Dept of Electrical Engineering IIT B Vision:

Abstract

The vision committee was formed based on the request of the Head of the Department to develop *a vision of the department for the next 10 years needs to be defined which includes yearly milestones for first 5 years - which may be used for self-evaluation during annual evaluations of the department.*

To understand the aspirations of the faculty and the groups, the committee decided to poll individual faculty as well as conduct discussions to understand gaps in the present situations as well as desirables. A draft vision was developed as a baseline for further discussion, criticism and modification. The various individual and group inputs were then harmonized at the vision committee level to develop a vision for the department considering the department as a whole.

The committee found that the department with DPC, DPGC and DUGC have provided policy development, implementation and arbitration. However, a critical gap was the regular assessment of departmental requirements in the present and future. An example of present requirements were listed as top challenges towards achievement of the vision of the department. To address these gaps, the committee recommends the formation of 3 standing councils to develop programs to address the challenges and realize the vision of the department. These are (i) Teaching Learning Council (TLC) (ii) Research Technology Council (RTC) (iii) Administration Infrastructure & Maintenance (AIM) Councils. For sustained focus on achieving the vision, annual reviews for (i) objectives setting & (ii) progress review (maybe at the DFM level) must be implemented for each council to assess future challenges & present achievement.

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Background & Motivation

The vision committee was formed based on the request of the Head of the Dept., Prof Fernandes as stated in the letter.

To state the basic role, the vision is to serve the following purpose as excerpted from the letter-

"a vision of the department for the next 10 years needs to be defined which includes yearly milestones for first 5 years - which may be used for self-evaluation during annual evaluations of the department."

Further, to state the basic areas of concentrations, the idea was to focus on

1. Research Development
2. Teaching Development

Using the above, develop plans to provide (i) resources (ii) faculty hiring to achieve the above goals.
The committee of the following was constituted
Prof. Udayan Ganguly (convener) - EE4- Devices
Prof. Shalabh Gupta- EE1, EE4 (Circuits & Systems), EE5
Prof. Sibiraj Pillai- EE1
Prof. Debraj Chakraborty - EE2
Prof. Anil K.G. EE4- Devices
Prof. Anil Kulkarni, EE3
Prof. Vikram Gadre- EE1, EE2, EE5

Given that this was the first such committee to be formed, the committee decided to develop *core definitions* of the department in terms of ***Goals, Mission, Core Value*** in addition to the Vision of the Department.

Methodology

The committee developed the vision in various stages

1. **Individual feedback:** A form was sent out (June 2015) to all the faculty to receive response. It elicited 8 responses.
2. A question was raised by Prof. Manjunath about why the vision was being developed group-wise and then collated instead of **top-down**. It was felt by the committee that a **bottom-up (**"from the grassroots") approach would be better as the "organic" concerns (e.g. resource issues, problems faced by each faculty etc.) would be raised. Finally, these could be prioritized at the department level.

3. **Group discussion:** The representatives of each research group was requested to poll their groups. The following format developed for Devices focus (Sept 2015) was recommended as the basic format. The groups could also generate their own as needed.

CSP:See document
Control and Computing: See document
PEPS: See document
Circuits and Systems: See document
Devices: See document

4. The vision of the different focus group was **considered, collated and harmonized by department level committee** to form a set of goals for the Dept to be developed till 2020.

An effort was made to record all the discussions formally through EE Moodle for posterity. It was partially successful.

Goal

To develop into and sustain as **a world-leading institute** for Research, Education and Technology Policy & Administration

Mission

1. To serve the technical R&D and educational* needs of the nation and international professional community (***service***)
2. To develop an academic and professional system to enable excellent research and researchers (***individual development***)
3. To engage, lead and collaborate with education and technology network towards building seamless technology and human resource development system. (***ecosystem development***)

* classroom learning and hand-on research training

Core Value

- To develop, trust and uphold human values and ethics
- To serve humanity through education, science and technology
- To develop the individual and the community

Why do we need to enunciate core values?

1. Core values are ***not captured in the mission or vision*** .
2. Core values are however **time-invariant axioms** that serve as *the* ***DNA of an organization***. It serve mission or vision that are time-bound 10 years and keep serving even when the mission and vision have evolved.
3. Core values are **preconditions to any other achievement** e.g. excellent in science or understanding, profits, system building etc. These values define the basis of conception and implementation of all ideas that form the group.

What constitutes each focus areas?

Communications and Signal Processing

The group specializes in research, development and education empowerment in the areas of **communication, signal/media processing, data networking and allied interdisciplinary areas**. The group also engages in interdisciplinary activities in biomedical, computer science, finance & economics, energy management, security, mathematics etc.

Power Electronics and Power System

The Power Electronics and Power Systems group focusses on **all aspects of electrical power systems** including planning, design, operation and control, and electrical power conditioning using high power semiconductor devices for industrial and power grid applications.

Control and Computing

The control and computing group investigates **the theoretical and algorithmic principles underlying modern engineering systems** in order to innovatively solve problems faced by academia and industry.

Devices & Technology

The group focuses on **devices for Computing, Communication, Energy & Power, Healthcare, Environment and related areas.** The group requires interdisciplinary expertise to perform devices research encompassing conventional electrical engineering as well as related areas in physics, materials science and more recently energy, chemistry, biology and mechanical engineering.

