External Peer Review of IIT Kanpur – The Report

April 14-16, 2014

Reviewers

Dr. Baldev Raj (President INAE and former Director, IGCAR)

Dr K Aprameyan (former MD, BEML)

Dr. Sayta P Chauhan (Senior Program Director, Battelle Memorial Institute, Ohio)

Dr. A R Upadhya (former Director, NAL)

Professor Jitendra Malik (University of California, Berkeley)

Professor Dipankar Das Sarma (IISc, Bangalore)

Dr. P R Sinha (CEO, 9.9 Media)

EXTERNAL PEER REVIEW COMMITTEE REPORT

IIT Kanpur, April 14 – 16, 2014

FOREWORD

Members of the Peer Review Committee (2014), IIT Kanpur appreciate the high credentials, achievements and contributions of the institute in the domains of education, research and technology.

We also wish to record our appreciation of the Ministry of Human Resources Development and IIT Council for taking an initiative to engage a set of experts to do the review in a structured and comprehensive manner. We have enjoyed the opportunity and committed ourselves to serve the purpose.

IIT, Kanpur has responded with enthusiasm and deep commitment. The Committee members based on abundant information, observations and openness in discussions have deliberated on both achievements and concerns. The members have placed emphasis on walking through a few facilities and engaging in group discussions with almost all the stake holders to make meaningful recommendations starting with divergent opinions on some of the issues, but at the end converging to clear recommendations, based on consensus built on merits of the perspectives.

The guiding approach was to provide an independent assessment to the Institute on the current levels of performance. We have made recommendations on incremental improvements; however our emphasis was to provide a clear pathway based on a few paradigm changes which can lead to enhanced eminence and visibility on a short horizon of less than ten years.

We believe that report shall receive serious considerations by the Board of Governors and right actions shall be taken to make IIT, Kanpur, the # 1 IIT of the country and one among the best in the Asia, during next ten years.

We are available, to continue to serve the cause of eminence for IIT, Kanpur.

2014 IITK Peer Review Committee

Table of Contents

COMPOSITION OF THE COMMITTEE 6

INTRODUCTION 8

1.0 RESEARCH & DEVELOPMENT (R&D): Raising the Bar 10

The Committee's Observations 10

The Committee's Recommendations 10

1.1 Setting benchmarks for R&D output 10

1.2 Developing cross-disciplinary capabilities 11

1.3 Infrastructure and resources for R&D 12

1.4 Processes for optimising R&D output 12

1.5 Governance and management of R&D 13

1.6 Stakeholder engagement in R&D 14

2.0 EDUCATION: Rebuilding Teaching Excellence 15

The Committee's Observations 15

The Committee's Recommendations 16

2.1 Outreach and marketing 16

2.2 Admissions counselling 16

2.3 Learning experience 16

2.4 Launching new programmes 17

2.5 Research and innovation 17

2.6 Placements 18

2.7 Alumni relations and fund-raising 18

3.0 FACULTY: Enhancing Hiring, Nurturing, Evaluation and Reward Systems 19

The Committee's Observations 19

The Committee's Recommendations 19

3.1 Attracting fresh talent 19

3.2 Nurturing existing talent 19

3.3 Evaluating and incentivising 20

3.4 Freeing from administrative responsibilities 20

4.0 INFRASTRUCTURE : Expanding and Upgrading 21

The Committee's Observations 21

The Committee's Recommendations 23

5.0 STAFF: Improving Dialogue and Career Paths 25

The Committee's Observations 25

The Committee's Recommendations 25

6.0 CULTURE: Creating an Ecosystem of Excellence 27
The Committee's Observations 27
The Committee's Recommendations 27
CONCLUSION 30
ANNEXURE I: PROGRAMME OF THE REVIEW COMMITTEE 31

COMPOSITION OF THE COMMITTEE

Dr. K Aprameyan

Dr. Aprameyan is former Chairman and Managing Director of Bharat Earth Movers Limited, where he played an instrumental role in transforming the company into a major player in diverse areas ranging from earth moving equipment to railways, defence, robotics and automation. Dr. Aprameyan is a Post Graduate in Automobile Engineering from the Indian Institute of Science (IISc), Bangalore, and has obtained his Doctorate in the field of Internal Combustion Engines from Paris University, France.

Dr. Satya P Chauhan

Dr. Chauhan is Senior Program Director, Batelle Memorial Institute, where he is responsible for managing several multidisciplinary research, development and demonstration (RD&D) programs that cut across energy, environmental, materials, chemical, and defence sectors. An alumnus of the Indian Institute of Technology, Kanpur with a PhD in Chemical Engineering from Case Western Reserve University, Dr. Chauhan has 35 years of outstanding record in innovation and innovation process management. He has 20 patents to his name, over 50 IP awards, and more than 200 publications. Dr. Chauhan received IIT Kanpur's Distinguished Alumnus Award in 2010.

Prof. Jitendra Malik

Prof. Malik is the Arthur J. Chick Professor in the Electrical Engineering and Computer Science department at the University of California, Berkeley, and has previously served as Chair of that department. He is noted for his research in computer vision, and is a member of the US National Academy of Engineering, the American Academy of Arts and Sciences, and one of ISI's Highly Cited Researchers in Engineering. An alumnus of the Indian Institute of Technology, Kanpur, he was awarded the Institute's Distinguished Alumnus Award in 2008. He has a PhD in Computer Science from Stanford University.

Dr. Baldev Raj

Dr. Raj was Distinguished Scientist and Director, Indira Gandhi Centre for Atomic Research and currently is President, Indian National Academy of Engineering. He shall be assuming office of the President, Committee of Academies of Engineering and Technological Sciences in June 2014. A prolific scientist, Dr. Raj is the author of more than 900 referred publications, co-author and co-editor of 60 books and special journal volumes, and has over 20 patents in his name. He is specialised in materials, energy, and archeometallurgy. He has a Bachelors in Engineering from what is now National Institute of Technology, Raipur, a PhD from the Indian Institute of Science, Bangalore and is the recipient of numerous eminent awards in India and worldwide. He is a Distinguished Alumnus of IISc, Bangalore and Chairman, Board of Governors of IIT, Gandhinagar and NIT, Puducherry.

