Improvements of Quality in Engineering Education

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Abstract:

Engineering Education is playing a vital role in the country. The economy of the country depends on type of engineering education. The first rate technical personnel can take the country to the dizzy heights. The engineering institutions must produce first rate quality personnel by considering the following few points. The quality of engineering education depends on the innovative pedagogy, teaching methodology, Emerging courses in engineering, Programme Objectives, Programme outcomes, Accreditation, Value added courses, Remedial classes, Seminars and workshops, placement and training, incubation centre. The present paper discusses above points.

Introduction:

Engineering institutions are producing lakhs of engineering graduates every year in India. However, many of them are lagging employable skills. The students, academic institutions and universities are very important in developing employable skills. The studends should have passion for learning. The purpose of every technical institution is to enhance capabilities of students by appointing good faculty from IITs and NITs, by providing equipments and infrastructure, by providing digital library, by creating knowledge through institutional solutions, and by creative technology solutions for class room teaching The reasons for lagging employable skills of students are: primary education, medium of instruction, rural background, financial status etc. Every institution should have good vision, mission, short term and long term goals and objectives. Every institution should try for reaching of goals and objectives. The affiliating university should play major role in controlling the quality its affiliated colleges. The university can improve the quality of its affiliated colleges in following way: By appointing qualified faculty, staff, periodical checks, introducing new equipments, instructing to introduce new labs, establishing calibration procedure for instruments and equipments etc.

Need of Innovative Pedagogy:

Engineering education in India is now facing new challenges. Liberalisation of trade and technological progress has changed whole economic scenario. The engineering world has followed transformation in technology for a long time. Disciplines were added and curricula were reformed in keeping pace with the technological advancement so as to provide the required manpower for economic development.

Hence, new approaches to reform system and the content and delivery of technical education are necessary. There should be a shift from the textbook learning to the learning by observation and doing. Students should acquire basic knowledge and the profeesional thought process. Students should master the art of using fundamental concepts to get practical knowledge.

In order to improve the teaching learning process, innovative measures should be introduced in the education system. The pedagogy should be ICT enabled. Which means video lectures, video animations. Virtual labs and simulators should be used to expand the range of experiments that can be performed by the students. Every student give action learning projects to the students so that they can get an opportunity to deploy their classroom learning in practical situations and acquire hands-on skills. It also helps students to inculcate critical thinking and problem solving skills.
Teaching Methodology: Every institute should adapt good teaching methods.

The following teaching methodologies are required to follow:

1.Latest teaching methodologies based on the recommendations of American society for engineering education.
2.Student centred teaching top down approach .
3.Full use of NPTEL and you tube and other educational videos, webinars of Indo US collaboration for engineering education.
4.Emphasis on practical work, mini and major project work.
5.Not just teaching, but mentoring , motivation to perform, not for punishing .
6.Every teacher should smiley friend, philosopher and guide to the student.
7.Encouraging the students to write technical papers, giving power point presentations in the conferences, seminars and in journals also.
8.Transforming learning into a joyous experience.

Emerging courses in engineering :

With passage of time there has been an immense growth of engineering, creating many conventional and unconventional job opportunities. The branches of engineering have diversified introducing many unique and unusual branches of engineering. They are: cloud computing, Information Security, Android, BIG DATA, Virtualisation Technology, Mechatronics, Petroleum Engineering, Oil and Gas Informatics,

Business Analytics and Optimisation, Automative Design Engineering, Infrastructure Development, Biomedical Engineering, Nano Technology, Pico technology, femto technology, web manufacturing, reverse engineering, rapid tooling, RPT technology, green and agile manufacturing, VLSI Embedded Systems, Mobile Computing, Ethical Hacking Artificial Intelligence, Robotic Engineering, Advanced control Systems etc.

Programme Objectives:

The programme objectives are very importantfor local needs, vision of the Institution, long term goals etc. For defining the Programme objectives the faculty members of the programme must continuously work with local employers, industry, Research and Development advisors, and the alumni. The objectives of a programme may be broadly defined under five categories. They are : 1) Preparation, 2) Core Competence 3) Breadth 4) Professionalism 5) Learning Environment.

1) Preparation : To prepare the students to excel in postgraduate programmes or to succeed in industry / technical profession through global rigorous education.

