement

Differential Equations, Numerics

Comments (not more than 100 words for each given below)

Strength:

ANNEXURE I

Weakness:

ANNEXURE II

Suggestions for improvement:

ANNEXURE III

III. Departmental Infrastructure

		Score
1.	Adequacy of Class Rooms and Multi-Media Facility	06
2.	Availability of Laboratories	05
3.	Availability of Conference/Seminar Room, etc.	06
4.	Availability of Seating Space for Research Students	02
5.	Availability of Internet Services in Research Labs and Class Rooms	05
6.	Departmental Library and E-Resources	07
7.	Computing Facilities and Software	03
8.	Adequacy of Offices and Furnishing for Faculty	02
9.	Faculty- Student Ratio	07
10.	Support Staff (Technical/Administrative) Adequacy	05

Comments (not more than 100 words for each given below)
Strength:

ANNEXURE IV

Weakness:

ANNEXURE V

Suggestions for improvement:

ANNEXURE VI

IV. Admissions of Ph.D Students

		Score
1.	Intake of Ph.D Students	09
2.	Admission Process	08

Suggestions:

Intake of Ph.D students is very

ANNEXURE ~~VII~~

Commendable and admission process is on merit. The department should continue the good work.

V. Outcomes

		Score
1.	Placements i. Placement of B.Tech/IDD Students ii. Placement of Masters Student iii. Placement of Ph.D Students	
2.	Average No. of Ph.D.s Awarded per Year	
3.	Publications per Faculty in ISI Indexed Journals/Year	
4.	Average Citations per Faculty/Year (Last-Three Years) (Web of Science/Scopus)	
5.	Recognitions; Awards(National/International) to Faculty/Students	
6.	Consultancy and Projects	
7.	No. of Ph.D. graduates who took Academics as Career (Based on Data of Last 5 Years)	
Comments and Suggestions for improvement:		

Date:

(Signature of the Reviewer)

(Name and Address of the Reviewer)

V. Outcomes

		Score
1.	Placements i. Placement of B.Tech/IDD Students ii. Placement of Masters Student iii. Placement of Ph.D Students	— 06 07
2.	Average No. of Ph.D.s Awarded per Year	08
3.	Publications per Faculty in ISI Indexed Journals/Year	07
4.	Average Citations per Faculty/Year (Last-Three Years) (Web of Science/Scopus)	07
5.	Recognitions; Awards(National/International) to Faculty/Students	06
6.	Consultancy and Projects	04
7.	No. of Ph.D. graduates who took Academics as Career (Based on Data of Last 5 Years)	08

Comments and Suggestions for improvement:

ANNEXURE VII

Date: 10/04/2014

CA-K-Nandakumara (Signature of the Reviewer)

(Raju K George)

Professor
Department of Mathematics
Indian Institute of Science
Bangalore-560 012

डॉ. राजू के. जॉर्ज / Dr. Raju K. George
वरिष्ठ आचार्य एवं अध्यक्ष/ Sr. Professor & Head
गणित विभाग/ Department of Mathematics
भारतीय अंतरिक्ष विज्ञान एवं प्रौद्योगिकी संस्थान
Indian Institute of Space Science and Technology
अंतरिक्ष विभाग, भारत सरकार/Dept. of Space, Govt. of India
तिरुवनंतपुरम/Thiruvananthapuram - 695 547

(Name and Address of the Reviewer)

Assessment Report on the Department of Mathematics, IITR, Roorkee

This review report is prepared based on the meeting by reviewers with all the stake holders, namely, faculty, students, staff of the department and by analyzing the infrastructural facility during the visit of the reviewers on April 10, 2014. The reviewers reached the IITR campus on April 09, 2014 and visited the department of Mathematics on 10th and left the campus on 11th April, 2014.

First of all, we would like to thank the faculty members, in particular Professor R. C. Mittal, Head, Department of Mathematics. All of them including the students extended their full cooperation. They were serious, forthright in their opinion aware of the strengths and weaknesses of the department and each and everyone would like to see the Department as one among the best in the national and international level. The reviewers strongly feel that an institution can be improved only if the concerned party has willingness to achieve it. Hence this report is essentially a combined self-assessment of the department by the people of the department together with our comments.

Hard copies of the Report of the Department (2008 – 2013) were given to the reviewers on 9th night by the HOD. A departmental meeting was arranged on 10th morning and the HOD presented the report of the activities of the department for the period 2008 to 2013. A detailed interactive discussion of the department activities was held after presentation. All the faculty members of the department were present. Later on review committee visited Labs and separate meetings were organized with Ph.D, MSc and MCA students. Faculty members individually and also in group met the review committee separately in the office provided and exchanged information and shared their views on various aspects of the department.