Prof. D D Sarma

Dr. Sarma is currently a Professor at the Indian Institute of Science, Bangalore and works extensively on the physics and chemistry of materials, with special emphasis on nanomaterials and strongly correlated materials. A prolific researcher, he has more than 400 scientific publications with close to 12,000 citations. He has lectured and worked with several leading institutions around the world including

University of Tokyo; Uppsula University, Sweden and the Tata Institute of Fundamental Research among others. Dr. Sarma has an MSc in Physics from Indian Institute of Technology, Kanpur and a PhD from Indian Institute Science, Bangalore. He is a recipient of IIT Kanpur's Distinguished Alumnus Award in 2014.

Dr. Pramath Raj Sinha

Dr. Sinha is the Founder and Managing Director of 9.9 Mediaworx, a niche media company. He was formerly a partner with McKinsey & Company, the international management consulting firm. Dr. Sinha has been part of the founding teams of several high-quality educational institutions. He has been intensely involved with the Indian School of Business (ISB) since its inception and was ISB's Founding Dean. He is now leading a philanthropic initiative to build Ashoka University, a liberal arts university, whose Young India Fellowship has become India's most prestigious postgraduate programme. Dr. Sinha has a B.Tech from the Indian Institute of Technology, Kanpur and an MSE and PhD from the University of Pennsylvania.

Dr. A R Upadhya

Dr Upadhya is an aerospace engineer who was associated with the CSIR-National Aerospace Laboratories during 1974-1986 as a scientist and again during 2004-2011 as its Director. In between he worked on the design of India's prestigious Light Combat Aircraft 'Tejas' in the areas of loads, dynamics and aeroelasticity. He was also the Programme Director of India's first National Programme on Smart Materials and MEMS. Presently, he holds the position of Dr Raja Ramanna DRDO Distinguished Fellow of the Department of Defence Research, Ministry of Defence, Government of India. He is a recipient of Distinguished Alumnus Award of the Indian Institute of Technology, Kharagpur and is a Fellow of Indian National Academy of Engineering.

INTRODUCTION

This Peer Review has the sole purpose of improvement, and aims to realise a set of paradigm changes for enhancing the eminence of the Indian Institute of Technology, Kanpur (IITK), to make it the best in the country and among the best in Asia and the world. To this end, the Review Committee undertook a comprehensive wholesome assessment of undergraduate students, post-graduate students, faculty, staff, infrastructure and ecosystem to give qualitative yet clear directions for achieving higher levels of purpose and eminence in IIT Kanpur. The detailed report to follow is evidence of the seriousness of the exercise.

The Director of IIT Kanpur, Dr. Indranil Manna, and the management team demonstrated, in spirit and deed, keen and engaging commitment to exchange current status, stature and scenarios relating to various aspects of the peer review. Prof. M. Anandakrishnan, Chairman, Board of Governors (BoG), with his presence and engagement not only owned the review but assured its serious consideration and implementation by the Board. The Review Committee members were delighted with the experiences of the process and the environment, which enabled the suggestions and the recommendations that are given in this report.

The following salient features about IITK stood out for the Committee –

- IITK continues to attract some of the best faculty. Despite lower numbers of faculty relative to other institutions, some of the faculty are comparable to the best in India and the world, in terms of research productivity, and are way ahead of others in India, in terms of awards and recognitions. IIT Kanpur needs to highlight this aspect for branding and attracting more of the accomplished young and experienced faculty.
- Campus life is full of excitement and creativity for students, faculty and staff. Infrastructure and maintenance is on an upswing, and there is an uplifting look-and-feel to the place. The student extra-curricular environment and student life outside of the classroom has improved over the years.
- Committee members sensed a vibrancy in the clubs and activities on campus, including the winning of the inter-IIT trophy etc. The team was impressed by the efforts of the students in engaging with the local community. It was heart-warming and inspiring to see IITK students teaching underprivileged children from the neighbourhood, some of them first in the families to have an opportunity to go to school, at the new Student Activity Centre.
- IITK presently has some world-class labs and projects – the wind tunnel, the nano-science facility, ACMS, super-computing, the incubation centre are a few examples. In addition, it is also expanding to interdisciplinary research projects and programmes.

A major transition from being a high-quality relatively undergraduate teaching-focused institution to becoming a large research-driven university is the current challenge and opportunity. In making this

transition, IITK has lost its position of pre-eminence in the perspective of the external world; IITK is no longer seen as the #1 IIT. The main thrust over the next decade has to be to make IITK the undisputed #1 institution in India. Benchmarking IIT Kanpur with the best select institutions in Asia and the world and not just institutions in India is being done by some of the Departments. It is recommended that this exercise be done as a practice for all the Departments and the Institute as a whole. This analysis, based on carefully selected parameters, can lead to strategies and actions to enhance the Departments and the Institute. In fact, IITK should not benchmark itself only against the IITs in the country. IITK should aim to be not only the best in the country but also one of the very best in Asia and the world and that is an opportunity that IITK can seize, build on and achieve.

IITK should sharpen its focus on impact of research and technology in some areas after detailed but honest deliberations within the Institute. Chosen areas should address national priorities and global challenges. This approach will bring different but complementary disciplines and departments together to enrich and enhance excellence. In addition, building our teaching brand, hiring more faculty to deliver on quality research and teaching, expanding infrastructure to meet future needs and hiring more staff to support the system are a few recommendations of this Committee.

The Review Committee reviewed the following IITK related documents and engaged in several interactions with key stakeholders:

- Briefings by Director, Deputy Director, Deans, and Heads of Departments (HoDs)
- Department-wise Internal Peer Review Reports and subsequent responses by HoDs related to vision, goals, and future plans by HoDs
- Recently formulated vision and mission statements prepared by the Director
- 2011 Draft of vision and strategies for IITK prepared by the IITK Foundation
- Direct interactions with IITK Management, HoDs, faculty, undergraduate/M.Tech./PhD students, and staff
- Visits to selected, major R&D facilities and centres

What follows is a detailed report of the Committee's observations and recommendations across a spectrum of elements and stakeholders that drive and maintain the Institute's core vision – Research, Education, Faculty, Infrastructure, Staff and Culture.

