Panel for review of Indian Institute of Technology Roorkee

Dear Prof. Banerji,

We the members of review panel wish to thank you and your colleagues for the meaningful preparation, documentation and briefing at various levels to facilitate the work of the panel to carry out institute level review of IIT Roorkee. We wish to congratulate IIT R for making best use of the opportunity offered by the transition from University of Roorkee to IIT R, enhancing the rich values and traditions of past and well aligning to the new IIT framework.

It was wonderful to interact with faculty, students and staff at various levels. Visits to various laboratories and facilities gave us a good insight in the vibrant academic and socio-cultural life on the campus.

The report of the review panel is attached. We do hope the IIT R would find the report useful during its march in search of higher excellence.

We wish to thank you for the superb hospitality extended to us.

With our deep appreciation and kind regards,

Tam Sridhar Larry William Kostiuk S. C. Dutta Roy

Indira Samarsekara Anil Kakodkar

Prof. Pradipta Banerji,
Director,
Indian Institute of Technology, Roorkee.
Roorkee

Indian Institute of Technology, Roorkee
Report of the panel for institute level review

Contents

Indian Institute of Technology, Roorkee
Report of the panel for institute level review

1. Introduction

A review panel consisting of Prof. Tam Sridhar, Prof. S.C. Dutta Roy, Prof. Larry Kostiuk and Dr. Anil Kakodkar visited IIT Roorkee on November 12 – 14, 2014 at the invitation of the institute for an institute level review in accordance with the identified terms of reference (Annex 1). Prof. Indira Samarsekera participated in the discussion through video call. Composition of review panel is given in Annex 2. The program followed by review panel is given in Annex 3. A well-documented Profile of the Indian Institute of Technology, Roorkee was made available to the members of panel in advance. Annex 4 (in 2 vols.)

Indian Institute of Technology, Roorkee has its roots in the first technological Institute in Asia. Established in the year 1847 the institution has remained in the forefront of engineering human resource development and knowhow and has significantly contributed to a number of national initiatives.

The Institute has three Campuses, namely the Roorkee Main Campus covering an effective area of 358.5 Acres, the Saharanpur Campus having an area of 25 Acres and the Greater Noida Extension Center spread over an area of 10 Acres. The institute has 21 Academic Departments, 1 Academic Centre, 3 Centres of Excellence and 7 Academic Service Centres/Units.

The vision and Mission statements of the Institute are as follows:

Vision :

To attain global level of excellence in education and to create a sustainable and equitable society through innovative research in science and technology.

Mission :

To create an environment that shall foster the growth of intellectually capable, innovative and entrepreneurial professionals, who shall contribute to the growth of Science and Technology in partnership with industry and develop and harness it for the welfare of the nation and mankind.

A synoptic view of the some of the parameters signifying the growth of the Institute since it was converted in to an IIT in the year 2001 is given in the following Table.

Parameters	**Year**		**Increase**
	2000-2001	2013-14	
Students UG	1602	4472	180 %
PG	1334	2093	57 %
PhD	265	1471	456 %
Total	3201	8036	152 %

Parameters	Year		Increase
	2000-2001	2013-14	
Faculty	330	459	39.1 %
Faculty Student Raito	1:9.7	1:18	-
Research Papers in Journals	215	1122	422 %
Outlay of (i) Sponsored Research	635	4047	537 %
(ii) Industrial Consultancy (Rs. in Lakh)	379	3627	857 %

The financial support to the institute towards monthly salary of the faculty, officers and other staff, maintenance of laboratories, essential services, infrastructure, etc. is primarily through a non-plan grant from Central Government. The Government also provides developmental grants under Plan schemes for meeting the stipends / fellowships of the M.Tech. and Ph.D students, procurement of permanent assets in terms of equipment and instruments, machines etc., and construction of houses, laboratories, etc. In the year 2012-13, the institute received funds to the tune of Rs. 167.78 crores under non-plan and Rs. 246.20 crores under plan from the Central Government.

Reviews of Academic Departments/ Academic Centers/ Centers of excellence were carried out earlier and these reports were made also available to the review panel.

2. Findings and Observations

2.1 General

Governance structure of IIT R follows the framework set out in the 'Institutes of Technology Act' of the Parliament. The institute is guided by its Board of Governors and is overseen by the Council of IITs Chaired by the Minister of Human Resource Development. President of India is the Visitor of the Institute.