Based on these observations, interactions, presentation and feedback, it has been found that there has been a commendable progress in the department since 2000, the year in which the institute was elevated as IIT. The real progress observed in research publications and the number of Ph. Ds produced by the department. The faculty in the department is enthusiastic and our assessment is that they have the

potential to make it a leading department. But sadly, we do not see any worthwhile (other than number of publications and students) national initiatives to become a leading center of learning. We somehow feel that they are isolated from the rest of the institutions in the country. We agree that the faculty members regularly visit abroad and domestic institutions for attending conferences and presenting papers. This is a welcome sign, but this is not enough to make it a visible department. To the reviwers, it is a pleasant surprise to see a large number of 100 research scholars in a single department which indicates that the department has the potential to grow.

The department should initiate new national programs of importance, organize regular workshops and conferences (both national and international) which will improve the standard of overall research as well as opportunity to meet the leading researchers. The faculty should regularly visit other institutes more often and participate in workshops and conference, create academic culture in the department, improve the teaching style, part of national programs etc. We agree that it is hard to ignore tradition, but the success comes from adaptability to the modern and current research without losing the traditional values. In this respect, the youngsters and seniors should cooperate together which will have tremendous impact for the future. By organizing more programs in their department, they can bring other researchers to their department.

The department has a strong group of faculty members mainly in four areas namely Mathematical Biology, Operations Research, CFD and Soft-computing. To make the department a reasonably complete department of Mathematics, some more areas are to be strengthened like Algebra, Advanced Analysis etc.

Research: It is interesting to note that most of the faculty members are involved in active research, but substantial improvement in the quality of research is required. One possible reason is that they are confined to the department and the collaboration outside the world is not to the expected level. Very active collaboration with outside the institute and with industry is the need of the hour. In fact, they have sufficient number of publications, but the general quality is not up to the mark.

Infrastructure: This is one of the major issues to be addressed **by the institute on war-footing way**. It is sad to know that the research scholars of an institution like IIT, do not have place to sit and work in the department. It is equally disgraceful that faculty members share single congested rooms. It is important to have good ambience and rooms where the faculty spent most of their prime time of their life. In addition to fact that the space is not sufficient, the condition of the building itself is poor to say the

least. The institute should immediately do the needful so that they have a new and large building.

Computational Lab: Though there are computer labs having desktop PC's, high performance computing (HPC) facility is not yet set up which is very much essential for the Modelling and Soft-computing group. Students are in need of computational softwares like MATLAB, Mathematica and MAPLE which are not available there at the moment. The department is known for its applied mathematics flavour, the Lab is not even comparable with ordinary colleges in the country. Further, closing the present computational Lab after office hours, for whatever reasons it may be, is not acceptable. The faculty should take note of this concern and do the needful at the earliest.

Course work and Curriculum:

(i) Research Scholars: There is no structured course work program for Ph. D scholars, which is essential for doing research in mathematics. We believe that there should be common foundation course work program for all the research scholars in the first semester of their admission. This is a very specific need of a mathematics department and may not be applicable to other departments. The students also expressed the opinion that they need a semester to decide a guide instead of choosing or allotting a guide as soon as they join the institute. We strongly support this argument as this is the case in most of the successful institutes.

(ii) MSc Students (regular and integrated): These students were not happy with the curriculum nor the syllabus. They feel that the syllabus is outdated. We suggest to form a committee, may be with a few members from other institutes and a detailed study is required. Though a lot of elective subjects are listed, the students essentially do not get an opportunity to select/ elect the courses. It is actually recommended by the department. The reviewers have a suggestion in this direction. Instead of studying a few elective courses haphazardly, we recommend to have few streams with few courses in each stream. This will give students to take one or two streams in which they can learn more about a subject and master in that area. The feeling with the students is that they are learning neither good pure mathematics nor good applied mathematics.

They are also concerned about the project work as they have no opportunity to work on real life problems, work with industries or with other institutes for their project works. A good discussion is welcome.

(iii) MCA students: The placement history of the MCA program is quite satisfactory. We understand that the institute has taken decision to close down this program and

hence the committee do not want to make any opinion. We would rather state the opinion of various parties concerned. The students have unanimously want to continue the program either in the department of mathematics or in any other department as it is one of the prestigious and well-received program of the institute. But the faculty members are divided on this account. Some of the faculty, especially seniors prefer to continue the program whereas the majority of the youngsters do not want to continue the program. They feel that this department should be developed as a world class department for mathematics.