1.0 RESEARCH & DEVELOPMENT (R&D): Raising the Bar

The Committee's Observations

The Committee feels strongly that there is a sound starting point for useful, project-oriented R&D, but the current portfolio is not adequately optimised in terms of efficiency, effectiveness, and most importantly, impact. The Committee members are also pleased to see that all internal stakeholders of IITK have already grasped what is good and what needs to be improved. What are needed are leadership, creativity, and cooperation in prioritising areas of focus, developing the associated plans, as well as a commitment to efficient execution. There is a need to enhance and enrich ownership among all stakeholders in order to take the Institute to the next level of eminence.

Below we offer select themes and strategies that can help integrate the very many suggestions that have already been offered.

The Committee's Recommendations

1.1 Setting benchmarks for R&D output

In the context of R&D, IITK should aspire to achieve high impact, qualitatively and quantitatively, in both basic and applied research as well as translational R&D and associated tangibles (patents, licenses, commercial deployment and Intellectual Property income). On the whole, IITK should aspire to make a mark for itself in R&D output measured in terms of number of publications, invitations in prominent capacities to international conferences, extent of recognition in cutting-edge R&D frontiers, and the ability to solve the problems of the industry and the challenges of the country.

In order to do this, the traditional key performance indicators (KPIs) of publications, citations, patents, and awards need to be expanded to include:

- Publications per faculty per year in international journals
- Number of IP developed and acquired by global organisations
- Level of external funding per faculty
- Number of industry/IITK partnerships
- Impact of R&D in the country and at a global level
- Number of publications per faculty with at least one co-author from another department or Centre

Progress towards the Institute's stated vision will be measured – by potential students and faculty, R&D sponsors, potential employees, and worldwide academic community – in terms of the quality of graduating students, faculty, and R&D products.

1.2 Developing cross-disciplinary capabilities

IITK should carefully examine the current and proposed initiatives related to following impactful cross-cutting R&D activities/capabilities – Interdisciplinary Programmes (IDPs), Centres of Excellence (CoEs) and major facilities. A strategic as well as operational plan to leverage and integrate these is needed.

To leverage cross-disciplinary research capabilities, it is imperative that the current IDPs either transform themselves into high quality interdisciplinary degree programmes with higher impact R&D or (a) be realigned with existing departments, (b) converted to stand-alone departments (e.g., Management), (c) eliminated entirely, or (d) transformed into CoEs with clear definitions of excellence and milestones to be achieved.

In terms of CoEs, some of the suggested centres that also support societal and national needs are:

- Clean water
- Clean air
- Recycle/reuse/disposal of solid waste and wastewater
- Advanced manufacturing, including basic materials such as steel
- Food – processing, preservation, and supply/logistics
- Energy production and utilization – transportation fuels, combustion, characterization
- Affordable healthcare
- Security – defence (threat detection), cybersecurity
- Sensors/sensing
- Transportation – air, land, space
- Welding/joining
- Materials – development and characterization; light-weight composites
- Robotics, low-cost automation, autonomous vehicles with specific purposes

In the selection of CoEs, IITK could use the following as key criteria:

- Distinctiveness (non-duplicative)
- Opportunities for R&D (the ability to obtain and execute mega-projects of Rs. 10 crore and above value)
- Capacity for inter-departmental and inter-organisational, especially industrial collaboration
- Contribution to and enhancement of the teaching mission, especially for undergraduate education
- The ability to deliver quality and impact

1.3 Infrastructure and resources for R&D

Several departments are either short on space and/or need modernisation of equipment and facilities. At the same time, there are serious inefficiencies in utilisation of currently available infrastructure. A mechanism to improve the maintenance and management of utilities needs to be devised.

The Committee observed that some of the major facilities are not equally accessible to all departments and are therefore under-utilised. To begin with, to promote optimal utilisation, faculty should be motivated and incentivised to share resources, within and outside IITK. Laying greater emphasis on technical collaborations with co-authoring of papers might help.

In terms of upcoming infrastructure, the institute has a great opportunity to devise the effective and impactful utilisation of the proposed Research Complex and Innovation Centre investments. These new facilities should be tied to IDPs/CoEs focus areas to enhance inter-departmental and inter-organisational collaboration. These plans could also be advertised to attract high-quality UG/PG students and faculty.

1.4 Processes for optimising R&D output

As IITK has greatly expanded its R&D portfolio, there seems to be a misconception of being forced to focus on R&D outcomes at the cost of education, especially UG education. The education and R&D functions of the institute must both remain important and must be synergised. It is clear that availability of faculty time for teaching is a key issue. This can be corrected only partly by adding more faculty. There is much opportunity to address the same problem by optimisation of R&D processes without substantially increasing the resources relative to number of faculty.

A few options are suggested below:

- The value of sponsored R&D projects seems to follow the "80/20 rule", with 20% of the projects accounting for 80% of the value. In fact, if the Rs. 1 crore and above projects are separated, the average value of the remaining 427 projects is only Rs. 11 lakhs, which on a yearly basis is only about Rs. 5 lakh. This puts a heavy project execution burden on the faculty, and results in subcritical engagement of the faculty not only for R&D, but also for teaching. This situation gets worse when in-house R&D and consultancy projects are added. Therefore, an effort must be made to increase the average value and, possibly, discourage sponsored projects below a threshold value.
- The procurement process and other project administration processes should be streamlined to make more time available for R&D, report writing, and preparation of manuscripts of papers. This also may help reduce the average time to complete a PhD, which, in turn, will reduce cost of R&D and elevate number of publications per faculty per year. Further, the Institute should aim at an average time of 5 years to complete a Ph D as the students

will not get financial support beyond this period and also their space and laboratory facilities would be better utilised by new students.

