



PROGRESS REPORT

- **Title of the Chair:** UNESCO Chair on Engineering Education, www.ucee.ac.ir, ucee@ut.ac.ir
- **Host Institution:** University of Tehran, www.ut.ac.ir/en
- **Date of formal establishment of the chair:** ۲۶ April ۲۰۱۴
- **Period of activity under report:** Dec ۲۰۱۱ - Apr ۲۰۱۵
- **Report established by:** Hossein Memarian UNESCO chairholder for Engineering Education, and professor of geo-engineering, University of Tehran, <https://rtis.ut.ac.ir/cv/memarian> memarian@ut.ac.ir

۱. Executive Summary

The primary initiative in launching UNESCO Chair on Engineering Education was started in ۲۰۱۰. This Chair was founded formally on April ۲۶, ۲۰۱۴ in a ceremony in the presence of Ms. Irina Bokova UNESCO Director General, and president of University of Tehran. The purpose of the chair is to promote an integrated system of research, training, information and documentation in the field of engineering education. It serve as a means of facilitating collaboration between high level, internationally recognized researchers and teaching staff in universities and other institutions in the Islamic Republic of Iran and elsewhere in the Arab states, Asia and Pacific, as well as other regions of the world. The specific objectives of this chair are to:

- Carry out research jointly with partners on the quality, relevance and inclusiveness of engineering education in the country, identifying concerns and propose remedial actions.
- Foster research and graduate studies in engineering education.
- Collect and disseminate nationally, data and information on new international development on engineering education.
- Help strengthen links and cooperation between higher education institutions and industry
- Contribute to the design of a national accreditation system for engineering education in cooperation with partners.
- Cooperate closely with UNESCO on relevant programs and activities.

In order to achieve the above objectives, the chair has focused its activities mainly on three areas of future studies, accreditation, and national and international cooperation. The main activities and research projects performed in the mentioned period can be summarized as follows:

- **Research:** Conducting diverse research projects on different areas of engineering education for the Academy of Science of Iran and different universities, organizations and ministries.
- **Publications:** Compiling three volumes of text books and more than ۲۰ research articles in the areas of “challenges of engineering education” and “educational innovations” nationwide.
- **Accreditation:** Developing national standards and guidelines for the accreditation of engineering education programs of Iran.
- **Educational design:** Design some new courses and educational programs for engineering education and revising some of the existing educational programs.
- **Training:** Holding diverse educational workshops for the professional development of faculty members and learning-teaching skills of teaching assistants.
- **Lecture:** Holding oral presentations in the Academy of Science of Iran and different universities and professional centers, in various areas of engineering education.
- **Contribution:** Contribute to design and establishment of Iran Society of Engineering Education (ISEE), Iran Accreditation Institute for Engineering Education (IAIEE) and Center for the Quality Assessment at College of Engineering, University of Tehran.
- **Cooperation:** Signing memorandum of understandings (MOU’s)) for joint cooperation with universities, engineering council, societies and related organizations and associations.
- **Establishment:** Developing the objectives and internal structure, and preparing necessary bylaws for launching the UNESCO Chair on Engineering Education

۲. Activities

۲-۱. Education/Training/Research

i. Education (Course design)

A prerequisite for any successful engineering education program is passing a national or international accreditation process. The results of internal assessments of some leading Iranian engineering schools showed that new courses should be designed and some existing courses should be modified. To fulfill these requirements three new courses were designed.

- **Introduction to Engineering:** A first year undergraduate engineering course. A textbook for this course was compiled and published (Memarian H. ۲۰۱۲. Engineering Profession, University of Tehran Press, ۵۲۴ Pages).
- **Engineering Education:** A graduate engineering course. A textbook for this course was compiled and published (Memarian H. ۲۰۱۲. Innovation in Engineering Education, University of Tehran Press, ۴۳۹ Pages).

- **Engineering Design:** A senior undergraduate engineering course. A textbook for this course was compiled and published (Memarian H., ۲۰۱۳. Engineering Design, University of Tehran Press, ۴۷۸ pages).

ii. Training (Workshops)

Holding diverse workshops for the professional development of faculty members and training of teaching assistants (TA) and those responsible for accreditation of engineering programs