Based on the detailed data reported in the Institutional Profile and the Director's presentation to the Review Committee, IIT Roorkee's current activities and past record of teaching, research and extension-work align very well with (and contribute greatly to) the two main objectives of the IITs (i.e., the advancement of knowledge through education and research, and service to the community and nation), as well as IIT Roorkee's own mission and vision statements. In general, the Committee was appreciative of the way the erstwhile University of Roorkee has transformed itself into IITR. This was the first experiment in transformation of an existing institution into an IIT. After some (expected) initial teething troubles, the institution appears to have made a rapid transition to an IIT. Healthy synthesis of the good features of both the systems has been a unique feature of IIT R. In particular, some of the value systems and traditions of the University have been retained, and considered from this perspective IITR appears to have carved out a distinct position for itself in the IIT system.

2.2 IITR well set to move to higher levels

IIT Roorkee has a long and distinguished history of its contributions to national development. Its facilities are well maintained. The facilities for students are perhaps better than most other IITs. Overall performance of IIT Roorkee is as good as most of the older IITs. *Within that background, the stated institutional aspirations appear very modest. With a young crop of faculty, it is perhaps time to set more challenging performance targets.*

2.3 Managing growth and conducive environment for academic work

The rate of change of key indicators of core academic activities shows that IIT Roorkee is experiencing tremendous growth. *Generally, these indicators are quite positive (e.g., research funding, number of faculty, number of students, number of graduating research students, numbers of publications, etc), but this information must be tempered with some concern that the balance in the system must be maintained. Currently, the UG student to faculty ratio (which is rising rapidly and there is uncertainty about what this final number will be after this period of growth) is putting considerable pressure on instructors in terms of workload and their being able to remain leaders in research. These numbers also have the potential to negatively affect the quality of UG education. Similarly, as much as ~20% of the faculty having joined IIT Roorkee in last couple of years raises concerns as to whether these young academics are receiving proper mentorship to be effective teachers and researchers. The current focus on growth is leading to concerns that quantity matters more than quality (e.g., having large numbers of graduating PhDs, as opposed to doing quality research), and this perception or reality must be managed to keep IIT Roorkee's research reputation. The Review Committee felt that more efforts should be made for faculty recognition in teaching and research.*

The only concern raised by faculty was the sense of falling quality of research students being admitted, especially with respect to their writing skills. As a result, faculty members are doing yet more menial editing work because of the pressure to graduate many PhDs in a short period. *While remedial program in English language skills should be pursued, there is also a need to attract top layer (say top 10%) of undergraduate students to do research early enough (say in their third year) including through collaborative arrangements with other engineering colleges.*

2.4 Curriculum and Core Offering

In common with most of the IITs, IITR also teaches a course on Introduction to the Department to the undergraduate students. It was suggested that this course should be taught by selected faculty from each area of specialisation in the Department, and should also involve research scholars of the Department, who would talk about their research topics. This altered approach would excite the imagination of the students and help in orienting them to research and innovation.

IITR does not appear to have a formal mechanism for collecting student feedback for each course and utilizing them for improving the quality of teaching and for faculty assessment and promotion. *It is suggested that feedback be compulsorily taken online from each student and for each course. It is suggested that data analysis be done using appropriate software in an independent small cell of the Institute set up for this purpose, to make a quantitative assessment of the effectiveness of the course and the teacher teaching the same. A mechanism for grading a teacher may be thought of (this is practiced in many U. S. Universities) and the best teacher in every Department should be appropriately recognised through one or more of the following :*

announcement in the Senate, a onetime book grant, a letter of appreciation from the Director, a cash award, an advance increment etc.

The curriculum in every Department should be continuously reviewed and a grand review should be carried out every five years making use of the feedback collected from various stakeholders such as employers, recently passed out alumni, projected needs of ongoing national programmes, emerging technology trends etc. It would be worthwhile aligning student learning with perspective user needs in a holistic manner. In this context department specific science courses could also be explored.

2.5 Laboratory infrastructure

The central facilities are very good, but long-term maintenance could be a problem. *It is suggested that the Institute hire some postdoc fellows to make these facilities work better.*

2.6 Future Plans

The Director of IIT Roorkee and his diaconal staff reported on their future plans for research and teaching. Some of these plans have been initiated, while others are truly for the future. The Review Committee was strongly supportive of these plans in aid of the basic mission and vision of the institution. Specific examples included:

- While maintaining the departmental structure of the institution for the benefit of clearly defined UG programs and degrees, five new

multidisciplinary Centres will be formed in partnership with industry and government over the next five to seven years that will hopefully involve 50% of the faculty and 80% of what will be 3000 PhD students. These planned Centres are:

- Design and Development (Smart Cities)
- Healthcare Engineering (Healthcare for the Last Mile)
- Smart Packaging
- Aeronautics (note: not aerospace)
- Energy and Environment

- There are plans for a Research Park, but is contingent on getting land near the main campus.