- Most post-graduate students already have decided to pursue PhDs, so M.Tech. + PhD should be changed primarily to direct-PhD or PhD + Post-doctoral to increase R&D performance and to also reduce administrative burden on faculty.
- The Dean of Research and Development should provide additional professional staff with expertise in program management, including progress reviews and ESHQ (environment, safety, health, and quality) reviews, as well as technology transitioning (patenting, licensing, etc.). This will help raise the quality and impact of R&D, and also keep projects within approved schedule and budget, while minimising the time devoted by faculty. Some of these activities can also be shifted to post-doctoral students and other non-teaching staff, both compensated well.
- The faculty performance (output) in terms of R&D is highly variable across departments and within a department. Some departments are very low in terms of sponsored R&D; others are imbalanced relative to more impactful, sponsored, versus consultancy projects. A few departments are overwhelmed by single individual contributions. While exceptional faculty are desired and are an asset, we should look deeper for uplifting the contributions of others to at least an acceptable standard.

1.5 Governance and management of R&D

IITK must modify governance models and processes to provide more autonomy and importantly, an inspirational ecosystem, for R&D.

Some of the recommendations are as follow:

- The departments should be able to hire postdocs and staff to support CoEs and larger R&D projects. The Institute is already working on developing a more attractive compensation packages for postdocs, which is a move in the right direction. At the same time, the Institute should also be forthcoming in providing departments the freedom to hire directly.
- As mentioned in the previous section, the procurement process should be streamlined, with a “fast track” process for procurements. Experienced experts (retired), at the apex levels in the Government, can be brought in to advice on robust but fast-paced procurement methodologies. Financial excellence is an integral part of institutional excellence. The best practices followed need to be practiced and strengthened.
- The Institute should consider ways to incentivise faculty members who help bring larger R&D projects. One possibility is to make their current, government-approved annual salary on a 9-month basis, with the extra 3 months at additional (proportionate) compensation

provided through externally funded projects. There also could be an option for work in industry or at other institutions during those 3 months.

- There is a need to have periodic faculty-student meetings, at all levels, with the concerned Deans present, to address issues of mutual concern.

1.6 Stakeholder engagement in R&D

To take IITK's contributions in R&D to a higher level, an opportunity exists to better engage both external and internal stakeholders.

- The work begun in the area of industry/institution partnerships must be greatly expanded. The core areas, many leveraged by CoEs, for such interactions should become more recognizable. This will lead the way to brand marketing and to also attracting high quality students and Post-docs.
- The departments should seek industrial advisors and mission leaders to refine plans for R&D; help identify industrial problems as well and conduct mission collaboration workshops to provide guidance for thesis work. At the Institute level, Industry Days should be organized to highlight CoEs, core R&D capabilities, and key R&D projects, as well as to seek outlets for technology transitioning.
- The Institute must increase alumni engagement specifically to expand R&D opportunities and to raise funds for R&D, for enabling recruitment of top-tier faculty. The Rs. 5cr per year alumni funding is too low for as eminent an institute as IIT Kanpur. Clear strategies with milestones should be worked out.
- A major effort is needed to engage undergraduate students, during the last two years of their stay, to meaningfully participate in R&D. This shall improve productivity, reduce costs, and also meet the goals of education and placement in core disciplines. Innovations should become a part of education through well thought-out and discipline-wise or product-wise labs with challenging experiments, and acceptance of results-based on approach and efforts rather than end-values.

2.0 EDUCATION: Rebuilding Teaching Excellence

The Committee's Observations

The External Peer Review Committee interacted with several students from the Bachelors, Masters and Doctoral levels. The Committee was impressed by the students, their enthusiasm and commitment to IITK and their constructive suggestions for improving the quality of the overall student experience at IITK.

In recent years, there has been tremendous growth in the number of students at all levels. Despite the significant increase in student population on campus, we were pleased to note that:

- The campus infrastructure for hostels and student life has not only kept pace with the expansion but also improved considerably in recent years.
- Student activities – in terms of cultural activities, sports, technology clubs and festivals – are well-orchestrated and the campus is bustling with a lot of right initiatives. The Committee was impressed with the students' social commitment to helping the underprivileged population in the surrounding area of Kalyanpur.
- The Counselling Service has done well to strengthen and address some of the emotional needs of students on campus.

However, the Committee also identified several challenges that IITK faces today that need to be urgently addressed:

- There is a widespread concern that IITK fails to get the best students – the top JEE rankers – anymore. In fact, in recent years the first 100 rankers in JEE have not joined IITK.
- Students in general desire more from the classroom teaching experience at IITK. Their belief is that faculty care more about research than teaching. They also feel that their creativity and research interests have no engagement with the faculty, who seem to favour Masters or PhD students for their research projects.
- Faculty, on the other hand, feel that students are not interested in engineering and view IITK as a stepping stone to "non-core" jobs or career paths. They feel that senior students also play a role in this by demotivating freshers from taking "core" subjects seriously and by choosing "non-core" jobs themselves. The Review Committee does not accept this as an argument. However, there is a need to address the underlying issues.
- In general, there is a divide between students and faculty on the quality of student experience and a certain cynicism that more and better cannot be achieved. This thinking must be clearly challenged and removed.

- Masters and PhD students, in particular from some of the newer programmes such as IDP and MBA feel that their expectations are not being met and that IITK does not deliver on its promises.

The Committee's Recommendations

The External Peer Review Committee would like to recommend that IITK should seek a paradigm shift to enhance the overall student experience, with a focus on new and effective teaching approaches. Our recommendations cover the entire student life cycle from outreach and marketing to alumni relations.

2.1 Outreach and marketing

IITK has many achievements to pride itself on. It has exceptional faculty with remarkable achievements to their name. It has an excellent campus and a wholesome ecosystem for students to study in and grow into holistic persons. Some of the most cutting-edge research in India is happening at IITK. It is important that these achievements are communicated to potential students and parents, as well as to potential faculty, as they make their choices about which IIT to be part of. In fact, the need to highlight and communicate IITK's many positives is accentuated by the inherent locational disadvantage the Institute faces, and therefore, IITK probably needs to do more on this front than other IITs. This could mean a better website, some active outreach activities to directly reach out to potential aspirants, targeted advertising and strong PR activities, all managed professionally by a capable set of marketing and PR professionals. IITK has a lot to be proud of and should not be shy about communicating its achievements assertively to the world.

