

# The UG Program at IIT Kanpur

## Interim Report

Academic Programme Review Committee

February 2009

# Introduction

- 50 years of IIT Kanpur
- India is a global economic power
  - Aspirations of the society have increased
  - Demands on industry have drastically changed
- Address major paradigm shifts
  - Globally competitive
  - Rapidly evolving technological needs
  - Rising expectations of students and parents

# Background

- Understand evolving needs of stakeholders
  - Students
  - Teachers
  - Industry
  - R&D

- **Students**

- IITs attract the cream of the country's students
- Black box approach
  - Motivational deficit
  - Lack of intellectual curiosity
- Poor communication skills
- Ignorance of world around

- **Teachers**

- Highly dedicated and knowledgeable faculty

- Teaching style

- Packed content
    - Frenetic pace of instruction
    - Inspirational teaching?

- Overemphasis on analysis

- Scope for tapping students' creative potential limited
    - Very little synthesis
    - Inadequate connection to real engineering problems

- Industry/R&D
  - Significant value addition
  - Cutting edge technologies
  - Vision
  - Adapt technology to changing environment
  - Address law of diminishing returns in technology development

# Focus

- Carve a niche in Science & Technology
  - Provide avenues to hone skills
    - Managerial
    - Entrepreneurial
    - Social
- Technological solutions to local problems
- Nation building through technology development
  - Sensitise students to local needs
  - Inculcate spirit of team work
  - Cultivate leadership qualities
  - Instill national pride

# Product

- Humane, global Indians who are leaders in their field



# Skill-Sets

- Basic skills
  - Mathematical skills
  - Analytical skills
  - Experimental skills
  - Hardware friendly
  - Scientific temper
  - Communication skills
  - Cultural and social awareness

- **Advanced skills**
  - Department-oriented skills
  - Interdisciplinary orientation
  - Synthesis
  
- **Auxiliary skills**
  - Management
  - Entrepreneurship

# Current Curriculum

- Strengths
  - Science-based education
  - Emphasis on fundamentals
  - Rigorous analysis
  - Humanities and social sciences

- **Weaknesses**

- Less emphasis on working with hands and tinkering
- Too much content
- Lack of flexibility to select courses vis-a-vis maturity, aptitude and interest
- Little scope for inter-disciplinary specialization
- Little stress on communication skills in evaluation

# Proposed Curriculum

- Truly credit-based curriculum
- Develop aptitude for experiment and exploration
  - Project-based laboratories
  - Minimum laboratory credits
- Conceptually challenging and thought-provoking curriculum
- Emphasis on inter-disciplinary education

- Cater to good, motivated student
  - UG research
  - Earning credits with universities of repute
  - Flexibility to take more courses through overload
  - Project-oriented internships in industry/R&D laboratories for credit

# Credits

- Present

- Academic Load (AL) =  $3L + T + 1.5P + 0DH$

- $5 \leq AL \leq 15$

- Typical AL = 10 – 11

- | AL | Weightage |
|----|-----------|
|----|-----------|

5 – 6	2
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7 – 8	3
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9 – 12	4
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13 – 15	5
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- Proposed

- Students expected to spend average 50 – 55 h/week, including exam/quiz preparation
- Credits should reflect contact and self-study hours spent by students
- Drop discussion hour
- $C = L + T + P + SS$ 
  - $SS = 2L + T + A$ , where  $0 \leq A \leq 2$
- 400 – 420 credits for graduation



# Graduation

- Present
  - Passing grade = D (4)
  - Graduating CPI = 5.0

- Proposed

- Clear approximately 400 – 420 credits

- Passing grade = D (4)

- Graduating CPI = 4.0

- Warning:  $CPI < 4.5$

- Termination:  $CPI < 4.0$

- De-motivate deficient students

- Minimum attendance requirement

# Degrees

- Present
  - B.Tech. (4 yrs)
  - Integrated MSc (5 yrs)