- With respect to the UG programs, new and useful programs are evolving that will involve these students more deeply in research projects, and allow for dual degree options, industrially related projects, honours degrees, internships, and considerable flexibility in course selection.

2.7 Creation of Centres

The subjects chosen for new centres are appreciated. It is recommended that each proposed Centre clearly defines the Big-Picture challenge that the Centre is expected to address and link it to the specific frontiers of science that the faculty and their students will work on to create new knowledge. Each centre should also identify two or three major challenges that they would address. This would help create a larger impact at the national level.

Besides a few carefully selected core faculty members around whom the centres would nucleate, all others should be drawn from other interested Departments, as adjunct faculty. Similarly, the core faculty would be adjunct faculty in the Department dealing with their parent disciplines and may teach a course there. Also, where appropriate, some of these new Centres be developed through strategic bi-lateral relationships with other IITs

Experience with such centres in other IITs shows that they invariably aspire to become separate Departments with their own teaching programmes at the undergraduate as well as postgraduate levels. This should be guarded against, so that the focus on research and innovation does not get lost.

2.8 Satellite Campuses

The two satellite campuses appear to be a distraction to normally efficient operations towards fulfilling the Institution's mission and vision, and will continue to be difficult to effectively integrate. The expected role of the Greater Noida Extensions Campus is admirable, but its distance from the main campus, and its own infrastructure, make it hard to exploit for true value.

Attention should be paid to the Shahranpur Campus. It is a historical legacy. *The single B Tech program (viz, polymer sciences) running at the Saharanpur Campus would be better served by being located at the main campus. This relocation would provide students with the properly supported IIT experience and the academic resources located at Saharanpur could also be better utilized at the main campus. Maintaining these satellite campuses as part of IIT Roorkee should be the topic of a separate review.*

2.9 Scientific Officer Cadre

This cadre has created problems in several institutions, including IITs. Persons in this cadre, being Master's/doctorate degree holders, and being in an academic environment, also wish to pursue higher studies and research, and do not like to be treated as second class citizens. The argument for such a cadre is that they are required to maintain sophisticated instruments and carry out routine testing and measurements. *With proper and extended training, these activities could as well be carried out by science graduates/engineering diploma holders/engineering graduates, who may be employed as technical assistants/officers with a well-defined career promotion scheme.*

IITR should learn from the experience of other Institutions and proceed on the creation/proliferation of the scientific cadre with caution.

2.10 Research Programmes

One of the unique feature of IITR research programmes is the emphasis on their relevance to the society. The institute plans expansion of its sponsored research and industrial consultancy. *However, none of these components should outweigh the importance of fundamental research, because one of the mandates of an IIT is to generate knowledge. Also, fundamental research and publications in high impact journals are important for global visibility. Faculty and research students should be discouraged to join the number game in their publications count by publishing in low quality mushrooming journals.*

Greater attention is necessary on better career opportunities for Ph.D students. This would lead to improvement in the quality of students getting into research. Greater engagement with agencies / industries that can benefit

through recruitment of Ph.Ds including better alignment of research deliverables to user needs should help. Ph.D programmes are also very important to bridge the faculty shortage in higher technical education space.

There should be greater attention to more intense industry participation in research activities at the Institute. Industry funding to the tune of around 20% could be aimed at.

2.11 External Stakeholder Engagement

Against the background of strong contributions to national development and social engagement, some concerns were raised in specific departments about having too much consultancy work. The Review Committee was less worried about this point, and encourages a better definition of what is consultancy and what is sponsored research. Alumni relations are very positive, but transitioning those connections to donations continues to be a struggle.

2.12 Faculty Recruitment and Orientation

The teacher student ratio in IIT Roorkee (as well as other IITs) has continuously degraded because of increasing student enrolment, which influences the institute activities in many ways. First, it cuts upon the time available for research; second, the teacher student interaction, which the IIT system has been proud of, reduces; and third, the teaching of large classes affects the quality of teaching adversely. Most large classes are now taught by power point presentation, which many teachers have to resort to, despite being fully aware that this is one of the worst techniques of teaching.

Faculty recruitment should be one of the topmost priorities of the Director and the involved administration. In view of the competition from several institutions, IITR must publicise the unique features of the institute to attract competent faculty. Once recruited, the new faculty members must be given all possible facilities and encouragement, in addition to a carefully designed orientation programme involving the Director, Deputy Director, Deans, and Head and senior faculty of the concerned Department.