Faculty Recruitment: This is another serious issue to be resolved urgently, but carefully. Once this is done, most of the problems in the course work and curriculum can be addressed without much difficulty. For the moment, the teaching load is considerably high. The department should take enough care while appointing faculty. Many current areas of research are not available in the department and appoint faculty to complement the research areas. Inbreeding should be strictly avoided as we have many examples in the country that inbreeding spoils a department in the long run.

Other Issues:

1. The students are not permitted to use their contingency properly to take photocopy etc, it is limited to a minimum.

2. **Scholarship:** This was a surprise to us. They do not get their scholarship in time which puts the students in trouble. The institute should do the needful irrespective of whether the institute receives the scholarship money from other agencies in time or not. We are sure and institutes like IITs will be able to manage some funding till they receive the Grant from the funding agencies

3. **Feedback on Courses:** Though the feed-back is collected, nothing is done about the feedback according to the students. We feel that the faculty should analyze the feedback and take necessary measures which will also improve the quality of teaching and pedagogical skills.

4. All the Ph. D students appreciated good student-teacher interaction. We congratulates the faculty, it is really wonderful and continue this good relationship.

5. **Financial matters:** We did not discuss the financial matters as probably it is not in our purview, but many faculty members expressed their concern that they

do not know anything about the financial support to the department. We feel that the department should conduct regular faculty meetings, inform/discuss with members about finance, problems and issues; Document/Minute everything for the good functioning of the department. It is time that we bring professionalism not only in subject matters, in administration as well. The Chair should take initiative to address the concern and issues of the faculty and students on a regular basis.

6. The teaching of a course should rotate among faculty members. One should not teach a course more than two or three time at a stretch.

Action Plan:

1. The faculty should publish papers in very good peer-reviewed journals

2. The students should be encouraged to go for Post-Doctoral research in institutions of high repute in India and abroad before taking up immediate jobs.

3. Resolve the office space and sitting space solution for the faculty as well as students immediately. Improve infrastructural facilities including computational labs and library.

4. Visibility of the department in the national scene should be increased by starting new initiatives and programs, organize more workshops and conference.

5. More academic interaction with other institutes is the need of the hour. Take initiatives to invite mathematicians for short and long duration and arrange invited talks/ lectures on a regular basis

6. Industrial interaction is needed and opportunity should be created to do more worthwhile projects for the MSc students.

7. Form a committee to discuss about the curriculum and syllabus. Should take input from the students. Perhaps, one or two students can be there in such course committees.

8. Improve teacher-student interactions.

9. Urgent need of faculty recruitment in certain areas.

10. Set up a good ambience for the Research Scholars.

A. K. Nandakumaran, Department of Mathematics, IISc., Bangalore

Raju K. George, Department of Mathematics, IIST, Trivandrum

Annexure

Annexure I: The department has a strong group of faculty members mainly in four areas namely Mathematical Biology, Operations Research, CFD and Soft-computing. The department has about 100 research scholars and we feel this is real strength of the department.

Annexure II: To make the department a reasonably complete department of Mathematics, some more areas are to be strengthened like Algebra, Advanced Analysis etc. It is interesting to note that most of the faculty members are involved in active research, but substantial improvement in the quality of research is required. In fact, they have sufficient number of publications, but the general quality is not up to the mark. One possible reason is that they are confined to the department and the collaboration outside world is minimal.

Annexure III: Very active collaboration with outside the institute and with industry is the need of the hour. Visibility of the department in the national scene should be increased by starting new national initiatives and programs, organize more workshops and conferences both at national and international level. Take initiatives to invite mathematicians for short and long duration and arrange invited talks/ lectures on a regular basis. Industrial interaction is needed and opportunities should be created to do more worthwhile projects for the MSc students. More faculty members should visit institutes in India and abroad. Encourage students to participate in workshops and conferences. New faculty should be appointed immediately in some essential areas.

Annexure IV: Essentially no strength as far as the infrastructure is concerned

Annexure V: Major concern is the space problem. Computational Labs and library facilities should be further improved. A high performance computing facility is inevitable for the type of research works going on in the department now.

Annexure VI: The institute should sanction a new and large building to the department of mathematics. The faculty should get Grant from national funding agencies by applying research and consultancy projects. They should also utilize NBHM library Grant appropriately and try to get more funding support.

Annexure VII: A structured course work is necessary for research students. The students should be encouraged to do project work with other institutes and industry.

Faculty should try to get industrial consultancy projects. The students should also be encouraged to go for post-doctoral work in good institutions in India and abroad. Form a committee to discuss about the curriculum and syllabus. Should take input from the students. Perhaps, one or two students can be there in such course committees. Improve teacher-student interactions. Urgent need of faculty recruitment in certain subject areas. Set up a good ambience for the Research Scholars