2.2 Admissions counselling

The constraints of the counselling process notwithstanding, it is important that IITK make**s** an extra effort relative to its peers in better informing prospective students at the crucial time when they are deciding on which IIT campus to join. It appears that in the current system, there may be an opportunity for IITK to distinguish itself by playing a helpful counselling role with students and reversing the current trends where student choice is driven entirely by the rankings and choices of the previous year. Pure dependence on the past is a slippery slope since with each year**,** students of lower and lower rank will join IITK in the mistaken perception that somehow standards at IITK are lower than at other IITs. A pure ranking-based judgment of quality is not only ill-conceived but unfair to the quality of IITK's education and infrastructure and needs to be corrected.

2.3 Learning experience

Improving the learning experience in the classroom deserves to be addressed urgently by IITK faculty. It appears that while student feedback suggests above-average teaching performance, not enough students

fill the feedback forms. Further, those that abstain from attending classes – for reasons including uninspiring classroom learning experience – are not involved in the feedback at all. An immediate measure towards accurately assessing teaching effectiveness and identifying areas of improvement would be imposing greater compliance on students in providing their feedback (including not giving out grades till the student has provided feedback on the faculty as is prevalent in certain universities). Also, while this is elaborated further in the faculty section of this report, we think it is important that IITK invest in faculty learning and development and also give greater importance to teaching performance in faculty evaluations. *We believe it is critical that the classroom learning experience for students at IITK be enhanced to benchmark levels.*

2.4 Launching new programmes

While IITK must be commended for creating new programmes that are interdisciplinary (Masters in Design, etc.) and contemporary (MBA), there is a sense that these courses, while popular and attractive, do not quite meet the expectations they promise prospective students. It seems that attracting the right faculty to complete the full complement of the courses in these areas is indeed a big challenge. Additionally, some of these programmes may not even be distinctive. The MBA programme, for example, seems a tough one to take to a level of national prominence. Part of the discouraging performance may be explained by the fact that these programmes are in their infancy and will improve with time. However, if it is indeed an impossibility, even over time, to ramp up the quality to distinctive levels, then such programmes should be converted to a minor instead of a full major. We recommend that IITK not launch programmes unless there is a clear path to make them the most top-notch and distinctive in the country.

2.5 Research and innovation

The Peer Review Committee was concerned to hear that undergraduate students, especially those who are interested in research and seek an outlet for their innovative/creative potential, feel that they do not receive encouragement from faculty, who are keen to enlist post-graduate students in their research projects. We believe this must be addressed. Intertwining practical learning with classroom-based education has always been the hallmark of IITK and while this may not always be possible and may not be sought by all students, those who do seek such engagement should be encouraged to do so. This will also make IITK more attractive to those students who are keen on engineering and technology and may even create an opportunity for those “on the fence” to be converted. The Committee strongly believes that IITK should get the best out of its undergraduate students by harnessing their creativity and reclaiming its lost glory as a top institution. Participation of undergraduate students in research projects should grow multi-fold. This, along with improving teaching and classroom experience, will also help bridge some of the prevailing divide between students and faculty.

2.6 Placements

While the Committee did not get a chance to review placements in detail, it appears that in certain areas there is a dearth of "core" companies recruiting from IITK. As a first step, the Committee would recommend that the placement office be spruced up with increased professionalism. Further, it is advised that the placement office actively target companies that may be recruiting from other IITs and persuade them to recruit from IITK as well.

There is a need for IITK to engage the core companies in a pro-active manner and cultivate a relationship. This does not mean just inviting them for a placement session at the end of the year, but a more continuous and productive approach of inviting them to visit the Institute and see for themselves what is going on in areas relevant to them. Also, if possible, IITK must take up projects of interest to these industries in B.Tech/M.Tech programmes which will bring in greater industry-Institute interaction and familiarity. Industries may even be persuaded to provide internships to students which, in many cases, lays the foundation for future employment.

2.7 Alumni relations and fund-raising

In the recent past, IITK has made tremendous strides in nurturing its relationship with its alumni. However, as the Committee discovered several times in its meetings, donor funding could go a long way in alleviating some of the core challenges at IITK, especially in freeing up faculty from some of the administrative burden and providing them better support in non-core areas. It appears the annual level of alumni funding at IITK remains under Rs. 5 crores a year on average. We believe that it should be possible to attract more contributions from alumni by making a right case to alumni, on a global and selective basis. This can be an important strategic initiative for IITK if it is to break out of the current constraints that it has to operate under given its near-complete dependence on government funding.

3.0 FACULTY: Enhancing Hiring, Nurturing, Evaluation and Reward Systems

The Committee's Observations

IIT Kanpur has several distinguished faculty amongst its ranks including winners of many national and international awards. It has also successfully increased its hiring rate in recent years. The Committee also notes positively the IITK's proactive approach to spouse employment as well as its efforts to increase the number of people hired in adjunct positions, bringing in a new source of talent from the industry. With these, IITK has a strong foundation on which to build its capabilities to become one of the top hundred research universities in the world in science and technology.

However, in the transition to being a primarily research university, and as mentioned earlier, there is a growing perception among students that the faculty now care less about undergraduate teaching. If this be true, then for an institute historically renowned for its undergraduate teaching, it is a problem. The Committee strongly believes in the balanced pursuit of teaching and research by hiring and nurturing adequate faculty and instituting periodic evaluation and reward systems to incentivise performance.

The Committee's Recommendations

3.1 Attracting fresh talent

Currently 9 out of the 13 departments have a student to faculty ratio of 20 or above while the ratio recommended by the Ministry is 10. This high ratio likely places a lot of stress on the existing faculty and affects their performance both in teaching and research. Hence, hiring excellent faculty needs to be of utmost priority to the Institution. IITK ought to be proactive and aggressive in increasing faculty strength to beyond 500. It should deepen the potential faculty pool by inducting larger numbers of post-doctoral candidates and industry experts into teaching positions. IITK could learn from IIT Bombay's (IITB) recent efforts in this domain. IITB has been especially effective with their recruitment effort in the United States, driven by an aggressive and expedited approach to generating offer letters. Further, nominating and thus later attracting Ramanujam, J C Bose and National Professors can add to teaching and research experiences of IITK in a significant way. The Institute should also look into raising funds specifically towards providing capping salaries, in order to attract better faculty to IITK.

