UNIVERSITY NEWS

Vol. 52 No. 27 July 07-13, 2014
Price Rs. 25.00

A Weekly Journal of Higher Education Published by the Association of Indian Universities

In This Issue

Articles
Engineering the Future of Engineering Education in India 3
Swami Vivekananda for Building a Humane Society through Education 7
Community Colleges as Gateway to Higher Education: The American Experience 12
Significance of Continuing Professional Development in Faculty Development 16
Convocation Indian Institute of Technology, Indore 20
Campus News 26
Theses of the Month (Science & Technology) 31
Advertisements 35

The Subscription Tariff

Inland Foreign
Institutions Students Mail (for residential address only)
Rs. Rs. US $ US $
1 year 950.00 375.00 210.00 170.00
2 years 1700.00 700.00 400.00 360.00

Subscription is payable in advance by Bank Draft/MO only in favour of Association of Indian Universities, New Delhi.

Opinions expressed in the articles are those of the contributors and do not necessarily reflect the policies of the Association.

Editorial Committee Chairman:
Prof Furqan Qamar

Editorial Committee:
Mr Sampson David
Dr Youd Vir Singh

Editor:
Dr Sistla Rama Devi Pani

Engineering the Future of Engineering Education in India

ORS Rao

Future of Engineering Profession

In order to crystal gaze the future of engineering education, we need to look at the future of Engineering Profession in the next decade or two. For this, we need to ask ourselves the basic questions about future engineers - who they will be, what they will do, where they will do it, why they will do it, and what does it imply for engineering education. We should also anticipate the environment in which they will operate and the challenges, they will be facing. The changes and challenges faced by future engineers in the next few years may be classified into following categories:

Proliferation of Knowledge: Rate of addition of new knowledge since the beginning of the current century, has been mind boggling and next decade will see it galloping further. Power of Google has been so immense that “Googling” has become the most common day-to-day activity for everybody, irrespective of demography and age groups.

Technological Developments: In the last century, technological developments and the body of engineering knowledge was essentially along well defined disciplines like civil, mechanical, chemical, electronics etc. However, the last few years have seen emergence and growth of multi-disciplinary developments as well as convergence of technologies. Impact of electronics, telecom and IT technologies on all other disciplines has been very profound. In this environment, an engineer cannot live in his own world but should be open to interact with other disciplines.

Globalisation: With increased globalization, companies compete globally for everything ranging from products, markets, resources, etc. In order to be successful in these markets, engineers need to be culturally adaptive.

Concern for Environment and Sustainability: for the past over 150 years, most of the remarkable Engineering / Technological achievements were based on the paradigm of controlling Nature rather than cooperate with it. Ironically, the same successes like fossil fuels, automobiles, plastics etc have endangered human life. For the last few years, there has been more awareness and concerns among people and governments on conservation of Nature and Sustainability of Growth. So much so, some companies started focusing on Triple Bottom Line (Profit, People and Planet) objectives that are essential for sustainability. In the next few decades, engineers must change their mind sets to contribute to building a more sustainable world. In this context, it will be mandatory for the Engineers to adopt Green Technologies for design of products addressing industry/social problems.

*Vice Chancellor, The ICFAI University, Ashok Vihar, Dehatoli, Ranchi-834 002 (Jharkhand)
**Corporate Social Responsibility:** Industry converts natural resources into socially or commercially useful products and services using human resources. In this process, it is likely that day-to-day lives of people are adversely affected. In some cases people are displaced in projects like exploration of natural resources or setting up infrastructure projects. Industry has to take the responsibility to address the consequent social problems. Last decade has seen increased awareness and sensitivity to such issues. Next decade will see Corporate Social Responsibility not just mandatory but a key parameter for success of organisations and engineers, as professionals.

**Abrupt Changes:** Current century is characterized by sudden and dramatic changes in economic and social environment due to factors like terrorism, European Economic Crisis, Social upheaval in Middle East etc. The world will witness more such cataclysmic changes, in the years to come. The future engineers need to acquire skills to anticipate such changes and more importantly, adapt themselves and manage them successfully.