2.13 Administrative Appointments

Rotating Headship system, introduced in IITs in 70's, brought in a sea change in democratizing the administration of the Departments. Similarly, the term appointment of Deans, Deputy Directors and other administrative positions involving faculty have added much improvement in the overall administration of these Institutes. In several institutions, seniority is given the topmost priority in such appointments. This is not necessarily the best option. In the overall interest of the institute, the competence of the person must be taken into account, even if in the process, some faculty become unhappy because of being bypassed.

2.14 Governance and Financial Resources

No issues were seen in transparency at the Institutional-level, but it was unclear whether that transparency extended down into all Departments. The infrastructure was considered very good, and some of the best in the country. On the management side, there were indications that data collection needed for a proper quantification of institutional activities was a challenge. *The Review Committee encourages the development and implementation of a database driven system to collect information to better understand and track all academic*

and financial activities. IIT Roorkee's website is poor and needs a complete overhaul highlighting achievements to attract even better students and faculty.

There are very good relationships between the Director's Office and Faculty, Non-Faculty Non-Technical, and Employee groups, though there was a desire for greater consultation prior to the creation of new policies in order to ensure ease of implementation.

2.15 Interaction with the Faculty Forum Representatives

The following major points emerged in interaction with the Faculty Forum representatives: 1) adverse effect of degrading faculty student ratio; 2) need for consolidating M.Tech. programmes; and 3) low quality of M.Tech and Ph.D. intakes.

In respect of item 2), specific mention was made of the of M.Tech. Programmed on Disaster Mitigation and Control, where faculty from different Departments teach disjointed topics. As a result, students do not have a sense of belonging to any unit of the institute, and they lose interest.

In respect of item 3), a specific mention was made of the Earthquake Engineering Department not getting good quality students. *However, because of the pressure of career advancement, faculty are forced to make compromises on the quality of intake, and all students eventually graduate, thus bringing down the reputation of the Department as well as that of the Institute. The problem does not have an obvious solution and has to be deliberated in appropriate forums to seek a solution.* Will integration with the Civil Engineering Department help? This is an open question, and has to be answered keeping the historical perspective in view.

In general, interest of the faculty, particularly of the young faculty, in teaching has decreased considerably as compared to earlier days because of pressure on publications and Ph.D. supervision. These are given the utmost importance in promotions in which teaching quality is not, in general, taken into account. Usually, the latter parameter goes by individual perceptions. *Having a formal teaching evaluation with quantification may be of help in reversing the trend with respect to the importance of teaching.*

One of the adverse effects of decreasing interest in teaching is that many bright undergraduate students do not feel adequately challenged by rote learning, particularly if done with power point presentations, and they lose interest.

One of the concerns expressed in this interaction was inadequate technical assistance in the laboratories and inadequate maintenance grants for equipments and instruments. Also, in keeping with the global trends, experimental research is on a downward slope, in favour of computational methods and simulation, and needs to be boosted up by proper incentives and facilities.

2.16 Interaction with the Representatives of the Employees' Union

The identified need for greater technical support in the Departments for research appears to be real.

In this interaction, it was suggested that class B employees should also be involved in remunerative extra duties like those required in JEE, GATE etc. Also, payband anomalies should be sorted out by the Institute, rather than referred to the MHRD, which takes a long time for the necessary resolution.

There is hardly any incentive system for excelling in work assigned to the employees. Also, equipment training and continuing educations programs should be initiated / enhanced.

2.17 Interaction with the Representatives of the Officers' Forum

In this interaction, it was pointed out that the officers have no scope for attending international conferences and that even participation in national conferences is a problem, although some of them had their papers accepted for presentation. A second point made by the representatives is that there is no well-defined career progression scheme for the officers. Third, there is no adequate representation of the officers in the policy-making bodies. Since the officers are largely responsible for implementing the policies, such a representation would minimize implementation problems. Finally, in terms of residential accommodation, officers face uneven competition with the faculty.

It is felt that taking some relatively simple measures so that they feel themselves an integral part of the system can adequately rectify the unhappiness of the officers.

2.18 Interaction with students

Interactions held separately with undergraduate and postgraduate students indicate that, in general, they are happy with the mentoring by the faculty, and there does not appear to exist any major problem.

2.19 Students' Extra-curricular Activities

The facilities for indoor and outdoor sports, as well as other recreational activities, are exceptionally good, perhaps the best amongst all the IITs and in the country, with enthusiastic participation by boys, as well as girls. That the sports general secretary is a girl speaks volumes of the campus environment and absence of gender bias.