3.2 Nurturing existing talent

For IITK to establish itself as the hallmark of inspirational teaching, the Institute must undertake proactive initiative towards developing and nurturing teaching talent. Establishing a Teaching-Learning Centre in the campus, run by dedicated resources, will go a long way in this direction. The Committee sees the

Centre becoming the hub of knowledge exchange, mentorship and best practice sharing around pedagogy and teaching methodology. Also worth considering is establishing an 'Academy for Engineering' jointly with other IITs, ISERs, NITs and private engineering institutions of repute.

3.3 Evaluating and incentivising

Faculty should be evaluated on a regular basis for their accomplishments in *research*, *teaching* and *service*, in line with systems in several world-class universities where Assistant Professors are reviewed every two years, Associate Professors every three years and Full Professors every four years. The *research* record is judged usually by publications, patents, awards and so on, while *teaching* includes both classroom teaching and graduate student mentoring. *Service* includes service both to the institution and to the external world. IITK should also put systems in place to help faculty with each of these elements of evaluation – for example, faculty who may need help with teaching could benefit from advice from a designated pool of distinguished teachers. Faculty can also be mentored on aspects of their research by senior colleagues.

In order to encourage faculty to perform at their best through their long careers it is important to have an incentive structure that rewards outstanding performance along these dimensions. Universities around the world have used different mechanisms to accomplish this objective. As a specific example, the University of California has a system of steps for Assistant, Associate and Full Professors roughly equivalent to the increment system in India. In this system, if a faculty member performs at the expected level, they get a one-step increment. If they are particularly accomplished in research or teaching, they may receive one and a half increments (or even two increments). If, however, they are under-performing in any of the dimensions, they may get only half an increment or even none. Appropriate versions will have to be devised to fit the institution of IITK, but we believe a system of continuous assessment and an associated reward system would be very helpful in bringing out the best.

3.4 Freeing from administrative responsibilities

The Committee observed that the current administrative burden on faculty is unproductively high owing to the large number of and, often low-value, projects they handle. The Committee was informed that there were as many as 1,252 projects at Rs. 14 lakhs or less for a 3 year period. There is a need to unburden faculty from some of the administrative responsibility the huge number of projects entail by recruiting and providing adequate support staff as well as by outsourcing non-core faculty roles, allowing faculty to devote greater time and energy to teaching and research.

4.0 INFRASTRUCTURE: Expanding and Upgrading

The Committee's Observations

Infrastructure of high standards and at an optimum level, in addition to adequate faculty and staff of high quality, is fundamental for an academic institution to achieve and demonstrate a high level of academic performance in education and research. Further, IITK, being a primarily residential institution not located in a metropolitan city, needs to be self-sufficient in terms of comfortable levels of accommodation for students, faculty, staff and other employees, as well as amenities (utilities, services and support facilities), recreational facilities (sports, extracurricular activities, entertainment) and other daily necessities. On the academic front, investment in and upkeep of infrastructure such as classrooms, laboratories (for teaching and research), support facilities (library, computing, fabrication, research, placement, student lounges etc.), seminar and conference facilities, study rooms, faculty and staff rooms is necessary.

It must be kept in mind that students of an academic institution will carry with them fond and nostalgic memories of their tenure in the institution if it is happy, comfortable and productive, and propagate this as brand ambassadors of the institution. Good infrastructure has a major role to play in this regard.

During the Committee's inspection and interaction, it was observed that IITK has much of the above-mentioned infrastructure in reasonably good measure at present. Students, faculty and residents of IITK have ready access to:

- Adequate water and electricity supply, sewage treatment
- Sufficient levels of residential accommodation for faculty and staff
- Central computing facility with the best HPC facility in the country
- Good institute-wide LAN with Gigabit fibre-optic backbone and 1 Gbps internet bandwidth
- SIDBI Innovation & Incubation Centre
- Adequate number of classrooms and laboratories
- Student's Gymkhana and Activity Centres
- Well-equipped Library and Health Centre
- National Test/Research facilities(e.g., National Wind Tunnel Facility, Flight Laboratory, Nano Science Centre, ACMS, Solar Energy Research Enclave, etc.)
- Centres for Interdisciplinary studies/research

However, from the feedback received from the students, faculty, HODs, officers and staff, it was noted that:

- In many of the departments, the teaching and research laboratories space is suboptimal for the current student strength, leading to crowding and delay.
- Some of the laboratories need to be upgraded and modernised with state-of-the-art equipment.
- Central facilities like the machine shop and the PCB fabrication facility are not able to provide adequate support and hence students are forced to seek outside services. But such support is not available in Kanpur, and has to be sought from elsewhere (most often, Delhi), leading to delays.
- Student accommodation, particularly at the first year undergraduate level, is crowded due to the increase in intake in the recent past.
- Office automation needs significant improvement.
- Student counselling facility has been improved in the recent past, but needs additional space.
- Student Gymkhana and Activity Centre needs more space for clubs.
- Lots of modern high-quality civil construction activity is planned to be executed in the coming years, but Kanpur is not geared up for the challenge with the right professional service groups; this puts extra pressure on the engineers and staff who, like the faculty, are unable to attract good quality professionals. Also, they are not motivated due to lack of career advancement opportunities.

Additionally, internal reviews carried out at the departmental level also brought out the need to:

- Improve cohesiveness in the case of some departments where the facilities are distributed over the academic area
- Improve maintenance and utilization of equipment and establish stringent safety norms
- Provide uninterrupted power supply to critical equipment (particularly in Civil Engineering and Material Science Departments)

The Director is also acutely aware of the ageing infrastructure and inadequate floor space, and the need to bring in a sense of urgency in civil construction projects and the associated difficulties in implementation.