**Role of Engineering Education in Grooming Engineering Professionals for Future**

As can be seen from the previous section, environment in which engineers will operate in future, role expectations from them and challenges faced by them will be different from what they were in the last century. Roles performed by fresh engineering graduates in the last century were mostly routine and technical, in nature, pertaining primarily to a single discipline of Engineering studied by them. Engineering students acquired the requisite knowledge through class room lectures and skills through working on experiments in laboratories and workshops. However, role expectations from fresh engineering graduates in future will be more complex - interdisciplinary in nature and must have skills to use technology tools and interact more intensely with society. Accordingly, components of education (Knowledge, Skills and Attitude) that need to be imparted will be different, though certain fundamentals remain unchanged. Likewise, the way they have to be taught-learnt also will be different.

**What to Teach?**

Components of education that need to be taught can be classified into Knowledge, Skills and Attitudes and Values.

**Knowledge:** Amount of new knowledge created every passing day, in every discipline of Engineering/ Technology has been increasing exponentially. At the same time, knowledge requirements for different industries and different roles vary widely. In real life, problems will not surface with the tag of specific disciplines. There is no way that any Engineering educational program (under graduation or post graduation) can cover all knowledge required as a part of its curriculum. A pragmatic way to address the issue could be: to teach core fundamentals of requisite sciences and engineering principles, besides economics, finance and social sciences and students are enabled to learn on their own, new knowledge, in depth, as and when needed. Besides, the students should be equipped to diagnose real-life problems, identify the type of knowledge needed and more importantly, how to integrate them to solve the problem. In addition, every student must be made conscious of the imperative for life-long learning and ways and means of self study for continuous learning. Encouraging students to register for Massively Open Online Courses (MOOC) like edX, Coursera, Khan Academy, NPTEL etc to supplement class room learning will initiate them to continue similar means for self-learning, after they graduate.

**Skills:** While during the last century, Engineering Education focused primarily on imparting technical skills to the students; in future, there is need to focus more on cognitive and behavioural skills in areas like critical thinking, problem solving, self-assessment, integrative thinking, self-learning, interpersonal, communication and change management.

**Industry is increasingly looking for Higher Order Thinking (HOT) skills like Analysing, Evaluating and Creating.**

Besides looking at the requirements of the industry with a view to make the graduating students employable, educational institutions in future, must also impart requisite skills to make the students self-employable, either as entrepreneurs or as freelance independent professionals. Essential skills in this regard include entrepreneurship, finance and marketing.

**Attitudes, Values and Ethics:** Failure of the education system to systematically address the issues of attitudes and ethics has already created adverse impact on the society. In view of this, it is becoming increasingly critical for Educational Institutions to put in efforts to shape the character of the students, by inculcating positive attitude, with good personal values.
so that the graduating students can become not only competent professionals but also good human beings and lead a happy life. Students must be made conscious of social, moral and ethical considerations in their day-to-day working as well as in decision making. It is too simplistic to assume that a course on humanities in the curriculum is adequate to bring about such an attitudinal change. It needs systematic inputs, followed by practice, accompanied by patient counseling so that the principles are ingrained in the minds of the students and become part and parcel of the personality of the students.

How to Teach?

Pedagogy to be adopted needs to be different in the context of the changed environment in which the students are brought up. Students born after 1995 were brought up in a digital age, wherein technology has been an integral part of their day-to-day life. Information and Communication Technologies (ICT) can help in improving the effectiveness of Teaching Learning processes. Audio-visual technologies can help in enhancing retention levels whereas online learning can facilitate convenience enabling a learner to study when he wants or where he wants. Virtual Class rooms can help in simulating real class room environment facilitating interactivity among the student-teacher-other students. Virtual Laboratories can facilitate conduct of experiments that may not be feasible to do physically because of reasons of cost or hazard.

Blended Learning, wherein technology and traditional teaching methods can be judiciously combined, can get the best of both worlds. Flipped Classrooms (also called Inverted Classrooms) approach can be used to make students learn the concepts at home using technology and practice the same in the classroom, under the guidance of the teacher.

However, no amount of technology, however sophisticated, can substitute a teacher, though the role of a teacher will undergo a dramatic change, in future. It will be the teacher who will decide on the most appropriate method for teaching, depending on the subject and the profile of the learners and act as a facilitator and a coach, by guiding and monitoring their learning.