2.20 Library Facilities

A visit to the Library impressed the Committee and indicated that the resources are adequate and fully utilized by the faculty as well as students. Considering the central role of library resources in sustaining high quality research, the Committee would like to suggest that adequate funds provision to support ongoing and future library needs should be ensured.

3. Recommendations

In the report the text containing recommendations has been made in italics. This section gives a consolidated listing of the recommendations.

1) *The stated institutional aspirations appear very modest. With a young crop of faculty, it is perhaps time to set more challenging performance targets.*

2) *Faculty recruitment should be one of the topmost priorities of the Director, Departments and the involved administration. In view of the competition from several institutions, IITR must publicise the unique features of the institute to attract competent faculty. Once recruited, the new faculty members must be given all possible facilities and encouragement, in addition to a carefully designed orientation programme involving the Director, Deputy Director, Deans, and Heads of Departments and senior faculty of the concerned Department.*

3) *Although significant induction of new faculty has taken place in recent times, coping up with increasing number of students without having to compromise teaching and research has become a big challenge. Greater mobilization of teaching resource through adjunct/visiting faculty as well as teaching assistants could be of help.*

4) *In general, interest of the faculty, particularly the young faculty, in teaching has decreased considerably as compared to earlier days because of pressure on publications and Ph.D. supervision. These are given the utmost importance in promotions in which teaching quality is not, in general, taken into account. Usually, the latter parameter goes by individual perceptions. Having a formal teaching evaluation with quantification may be of help in reversing the trend with respect to the*

importance of teaching. It is suggested that feedback be compulsorily taken online from each student and for each course. The data analysis should be done using appropriate software in an independent small cell of the Institute set up for this purpose. This should lead to quantitative assessment of the effectiveness of the course and the teacher teaching the same. A mechanism for grading a teacher may be thought of and the best teacher in every Department should be appropriately recognised through one or more of the following : announcement in the Senate, a onetime book grant, a letter of appreciation from the Director, a cash award, an advance increment etc.

5) *With a view to attract bright young students to do research in large numbers, there is a need to attract top layer (say top 10%) of undergraduate students to do research early enough (say in their third year) before they firm up their career options. These efforts should include collaborative arrangements with other engineering colleges that enable engagement with a larger body of undergraduate students.*

6) *In common with most of the IITs, IITR also teaches a course on Introduction of the Department to the undergraduate students. It was suggested that this course should be taught by selected faculty from each area of specialisation in the Department, and should also involve research scholars of the Department, who would talk about their research topics. This altered approach would excite the imagination of the students and help in orienting them to research and innovation.*

7) *Remedial program in English language skills should continue to be pursued*

8) *The curriculum in every Department should be continuously reviewed and a grand review should be carried out every five years making use of the feedback collected from various stakeholders such as employers, recently passed out alumni, projected needs of ongoing national programmes, emerging technology trends etc. It would be worthwhile aligning student learning with perspective user needs in a holistic manner. In this context department specific science courses could also be explored.*

9) The Institute has established excellent central instrumentation facilities. Their long-term maintenance could be a problem. It is suggested that the Institute hire some postdoc fellows to make these facilities work better on a sustained basis.

10) *It is recommended that each proposed Centre clearly defines the Big-Picture challenge that the Centre is expected to address and link it to the specific frontiers of science that the faculty and their students will work on to create new knowledge. Each centre should also identify two or three major challenges that they would address. This would help create a larger impact at the national level.*

11) *Besides a few carefully selected core faculty members around whom the centres would nucleate, all others should be drawn from other interested Departments, as adjunct faculty. Similarly, the core faculty would be adjunct faculty in the Department dealing with their parent disciplines and may teach a course there. Also, where appropriate, some of these new Centres be developed through strategic bi-lateral relationships with other IITs.*

12) *Experience with such centres in other IITs shows that they invariably aspire to become separate Departments with their own*

teaching programmes at the undergraduate as well as postgraduate levels. This should be guarded against, so that the focus on research and innovation does not get lost.