2) Core Competence: To provide students with a solid foundation in mathematical, scientific and engineering fundamentals required to solve engineering problems and also to pursue higher studies.

3) Breadth: To train students with good scientific and engineering breadth so as to comprehend, analyse, design, and create novel products and solutions for the real life problems.

4) Professionalism: To inculcate in students professional and ethical attitude, effective communication skills, teamwork skills, multidisciplinary approach, and an ability to relate engineering issues to broader social context.

5) Learning Environment: To provide student with an academic awareness of excellence, leadership, written ethical codes and guidelines, and the lifelong learning is needed for a successful professional engineer(career). Within the five broad categories, each programme may define its own objectives appropriate for the specific discipline.

Programme Outcomes :

The programme outcomes are the skills and knowledge of the students should have at the time of graduation. The outcomes essentially indicate what a student can do from subject-wise knowledge acquired during the programme. The outcomes may be programme specific within broad categories given in the following. Generally, the engineering programmes must demonstrate their graduates to the have following capabilities :

Demonstrate knowledge of mathematics, science and engineering.

Demonstrate an ability to identify, formulate and solve engineering problems.

Demonstrate an ability to design and conduct experiments, analyse and interpret data.

Demonstrate an ability to design a system, component or process as per needs and specifications.

Demonstrate an ability to visualize and work on laboratory and multi-disciplinary tasks.

Demonstrate skills to use modern engineering tools, software and equipment to analyse problems.

Demonstrate knowledge of professional and ethical responsibilities.

Ability to communicate effectively in both verbal and written form.

Understanding of impact of engineering solutions on the society and contemporary issues.

Develop confidence for self-education and ability for life-long learning.

Participate and succeed in competitive examinations.

Accreditation:

Quality is an important concern for all engineering educators. It is a way to assure quality in engineering education. Accreditation is an indicator of quality of education being imparted by colleges and universities. It suggests the standard infrastructure, faculty, teaching and learning methods and research activities in the institute. The accreditation involves a periodic audit against present standards of engineering of a particular branch. Accreditation is a process of quality assurance, giving credit to academic activities of a particular course.

The credentials used by public, students and prospective students, employers, industry and government bodies. The accreditation serves to encourage progress in higher education and increase the new programs and curricula to new developments in science and engineering and market. It leads to the superior pedagogical methods and make engineering education more exciting , effective and relevant. In order to improve the quality All India Council of Technical Education established the National Board of Accreditation.

NBA periodically conduct evaluation of engineering institutions on the basis of guide lines, norms and standards specified by it. NBA is dedicated to build the quality engineering education system. NBA gives credit to the clearly defined visible academic activities and objectives. NBA has taken into account international practices for quality assessment.

Value added Courses: Value added courses for all students and special coaching should be given to slow learners.

Remedial classes: Remedial classes should be conducted for weaker students on Saturdays, late and early hours for weaker students.

Student Counseling : Student counseling session should be conducted with individual attention to their queries and problems.

GRE, GATE, TOEFL/ IELTS : GRE, GATE, TOEFL/ IELTS classes should be conducted for the students who aspire for higher studies.

Seminars and workshops : Seminars and workshops should be conducted by the industrial experts, experts from IITs NITs and universities on emerging areas for enhancing, updating and abreasting the skills of the students on emerging areas.
Placement and Training: Special training should be given for placements from second year onwards in aptitude training (Verbal and non-verbal) and interview skills, Technical GD and core subjects.

Incubation Centre: The centre aims to attract students to develop their entrepreneuriaskills.Thecentre encourages students to develop new ideas and innovative products. It mobilizes resources for product designing and commercial feasibility. Hence, in incubation centre new ideas, concepts, business plans and innovative ideas initiated by students and faculty. The university also encouraging for such innovative ideas and products for developments.

Conclusions:

This paper is reviewed at a length the importance of engineering education in nation building. I have covered few importance points that will make engineering education meaningful and project the country to dizzy heights.

In a summery I would conclude the following:

Every institution should try for quality oriented engineering education.

Every institution should try for objective oriented and outcome based engineering education.

Every institute should have motivated staff.

Every institution should have placement cell with motivated staff, digitization centre, .

Every institution should have at least one innovative lab for one programme.

Eligible Institutions should get required funds frm UGC, AICTE, DRDO, DST etc.