- Proposed
  - All first degrees of 4 yrs duration
    - B.Tech. (Engg.) and B.S. (Sciences/Economics)
  - Option for Minors/IDM in a second branch (incl. HSS)
  - One more year for the second degree
  - Option for a second degree exercised at the end of III year
    - M.Tech. (Engg.), MSc (Sciences/Economics), MBA
    - Second B.Tech. degree
  - Switching between Science/Economics and Engg. degrees

- **B.Tech. in Engineering Sciences**
  - Initially this branch will be offered as a “branch change” option.
  - It will have a compulsory core like other students.
  - Stress will be on engineering sciences.
  - Multiple minors or interest-based course stream in departmental compulsory slots

# **Academic Programme Structure**

	HSS	Sc	Esc	TA	Deptt	Open/Core Electives
Original 1963	18.7	22.6	13.2	11.3	34	
I UGRC 1970	16	20	10	10	32	12
II UGRC 1981	10.9	12.9	15.2	6.5	41.3	12.9
III UGRC 1992	10	15	15	5	42.5	12.5
IV UGRC 2001	9.6	19.2	9.6	2.4	50.0	2.4
V ARC 2008 Proposed	12-15 Includes Mgt.+ Comm Skills+ Foreign Lang.	20 <i>Compulsory Electives</i>	10	2-5 Manufact. + Engg. Drawing	35-40 Comulsory : 25-30  Electives: 10	15

# Core

- Broad-based courses
- Flexible core programme:
  - Compulsory and elective components
  - Fixed slots for compulsory courses
  - Departments decide slots of some courses
  - Students free to choose slots for electives
  - Specified core credits for first 2 years
- Multi-departmental participation mandatory
- PE offered in first 2 semesters
  - Faculty instructors/tutors; coaches assist tutors



- Sciences

- Divide into compulsory and elective slots
- Compulsory courses cater to all departments
- Electives contain department-specific core courses
- Compulsory curriculum

- Basic

- 2 Maths, 2 Physics, 1 Chemistry, Physics and Chemistry laboratories

- Exposure to emerging sciences

- Introduction to Biology

- Esc

- Retain Electronics and Programming with modifications

- Programming

- Incorporate more “scientific computing”
    - Need to deal with students with below threshold exposure

- Electronics

- Reduce course content
    - Simplify and pitch it to an average student
    - Laboratory should be fun
      - Introduction of projects (fabricate an amplifier)
    - Move to II year because of math pre-requisite

- ESO
  - Should not be department-centric
  - Comfort level of students from participating departments

- TA

- Drawing

- Do away with drafting
    - Sketching and computer-based

- Manufacturing

- Addition of old TA203 + TA204
    - Very heavy: (2Lecture + 2Practical)/week + 2 projects
    - Split course
      - Two independent courses: ME and MME (1L + 1P)/week
      - Theory taught in I year; Both practical together in II year

- HSS

- Regular courses as before
- Communication skills
- General management
- Foreign languages
- Courses on Indian, world history

- Modular courses
  - Half-semester courses with half credits
  - Flexibility for department-specific core
    - PDE, Complex analysis, Waves, Lasers
  - Introduce new, specialised short-courses
    - Fracture mechanics, Smart materials, NDT, Chip design
  - Eliminate “stretched” courses
  - One mid-semester and end-semester examinations

# Implementation

- Students
  - Lack of vibrant academic atmosphere
  - Inculcate a sense of balance among students
    - Minimum attendance requirements
  - Number, scale, and funding of festivals should not relegate “academics”
  - Increase interest of students in experiments
  - Curb rampant copying in laboratory reports and home work

- Faculty
  - Balance between (i) teaching, (ii) corporate activities, and (iii) research
  - Course syllabus and instruction followed in letter and spirit
    - Maintain course files
    - Form course monitoring groups
- Fixed time table
- Examination and evaluation
  - 2 mid-semester vs 1 mid-semester examinations



Thank You!