13) *The two satellite campuses appear to be a distraction to normally efficient operations towards fulfilling the Institution's mission and vision, and will continue to be difficult to effectively integrate. The expected role of the Greater Noida Extensions Campus is admirable, but its distance from the main campus, and its own infrastructure, make it hard to exploit for true value. Attention should be paid to the Shahranpur Campus. It is a historical legacy. The single B Tech program (viz, polymer sciences) running at the Saharanpur Campus would be better served by being located at the main campus. This relocation would provide students with the properly supported IIT experience and the academic resources located at Saharanpur could also be better utilized at the main campus. Maintaining these satellite campuses as part of IIT Roorkee should be the topic of a separate review.*

14) *One of the unique and important feature of IITR research is the emphasis on their relevance to the society. The institute plans expansion of its sponsored research and industrial consultancy. However, none of these components should outweigh the importance of fundamental research, because one of the mandates of an IIT is to generate knowledge. Also, fundamental research and publications in high impact journals are important for global visibility. Faculty and research students should be discouraged to join the number game in their publications count by publishing in low quality mushrooming journals*

15) Greater attention is necessary on better career opportunities for Ph.D students. This would lead to improvement in the quality of students getting into research. Greater engagement with agencies / industries that can benefit through recruitment of Ph.Ds including better alignment of research deliverables to user needs should help. Ph.D programmes are also very important to bridge the faculty shortage in higher technical education space.

16) There should be greater attention to more intense industry participation in research activities at the Institute. Industry funding to the tune of around 20% could be aimed at.

17) Rotating Headship system, introduced in IITs in 70's, brought in a sea change in democratizing the administration of the Departments. Similarly, the term appointment of Deans, Deputy Directors and other administrative positions involving faculty have added much improvement in the overall administration of these Institutes. In several institutions, seniority is given the topmost priority in such appointments. This is not necessarily the best option. In the overall interest of the institute, the competence of the person must be taken into account, even if in the process, some faculty become unhappy because of being bypassed.

18) No issues were seen in transparency at the Institutional-level, but it was unclear whether that transparency extended down into all Departments. The infrastructure was considered very good, and some of the best in the country. On the management side, there were indications that data collection needed for a proper quantification of institutional activities was a challenge. The Review Committee encourages the development and implementation of a database driven system to collect information to better understand and track all

academic and financial activities. IIT Roorkee's website is poor and needs a complete overhaul highlighting achievements to attract even better students and faculty.

19) *During our interactions a specific mention was made of the M.Tech. Programme on Disaster Mitigation and Control, where faculty from different Departments teach disjointed topics. As a result, students do not have a sense of belonging to any unit of the institute, and they lose interest. Such situations, if they exist, need to be corrected.*

20) *Similarly, a specific mention was made of the Earthquake Engineering Department not getting good quality students. However, because of the pressure of career advancement, faculty are forced to make compromises on the quality of intake, and all students eventually graduate, thus bringing down the reputation of the Department as well as that of the Institute. The problem does not have an obvious solution and has to be deliberated in appropriate forums to seek a solution. Will integration with the Civil Engineering Department help? This is an open question, and has to be answered keeping the historical perspective in view.*

21) *One of the concerns expressed was the inadequate technical assistance in the laboratories and inadequate maintenance grants for equipments and instruments. The identified need for greater technical support in the Departments for research appears to be real. As it is experimental research needs to be boosted up by proper incentives and facilities in view of the greater attraction towards computational methods and simulation.*

22) *During discussion with a group of scientific officers, they expressed that they have no scope for attending international conferences and*

that even participation in national conferences is a problem, there is no well-defined career progression scheme for the officers, there is no adequate representation of the officers in the policy-making bodies and in terms of residential accommodation, officers face uneven competition with the faculty. It is felt that taking some relatively simple measures so that they feel themselves an integral part of the system can adequately rectify the unhappiness of the officers.

The scientific officer cadre has created problems in several institutions, including IITs. Persons in this cadre, being Master's/doctorate degree holders, and being in an academic environment, also wish to pursue higher studies and research, and do not like to be treated as second class citizens. The argument for such a cadre is that they are required to maintain sophisticated instruments and carry out routine testing and measurements. With proper and extended training, these activities could as well be carried out by science graduates/engineering diploma holders/engineering graduates, who may be employed as technical assistants/officers with a well-defined career promotion scheme. IITR should learn from the experience of other Institutions and proceed on the creation/proliferation of the scientific cadre with caution.

23) *A visit to the Library impressed the Committee and indicated that the resources are adequate and fully utilized by the faculty as well as students. Considering the central role of library resources in sustaining high quality research, the Committee would like to suggest that adequate funds provision to support ongoing and future library needs should be ensured.*

4. Concluding Remarks

Overall IIT Roorkee is performing well, with its rich heritage, excellence in education and research, orientation to national development, good students, passionate faculty as well as staff and excellent leadership. It has the potential to be an even better institution in years to come if adequate support is provided. We feel that some of the suggestions made by the group may be of use in taking IIT Roorkee forward.