In addition to the Institute's existing needs, IITK must also plan ahead to create infrastructure in line with its future vision of creating a centre of excellence in science-based engineering education through teaching and research and of regaining the position of the top-most engineering school in India and among top 100 in the globe. In the coming years, the management of IITK envisions a steep growth in the size of campus population to about 15,000 – with a student body of 7,000, 650 faculty members, and 800 technical and administrative staff by the year 2021. According to the Director, the interim target for

faculty is about 450 by the year 2016. Towards meeting its infrastructure needs for 2021, the Institute has already begun to take the following steps:

- The Management has drawn up an Institute Master Plan 2021, approved by BOG, with expert professional help, which considers the following:
    - The need for additional space required by the departments/units, residential requirements and other services using minimal footprint
    - Refurbishment/renovation of existing buildings
    - Retention of 'green areas'
    - PICs at Noida and Lucknow to facilitate easier and more efficient interaction with outside agencies, mitigating the 'Kanpur Disadvantage'
- The Master Plan also includes new initiatives such as a research complex to facilitate research in cutting-edge areas, an Innovation and Entrepreneurship Park to expand the existing ecosystem with focus on translational research, an animal house for facilitating research on human physiology, and a Core Engineering Laboratory.
- Some of the components of the proposed Master Plan have already been put into action, and are under construction or near completion. Some others are under tendering, while some are under preliminary planning and some have just been identified.

The Committee's Recommendations

Considering the above, and based on its assessment of the situation, the Peer Review Committee strongly recommends that:

- The pending actions under the Institute Master Plan 2021 for the projected growth be reviewed and prioritised, keeping the classrooms, teaching and research laboratories, faculty office space, and accommodation and amenities (particularly, expansion of the Health Centre) for campus residents on top of the list.
- It must be ensured that the infrastructural facilities are established ahead of the proposed increase in strength to ensure that new faculty, staff or students are not inconvenienced and demoralised on their entry.
- The experiences and issues of existing Inter-Disciplinary Programmes (i.e., need for office space for participating faculty from other departments, sharing of facilities etc.) should also be factored in while developing infrastructure and facilities for similar programmes in the future.
- Similarly, a concerted plan of action for efficient usage of high-value facilities in Centralised Research Centres must be drawn up. There is concern that such facilities may lose their

relevance if individual departments attempt to duplicate such facilities or the procedures become too bureaucratic.

- Departments with distributed labs and faculty offices in the academic area (Civil, Chemical, Physics) may be integrated in a single building to bring greater cohesiveness and intra-departmental interaction.
- Plans need to be put in place for efficient maintenance of infrastructure to ensure its continuous availability, and sufficient manpower and funds ought to be allocated to this end and towards the extensive new construction activity, coupled with sufficient career advancement opportunities as motivation. In addition, the Institute should provide for regular monitoring of usage of costly equipment to ensure their full usage and return on investment.
- The centralised fabrication service facilities may be strengthened with adequate equipment and trained manpower to provide necessary level of fabrication support to students.
- Office automation must be enhanced in scope and reach to make day-to-day administrative, finance, stores and purchase, and other such activities faster and more efficient.
- Attractive office and residential space for the proposed increase in post-doctoral fellows is to be created.
- The facilities at PICs at Noida and Lucknow may include services for managing outsourcing jobs to outside industries so that students/faculty are spared the burden of travel, etc. If necessary, such facilities may be established at other relevant centres to mitigate the 'Kanpur disadvantage'.
- Every major facility on campus must undergo a security and safety audit and a proper protocol must be drawn up to ensure its security and safety.

5.0 STAFF: Improving Dialogue and Career Paths

The Committee's Observations

The Review Committee met members of the IITK staff on April 16, 2014. The Committee was heartened to see that members of the IITK Staff are proud of the fame and prestige of IITK, exude a sense of belonging and appear to be eager to contribute to the process of improving the place to the best of their abilities.

The staff put forth during the interaction several of their concerns.

- Firstly, they brought out the fact that there is an absence of a formal platform that facilitates interactions between the staff and the administration. Lacking the traditional route of an employees' union or something similar, the staff members feel that their concerns have no way of reaching the decision-making bodies.
- Another common concern of a large cross-section of the staff at IITK is the perceived lack of any substantial route to career growth for most of the cadres.
- The third category of concerns expressed by some specific members of the staff pertains to cases of anomalies arising from the pay fixation in the revised pay-scale following the last pay commission recommendations for individuals. Typically, these refer to two members with different designations, but being in the same pay structure before the pay commission implementation, ending up with substantially different pay-scales after the revision. The member with the lower pay-scale in the revised structure feels discriminated against in view of the other member receiving a better pay-scale after the revision.

In the meeting, it was also brought up that the maintenance fund for all civil and electrical works available at IITK is severely inadequate, leading to the inability of the maintenance group to attend to most of the complaints received during the second half of the financial year. This must be a serious concern for the entire IITK community, and not just for the IITK staff members; however, the members of the maintenance staff bear the pressure arising from this lack of funds at the primary level and would like to sensitize the IITK authorities about finding a solution to this recurring problem.

The Committee's Recommendations

This Committee feels that the above laid out issues can be addressed in the following ways:

- To begin with, we feel that it will be healthy for the institution to have a mechanism in place that enables greater and more transparent administration to staff interaction, allowing the voices of the staff members and their genuine grievances to be received and redressed as appropriate. While this need not take the form of establishing a unionised approach, IITK

administration should explore ideas to have some form of a mechanism in place to achieve this possibility of a two-way dialogue between the Institution and the staff members.

- As regards the lack of a well-defined growth path, the Committee believes that this in the long run could adversely affect the level of staff motivation. It is therefore an important aspect that IITK authorities need to look into. The staff members cited several discrepancies in the promotion policies as well as pay-band and grade-pay fixation policies between the way it is practiced at IITK and at other IITs or at CSIR organisations. The Committee feels that it may be instructive for the IITK authorities to look into the various policies implemented in this respect at different IITs to establish a realistic, best-practice package/policy for its staff members.
- Lastly, on the question of anomalies in revised pay-scale, the Committee believes that the mentioned cases are more the exception than the norm. It is the impression of the Review Committee that such cases will be automatically taken care of when the two previous concerns of the staff members, mentioned above, are dealt with.