While imparting knowledge may be relatively easier, it will be more difficult to impart skills, more so, in the case of soft skills and cultivation of attitudes. Teacher has to identify clearly the skills to be imparted and communicate the importance of the same to the students convincingly. Besides, he has to design appropriate action learning activities to get them practiced by the students. Grading system to evaluate the performance of students for such activities should be more on the process, rather than on outcomes. Students should be given feedback at every stage and are counseled for better performance.

Challenges Faced

Future engineering education will be able to meet the aspirations of the new age students, only if all the stake holders put in concerted efforts in a synergistic manner. However, each of the stake holders will face challenges, which need to be addressed.

Educational Institutions

Educational Institutions have to invest adequate resources in terms of money and quality human resources to ensure a paradigm shift from current system to the new system.

Next few years will also see a shakeout in Engineering Education, which has scaled up capacity very quickly in the last decade, without taking care of quality. The shakeout has already started in 2013, which will accentuate in the next five years. Only such of the institutions with commitment to quality education, without looking for quick financial returns will survive. It is up to the educational institutions to interact more actively with industry and society and identify the changed expectations from the students.

As “one size does not fit all” educational institutions need to evolve different operating models, depending on the demographic segment of the students, targeted by them. Premier Institutions with excellent infrastructure that can attract quality students and quality teachers and offer post graduate and doctoral programs and get into research is the need of the day. They should benchmark themselves with the best-in-class institutions globally, get accredited by international agencies and can target global rankings. However, institutions that are unable to attract quality students, may limit themselves to be only teaching institutions and offer only under graduate programs and focus their efforts on ensuring minimum educational standards. Middle rung institutions, aspiring to become premier institutions, may first improve the quality of their education and build the requisite academic infrastructure, before moving into research.
Government Policies and Regulation

Government and regulators will face the challenge of increasing Gross Enrollment Ratio (GER) without compromising on quality. It will also be challenging to set standards of quality, in an environment, where there is wide disparity in quality of education in institutions across the country. Regulatory framework, in future, should be more facilitative than restrictive. It should encourage innovation rather than control centric. Government will also face the dilemma of how much autonomy to be given to institutions versus how to ensure maintenance of minimum standards. While there are benefits in welcoming foreign institutions into India in engineering education, government policies have to ensure that they should help in improving the quality of education. Success in future engineering education will depend on how government will be able to strike a fine balance among the key legs of the tripod - Expansion, Equity and Excellence, while formulating and implementing its policies.

Teachers

Teacher is the fulcrum, on whom quality of future education lies, particularly in highly knowledge centric area like engineering education. A teacher has to equip himself well in the same three components of education (knowledge, skills and attitude) so that he can be more effective in the changed environment. Besides acquiring higher qualifications, he has to keep himself abreast of the latest developments in his field by attending seminars and short term programs. Pursuing online MOOC courses can be an excellent opportunity not only to enhance his knowledge but also get insights into more effective pedagogy. In order to leverage technology for effective teaching learning, a teacher must know about the range of technology tools available and also acquire skills to blend them with traditional teaching methods. Unless the teacher is perceived as a role model by the students, in his values and ethics, he cannot inculcate the same in the students.

Students

Ultimately, it is the students that have to take the ownership and make the best of the opportunities to learn. They should understand that learning does not stop with their formal education and have to strive for lifelong learning. They should be conscious that skills and attitude are more important than merely getting good grades / marks in the examination. They should update themselves on the fast changing industry environment and the consequent changes in skill requirements and acquire the same. They should be realistic with regard to their career expectations and must be adaptable to seize the career opportunities, as they beckon. Next few years will present exciting opportunities for self employment, which need a change in mindset of the students.

Conclusion

Next few decades will see major changes in the environment, driven by not only technological developments but also changing society. Future engineering education must reinvent itself and re-engineer itself to make it relevant for the industry and society, at large. It needs concerted efforts from all the stake holders to effect the transition smoothly and successfully and build a strong edifice for the future of engineering education.

Bibliography


We Welcomes
Dr. H. M. Desai,
President AIU

Dr. H. M. Desai, Vice Chancellor of Dharmsinh Desai University, Nadiad, Gujarat, has taken over as President of Association of Indian Universities on 1st July, 2014 for the year 2014-15.

AIU fraternity welcomes him!