Circuits and Systems

The Circuits and Systems group works **on various aspects of integrated circuits and electronic systems to deliver solutions from chip level to system level**. Some of the activities of the group include investigation of novel architectures, design techniques and test methodologies for analog/mixed-signal/RF and digital integrated circuits with emphasis on theoretical advancements as well as practical implementations. The group is also engaged in development of computer architectures and processors for different applications.

Vision

Education & Teaching/Learning Vision:

Overview:

Sustain a curriculum aligned with **knowledge and skill requirements of engineering professionals***.

- Develop **new courseware**
- Develop conventional courseware with **new approach**
- Implement and develop **new teaching-learning techniques** (training / mentoring for faculty)
- Train teachers and researchers (IITB faculty/students & **outreach**)

- Develop **teaching aids** and labware (IIT and outreach)

* other engineering professionals are also trained by our dept.

Top challenges:

1. No standard **resources/policy** for teaching/learning development e.g. collaboration with ET-IDP.
2. One dimensional (student feedback based) methods of **teaching quality**; No technical feedback / mentorship to teachers e.g. from ET folks.
3. No plan/resources for generating **online educational** content e.g. web based, books etc.
4. No sustained **outreach** to (i) industries and (ii) academic institutions as a department/focus groups for dissemination
5. Enabling the development and sustenance of **state-of-the-art teaching labs** is essential
6. Teaching classroom / lab related **Space requirements** and projections are not available.

Research & Technology Development Vision:

Overview:

Develop a **world class research portfolio** of present and exploratory topics

- Develop **fundamental knowledge** (e.g. understand long terms problems)
- Develop **critical technology**, IP and nucleate start-ups
- Develop and sustain ***shared* world class facilities** (dept/institute support needed)
- Serve **national needs** in technology R&D (transfer technology)
- Develop **industry engagement**

Top Challenges:

1. Need better **Industry interaction** plans and outreach
2. Improve hired **student quality** at post grad level.
3. Provide better student resource e.g. **office space, housing** etc
4. Sustain **undergrad student interest** in research
5. Improve lab **staff quality**
6. Provide **better packages to lab staff** e.g. office space, housing, career paths, performance evaluation etc
7. Research lab related **Space requirements** and projections are not available/ planned
8. Resources / incentives for **inter-group collaborations** needs to be explored
9. Need **focus areas of interest for hiring**
10. May need at par **incentives for newly hired faculty** (space, start-up grant etc). - may coordinate with institute

11. Need approx. **hiring targets** for each focus group during a period of say 5 years

Technology Policy & Administration Vision

Overview:

Contribute to science and technology policy-making nationally and internationally.
Develop effective departmental management practices to create a wholesome academic environment.

- Develop **industrial and national roadmaps** and standards
- Develop Research and Education **Policies**
- Develop and implement **streamlined** lab & departmental administration procedures
- Develop institutional engagement to **strengthen the academic network** (e.g. IITs/NITs, international universities etc) towards specific goals (e.g. student/teacher exchange, capability sharing).
- Participate in and organize **conferences/symposia/workshops** periodically

Top Challenges:

1. Standard activities e.g. admissions etc needs to have **standard processes and standing committees**
2. Admin staff **career path** and performance assessment based promotions
3. Develop standard process for **conference management**
4. Develop **efficient interactions with the main building**

Implementation of Vision

DPC, DUGC and DPGC provide policy interpretations. However, an executive program is needed to evolve the department's response to present and future needs in a proactive manner.

1. **Review of the aspiration** of each group **by the HoD** - may be addressed directly.

2. **Faculty hiring** (e.g. hiring target, areas of interest) may be implemented by **FSC**. Further, improvements in incentive (e.g. space, start-up grants) to be at par with best Indian Universities must be enabled.

3. **Curriculum review** may be done (with faculty/student feedback) with a standing curriculum committee. This could be part of **DUGC and DPGC**. Ideally this maybe part of Teaching Council (below).

In parallel to the above, the implementation of the vision would require separate “councils” to prioritize the vision goals/challenges and then create proactive development of programs in three areas -

4. **Teaching & Learning Council (TLC)**: To develop sustained solutions and review of progress, a committee needs to be formed to realize Teaching / Learning vision. This would take care of the top challenges in Education and Teaching/Learning section.

for example- As online course offerings are a gap - provide resources / incentives for **online courseware** development

5. **Research & Technology Council (RTC)**: To develop sustained solutions and review of progress, a committee needs to be formed to realize research / technology vision. This will address the top challenges in the Research Vision section.

for example: As industry interaction is a critical challenge - the council may enable **industry affiliate program**

6. **Administration, Infrastructure & Maintenance Council (AIM)**: To develop sustained solutions and review of progress, a committee needs to be formed to develop (i) administration (ii) maintenance & resource improvement. This will address the top challenges in the technology policy and administration vision as well as resource requirements projections.

for example: given the space and seating requirements for students and labs, the council may develop **dept space**.

Young faculty involvement in Dept activities must be ensured from early stages **without loading** them significantly (**team building**).

Sustaining the vision

A **sustained annual - objectives & progress review model** (maybe at the DFM level) must be implemented for each office/committee to assess challenges & achievement.

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