6.0 CULTURE: Creating an Ecosystem of Excellence

The Committee's Observations

An institution's culture is the sum total of the collective values, beliefs and ideals of its members and is shaped by the sense of ownership and responsibility they share. It is the invisible undercurrent that influences behaviour and guides decisions and actions at a subconscious level. In many ways, it is the Institute's culture that defines the 'IITK experience'. As noted at various points in this report, the Committee found in IITK an environment of intellectual curiosity and a commitment to academic excellence. Students, faculty and staff alike took pride in belonging to the IITK community. The strong social conscience that pervades the Institute was visible in student initiatives for the underprivileged as well as in the social impact research that faculty undertook.

The core elements of the IIT vision, as expressed in Nehru's words, and the Sarkar Committee and Nayudamma Committee (1961) reports are:

- The basic function of IITs is the production of scientists and engineers of the highest calibre through education. It should be tightly integrated with research and extension.
- Goals and tasks of the Institutes should relate continuously to changes taking place in the socio-economic development of the country and rapidly exploding universe of knowledge in science and technology.
- IITs should embody the student with values, enthusiasm and ability to engage in research, design and development to help building the nation towards self-reliance in her technological needs.

In keeping with this vision, the Committee feels that it is imperative, going forward, to maintain and enhance the ecosystem of excellence that IITK prides itself to fulfil its primary objective of being a world-class technological institute. It is important also to ensure that students, faculty and other residents of IITK, even while living in the safe and insular environs of the campus, stay tightly integrated with the community and ecology around them so they may contribute to nation building by solving some of India's most challenging and pressing problems. To this end, we lay down a few recommendations in matters of quality management, governance, ecology and social impact.

The Committee's Recommendations

Several of the recommendations in creating a culture of excellence at IITK are already captured in the earlier sections. In this section, the Committee has chosen to make specific recommendations grouped into several categories that have not yet been covered elsewhere in this report.

Total Quality management

- Improve quality of interaction with all stakeholders at all levels
- Effective coordination between different departments/faculty members in particular to maintain cordial relationship

Environment and ecology

- Energy Conservation
    - Energy audit to be conducted for IITK and the recommendation to be implemented on a time-bound manner
    - Exploitation of renewable energy resources such as solar water heaters for cooking, photovoltaic cells for electrical energy generation for street lights, to be considered
    - The Institute should consider designing and installing a campus-based micro-grid to more efficiently manage the back-up generators as well as power from alternative energy sources generated on campus.
- Maintenance of Flora and Fauna
    - A few more water bodies could help promote this aspect, where IITK is already doing well
    - The Institute can be further enhanced in terms of elegance, beauty and biodiversity
- Waste management
    - Bulk solid waste to be recycled for power generation
    - Sewage water to be recycled and used for watering plants
- Conservation of water resources and greening of the campus, with zero waste
    - Drip irrigation system to be popularised in the campus
    - Artificial ponds to be formed for harnessing rain water
    - Rain water harnessing system for all the major buildings to be implemented and the harnessed water can be used to improve the water table in the campus
    - Water audit to be conducted and the recommendation to be implemented

Social responsibility

Students of IITK have already taken some initiatives in this direction. In addition, students can –

- Adopt a nearby village and provide primary education to women and elders
- Provide free tuition to school children, in a more enhanced manner

This will facilitate holistic growth of the student community, and sensitise them to the society.

Corporate governance

- Establishment of unique systems of open, flexible but functional governance
- Invitation to industry leaders to participate in governance to inject fresh ideas, based on their practical experience, and promote industry-institute interaction by networking with them

Safety and upkeep

- Safety of men and material
    - Safety department to take proactive measures to identify areas where safety is compromised and suggest safety measures such as safety shoes, spectacles, helmets, gloves, masks, etc. and provide necessary equipment on a time-bound schedule and ensure that they are effectively used
- Good Housekeeping
    - Cleanliness to be inculcated by effective supervision of the cleaning jobs done by the concerned contractors
    - Incentives to be provided by giving awards or rewards building-/department-wise

CONCLUSION

Experiencing the eminence and the ecosystem of IITK was a pleasure for the members of the Review Committee. The Committee appreciates much of what IITK has accomplished, and has made recommendations for improvements and paradigm changes, where necessary. The members of the Review Committee wish to see IITK reach higher levels of performance and scale greater heights of excellence in the coming years. The real purpose of the peer review, therefore, shall be served, with the Institute achieving higher echelons of success, purpose and eminence.

Our heartfelt thanks and gratitude to the Chairman of the Board of Governors (BoG), the Director, the team and all those who made our stay comfortable and enjoyable and our job easier with a lot of prior planning and comprehensive information. We look forward to receiving feedback on our approaches and recommendations. We wish the BoG, the Director and his team all the success in their endeavours.

ANNEXURE I: PROGRAMME OF THE REVIEW COMMITTEE

DAY 1: APRIL 14, 2014	
Time	**Event**
09.00-09.15 hrs	Welcome address by Prof. Anandakrishnan, Chairman, Board of Governors
09.15-10.00 hrs	Presentation by the Director
10.00-13.00 hrs	Presentations by Deputy Director and Deans
13.00-14.30 hrs	Lunch
14.30-17.30 hrs	Visits to major institute facilities
17.30-19.00 hrs	Meeting with student gymkhana ad PhD students
19.00-20.00 hrs	Play
20.30 hrs onwards	Chairman's dinner

DAY 2: APRIL 15, 2014	
Time	**Event**
09.00-13.00 hrs	Presentations by Heads of Departments and Programmes
13.00-14.30 hrs	Lunch
14.30-17.30 hrs	Visit to major institute facilities
17.30-19.30 hrs	Meeting with UG and PG students
20.30 hrs onwards	Director's dinner

DAY 3: APRIL 16, 2014	
Time	**Event**
08.00-09.30 hrs	Breakfast meeting with Director, Deputy Director and Deans
09.30-10.30 hrs	Meeting with staff
10.30-12.00 hrs	Visit to incubation centre and meeting with start-ups
12.00-13.30 hrs	Meeting with local industry representatives and alumni
13.30-15.00 hrs	Lunch
15.00-17.00hrs	Report writing
17.00-18.00 hrs	Meeting with Director, Deputy Director, Dean of Faculty and Dean of R&D
18.00-19.30 hrs	Address to the faculty