We wish the institute a glorious future as a knowledge institution of global standing that is front ranking in term of its impact on national development.

5. Acknowledgments

The Committee wishes to place on record its appreciation of the efforts made by all sections of the Institute in facilitating this review. The inputs provided and arrangements for interaction with different stakeholders were well prepared. Cooperation extended to the Committee and the hospitality offered was superb. The Committee appreciates the fact that the Chairman Board of Governors was there during all the deliberations and interactions and offered useful suggestions and comments.

Annex 1

Terms of Reference for Review of the IITs

Preamble

The review is envisaged as an institutional review principally focusing on the core academic activities of teaching, research, as also interaction the industry. Due importance, however, should be attached to a review of matters that influence academic performance, such as governance, management structure, support systems and institutional culture. All of these should be such as to enable the Institute being reviewed to realize the goals enunciated in its Vision and Mission statements.

The Review Committee should assess the performance of institution and make recommendations at two levels: the general and the specific. Some aspects that must necessarily be covered under each are listed below.

I. General considerations

The Committee should opine on A) where the Institute reached in relation to char ters and projections spelt out in the past; B) its plans for the future; and C) the metrics that the Institute adopts in assessing itself.

A. Progress in relation to previous projections. The IITs were set up as outlined by the Sarkar Committee Report, which also spelt out their charter. The charter has undergone minor changes to keep pace with the times and as reflected in the IIT reviews of 1972, 1986 and 2004. Furthermore, each Institute may have enunciated its own Vision and Mission statements.

Progress may be reviewed under two major heads:

- In relation to the IITs' charter
- In relation to the Institute's existing Vision and Mission statements.

B. Plans for the future. Along with Vision and Mission statements, a strategy may have been articulated by the Institute as to how to reach its goals. The Committee could therefore remark on:

- Projections made
- Strategies formulated.

C. Measures adopted toward A and B above

The Institute may internally assess its own performance using a set of criteria and metrics. The Committee may opine on the suitability and robustness of these.

II. Specific Indicators

The Review Committee should consider separately the Institute's performance in the arenas of its core academic activities: teaching and research. A selection of indicators is listed below.

1. Curriculum and Courses Offered

i. Range of degrees and disciplines.

ii. Consistency of curricula with academic vision.

iii. Vision for curricula and academic offerings 5-10 year s in the future.

iv. Range of research activities:

a. Volume,

b. Breadth.

v. Quality of programmes (Under Graduate/ Post Doctoral)

a. Relevance to recruiters.

b. Periodicity of curriculum review

c. Mechanism for program review at the under -graduate and Post –Graduate levels.

d. Course work mandated for PhD students and the average courses done per PhD student

e. Publications per Faculty /Masters/ PhD student

f. Publications per Faculty /Masters/ PhD student in a list of top 10 papers research field publications identified by the Institution.

g. Major research contributions.

h. Citations

i. Student placements

j. Ph.D. placements

k. Recognitions, Awards (national international) by faculty

2. Motivational environment for academic work:

a. Teachers Adequacy: (eg. Teacher - Pupil Ratio for each academic department)

b. Average time that it takes a new faculty to set up lab

c. Retention rate for young faculty.

d. Tutors for students in courses with greater than 100 students

e. Quality of engagement of teachers with students. (Student feedback on courses and curricula.)

f. Interdisciplinary Projects/ Ph.Ds

g. Work space for Ph. d scholars

h. No. of international conferences attended by a Ph. d student (for exposure /

paper presentation)

i. No of papers with Phd student as first author

j. Consultancy and project money

k. Research grants/ seed money from internal savings of the Institute to young

faculty/ Post graduate students

l. No. of students who were motivated to opt for careers in engineering/

science sectors (based on available data, for at least last five years)

m. How many M.Tech students were motivated into PhDs

n. No of Phd graduates who were motivated towards a career in academics,

(abroad or IIT/ IISC/ TIFR/ CISR/ BARC/ etc, based on available data, for

at least last five years)

o. No of post -Doctoral scholars hired in the institute

p. Number of International students in Ph.d and in post Doctoral programmes

q. Number of International visiting faculty

r . Collaborations internally and with other Institutes

s. Adequacy of infrastructure, labs and equipment, for example by assessing lab use by students per experiment in core courses.

t. Adequacy of research and technical assistants,

u. Modernisation of libraries, extent of electronic accessibility to library

resources.

