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## Some Aspects of Materials Education

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### **ABSTRACT**

With overall improvement of human intelligence, socio-economic condition and several other factors it becomes mandatory to keep on changing the learning content of a student and the teaching learning procedure. In our country, materials engineering is a field which conventionally is more attractive for research than undergraduate study. Time has come to take concrete steps to match the industry demand and to attain the level of outcome based accreditation which is becoming mandatory for many institutes at least at undergraduate levels. Apart from these heavily loaded thoughts, attracting young bright students in this specialization is the prime need.

Though the institutes across the country have diversified name of the departments which teach such courses along with similar diversities in name of the undergraduate degrees, the course content is necessarily similar to some extent. During curriculum development, without bothering about the name at least 70% of the course content may be made highly similar so that there may be short time exchange of teachers and students across such likeminded institutes. Moreover, for such activities, the credit system and evaluation scheme should also be streamlined across institutes through national initiative though institutes are independent in nature. Total similarity is not possible and not prescribed as every institute and department has its own identity, specific strong points and location based needs. Such recent initiatives show that major modifications are necessary in the initial semesters of undergraduate curriculum. Introduction of mathematical approach as far as possible in every course of materials engineering is a better concept in lieu of mindless abstract mathematics.

Recently, due to national initiative, faculty members are moving towards ICT based teaching approach and producing more soft content like MOOCS etc. Such e-resources are plenty in this field; one has to carefully serve them to ignite the minds of young students. Referring available cross institute e-resources with proper guidance and real life examples at every stage of teaching starting from thermodynamical approach of day to day happenings to understanding the structure property of daily used components may be a winning strategy.

Product oriented student project is need of time to fulfill make in India approach. But it should also be kept in mind that materials engineering does not come with conventional 'product' and need of basic research is evergreen and is must for a student

who is just starting his first project. Moreover, to fulfill product oriented research, industry academia interaction is prime necessary and until change in national policy and mindset it will continue as it is, in spite of such many discussions.

**Keywords:** Curriculum; ICT; MOOCS; Industry-academia.



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# SOME KNOWN FACTS OF Under Graduate Engineering Education

**Stakeholders: Students and their parents, teachers (and the Institute), industry and society**

**Ideal GOALS of all Stakeholders:**

**(Lets take the guideline set by National Board of Accreditation, known as 'Programme Educational Objectives')**

- I. To prepare students for successful careers in Indian/multinational industries that meets all the necessary needs of a perfect professional as well as to excel in post graduate programs.
- II. To make the students fundamentally strong in solving mathematical, engineering and scientific problems.
- III. To train students with good scientific and engineering breadth so as to comprehend, analyze, design, and create novel products and solutions for the real life problems.
- IV. To indoctrinate the students in professional and ethical attitude, effective communication skills, teamwork skills, multidisciplinary approach, and an ability to relate engineering issues to broader social context.
- V. To motivate students to develop ethics and codes of professional and social lives as well as to keep awareness of life-long learning.

# GOAL achievement parameters



*Students and their parents (majority):*

**Short sighted – Campus recruitment with high salary (sector selection doesn't matter)**

**Far sighted – Stable career with creativity to obtain mental peace**

*Teachers:*

**Short and far sighted – To see the student successful after a reasonable period of time.**

*The institute:*

**Short sighted goals – Campus placement and higher study admission (mainly in numbers).**

**Far sighted – Portfolio of alumni members.**

*Industry:*

**Short sighted – Employable engineering graduates having technical knowledge related to that specific industry.**

**Far sighted – Relatively cheap indigenous technology.**

### ***Society:***

Short and far sighted – Educated and financially balanced mass having good ethics.

### ***Observations:***

- *Only teachers and society have time independent GOALS.*
- *Other stockholders have contradicting short and far sighted GOALS.*

## **SOME ADDITIONAL KNOWN FACTS OF Under Graduate Materials Engineering Education**

### ***Negative sides:***

- *Social image of a student related to “Metallurgical”*
- *Identity crisis during initial career*
- *Poorly managed Internship program*
- *Qualitative approach*

# WHAT WE CAN DO

- 1. Create awareness to the potential students regarding “Materials education”**
  - By organizing quiz, debate amongst local +2 students.
  - **Interaction with parents of such students.**
  - Creation of interesting e-based open contents on materials topic so that other can access.
  
- 2. To inspire the admitted graduate students**
  - Introduction of at least one (full or half semester) Departmental subject at the initial each semesters. The subject may be informative in nature with a connection to day to day life. This may deal with structural information of materials used in our day to day life. If possible practical may also be organized. Information can also be shared about modern innovations related to materials (including electronics) industry. In later semester the same courses can be linked with in depth analysis in quantitative mode of study.

- During delivery of any theory course, real life example can be interesting .
- Total contact hours for existing Materials curriculum may be reduced to accommodate basics of electrical equipment and automation. This will decrease dependency of materials engineer at job place.
- Students are highly tech savvy, modern interactive teaching technique inspires them. Even mobile app related to materials education can be thought off.
- Creation of video lectures so that student can clear a doubt later also. But every faculty member may not be needed to prepare such e-content. Fantastic e-resources are already available, teacher has to guide them about the resourceful and interesting one related to a particular course.
- If we discuss about Indian students in UG materials program, the average population is habituated in spoon feeding. For them extra care may be required for tests like GATE so that students can be diverted to higher study. Similar career counseling guidance can be arranged.



- As far as possible materials education needs a shift towards quantitative approach.
- **Laboratory classes with proper attention.**
- **Hands-on experience on soft skill, Example: Thermo-Calc software after theory on phase diagram.**
- **Thrust on computational materials engineering.**
- **Creation of small courses (half semester) based on industry feedback and teaching the same partly by industry expert.**
- **Meaningful internship program with help of industry.**

## Hindrances:

- ✓ Institute guidelines
- ✓ Shortage of faculty members of specific specialization
- ✓ Missing links between Industry – academic – R & D
- ✓ Up gradation of faculty members

## How to overcome:

- ✓ Creation of course curricula with same credit policy and similar content (basic or core courses) across like minded Institutes for easy resource sharing
- ✓ Sensitization of faculty members with modern teaching tools
- ✓ Movement of faculty members across academic institutes/industry/R & D.

**Thank you!**