3 External Stakeholder Engagement

A. Industry Collaboration

a. No. of Industry -sponsored research projects and Industry sponsored research problems for PhD

b. Total Income from Industry Sponsored Projects

c. Technology transfer / adopted by labs, industry

d. IPR and Patents

e. Curriculum development initiatives in collaboration with Industry

B. Contribution to National Development Goals/ Priorities

a. Number of nationally relevant projects in research-defense, medicine, environment, energy, health, roads, etc

b. Social outreach programmes

c. Policy Inputs/ Consultancies

C Social Responsibility

a. Community relevant projects, social outreach

b. Sensitiveness to on- campus workforce/ labour

D. Alumni Engagement

a. Alumni Get-togethers

b. Contributions from Alumni

c. Use of Social Media

4. Vision for the future:

Goals/ strategy/ tactics for the next decade

5. Governance and Financial Resources

i. Management

a. Adequacy of administrative support/ systems in relation to the level of
activities envisaged?
b. Responsiveness of the system to faculty, student needs

ii. Financial Resources Management

a. Fund mobilization (beside MHRD)

i. Internal Revenue Generation as percentage of Non-Plan expenditure
ii. Corpus Fund

b. Cost Efficiency

i. Cost per student
ii Fee per student per annum/ Non-Plan Expenditure per student
iii Total fee paid by student (discounted)/ Per annum average salary

iii. Transparency:

Mechanism of transparency in place by the Institute as steps that have been taken for internal quality assurance

a. Transparent decision making processes

b. Academic issues, research grants, systems for recognition/ awards etc.

c. Procurement processes

d. Infrastructure development

e. Proactive disclosure on all critical issues

f. Placing information in public domain: website

iv. Infrastructure: Is the support infrastructure (IT, Hostels, Faculty/ Staff housing, sports facilities) adequate? And how sensitive and eco-friendly it is to the immediate environment.

6. Stakeholders Survey

a. Internal Stakeholders
   i. Students
   ii. Faculty
   iii. Non-faculty

b. External Stakeholders
   i. Industry
   ii. Alumni
   iii. Community leadership
   iv. Government

7. Diversity

What is the current status of diversity on campus? Does the Institute have programmes to promote diversity among students, staff and faculty? Does the Institute have adequate mechanisms to deal with issues related with discrimination and harassment?

8. Process of External Review

a) The Peer Review of each Institute would be carried out on a periodic basis, once in every five year s. For the new IITs, similar exercise be carried out on completion of five years.

b) The Review Committee will consist of five eminent persons from Industry and Academia, to be selected by the Chairman of the Council of IITs, from a panel of 10 names proposed by the Board of Governors of respective Institutes. The report of the Review Committee will be placed before the IIT Council for its consideration.

c) Besides periodic review of the institution, each IIT will similarly undertake, an in-house, department-wise review before any external Peer Review is carried out. The report will be considered by the concerned BOG of IIT and the recommendations made therein would be pursued at appropriate level i.e. at the Institute level, Board level and the IIT Council, if necessary.

Annex 2

Composition of review panel

Indian Institute of Technology, Roorkee
Report of the panel for institute level review

1. Prof. Tam Sridhar,
AO, Sir John Monash Distinguished Professor,
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Annex 3

Indian Institute of Technology, Roorkee
Report of the panel for institute level review

The panel met at IIT Roorkee on November 12 – 14 as follows:

Date	Time	Venue	Program
12.11.2014	7.30pm	NCN Committee Room	Welcome by Director & presentation of bouquet
12.11.2014	7.35pm	NCN Committee Room	Presentation by Director
12.11.2014	8.30pm	NCN Special Dining hall	Dinner
13.11.2014	8.30am	NCN Special Dining hall	Breakfast
	9.30am to 11.30am	BoG Room	Meeting with Chairman BoG, Director, Dy. Director and all deans
	11.30am to 12.30pm		Visit to IIC, Biotechnology Department and Library
	12.30pm	NCN Special Dining hall	Lunch
	2.00pm to 2.40pm	BoG Room	Meeting with members of Faculty Forum
	2.50pm to		Meeting with members of Officer's Forum

	3.30pm		
	3.40pm to 4.20pm		Meeting with members of Employee's Union
	4.30pm to 5.10pm		Meeting with student members of SAC
	5.10pm to 6.00pm	BoG Room	Concluding Session with the Chairman BoG, Director, Dy. Director, and all deans
	6.00pm to 6.30pm	BoG Room	Internal discussion within the panel
	6.30pm to 7.15pm	Sports Complex	Visit to Sports Activities including ES Club
	8.00pm	Director's Lodge	Dinner
14.11.2014	8.00am	NCN Special Dining hall	Breakfast

Annex 4 (to be added)