۱. **TA training**, for teaching assistants of the College of Engineering, University of Tehran (March ۷, ۲۰۱۵)
۲. **Learning and teaching styles**, for faculty members of the College of Engineering, University of Tehran (March ۴, ۲۰۱۵)
۳. **TA training**, for teaching assistants of the College of Engineering, University of Tehran (March ۳, ۲۰۱۵)
۴. **Preparing educational objectives**, for faculty members of the College of Engineering, University of Tehran (January ۲۸, ۲۰۱۵)
۵. **Teaching experiences**, for faculty members of KNT University of Technology (January ۲۱, ۲۰۱۵)
۶. **TA training**, for teaching assistants of the College of Engineering, University of Tehran (October ۲۱, ۲۰۱۴)
۷. **TA training**, for teaching assistants of the College of Engineering, University of Tehran (October ۱۵, ۲۰۱۴)
۸. **Learning and teaching styles**, for faculty members of KNT University of Technology (October ۲, ۲۰۱۴)
۹. **Transition from quantitative expansion to qualitative development**, for educational deputies of engineering education schools of Iran (June ۱۹, ۲۰۱۴)
۱۰. **Learning and teaching styles**, for faculty members of the College of Engineering, University of Tehran (March ۶, ۲۰۱۴)
۱۱. **TA training**, for teaching assistants of the College of Engineering, University of Tehran (February ۲۶, ۲۰۱۴)
۱۲. **TA training**, for teaching assistants of the College of Engineering, University of Tehran (February ۲۰, ۲۰۱۴)
۱۳. **TA training**, for teaching assistants of the College of Engineering, University of Tehran (November ۲۸, ۲۰۱۳)
۱۴. **Learning styles**, for faculty members of the College of Engineering, University of Tehran (October ۱۰, ۲۰۱۳)
۱۵. **TA training**, for teaching assistants of the College of Engineering, University of Tehran (April ۱۵, ۲۰۱۳)
۱۶. **TA training**, for teaching assistants of the College of Engineering, University of Tehran (February ۲۱, ۲۰۱۳)
۱۷. **The necessity of accreditation of national engineering programs**, for academic deputies and representatives of engineering universities in the Academy of Sciences of Iran (November ۲۸, ۲۰۱۲)
۱۸. **Internal assessment of engineering programs**, for managers and representatives of College of Engineering, UT (November ۲۰, ۲۰۱۲)

- ۱۹. **TA training**, for teaching assistants of the College of Engineering, University of Tehran (November ۱۷, ۲۰۱۲)
- ۲۰. **Mechanism of internal assessment of engineering programs**, for managers and representatives of College of Engineering, UT (October ۱۳, ۲۰۱۲)
- ۲۱. **TA training**, for teaching assistants of the College of Engineering, School of Electrical and Computer Engineering, University of Tehran (October ۴, ۲۰۱۲)
- ۲۲. **TA training**, for teaching assistants of the College of Engineering, College of Engineering, University of Tehran (May ۲۸, ۲۰۱۲)
- ۲۳. **TA training**, for teaching assistants of the College of Engineering, College of Engineering, University of Tehran (May ۱۶, ۲۰۱۲)
- ۲۴. **The necessity of accreditation of engineering programs**, for management body and representatives of Amirkabir University of Technology Council (April ۲۰, ۲۰۱۲)

iii. Research

With the passing of over eight decades from the beginning of modern higher education in Iran, engineering education has passed many ups and downs. At present, more than ۱,۴ million students are studying in hundreds of engineering education centers in the country. The enhancement of engineering education is subject to identifying its challenges and presenting proper approaches to overcome them. This is an issue which will only be possible by organized research. Below are selective research projects accomplished by UNESCO chair on engineering education:

Developing the indicators of accreditation and chronical assessment of engineering education programs of Iran

- For: Office of Scientific and Research Deputy, Presidential Office, General Office of Assessment of Science Development
- Advisor: Iran Society of Engineering Education (ISEE)
- By: Dr. Hossein Memarian
- ۲۰۱۲

Mechanism of accreditation of Iranian engineering education programs

- For: Iran Academy of Sciences
- By: Dr. Hossein Memarian
- ۲۰۱۱

Revision of national BSc Mining Exploration Engineering Program

- For: Ministry of Science, Research and Technology
- Advisor: University of Tehran
- By: Dr. Hossein Memarian
- ۲۰۱۰

Revision of national MSc Mining Engineering exploration program

- For: Ministry of Science, Research and Technology
- Advisor: University of Tehran
- By: Dr. Hossein Memarian
- ۲۰۱۰

۲-۲. Conferences/Meetings

i. Conferences with active collaboration and participation of the chairholder

- ۱st National Conference on Quality Assurance of higher education, ۲۰۱۴
- ۳rd National Conference on Engineering Education, Sharif University of Technology, ۲۰۱۳
- ۷th Conference of Quality Assessment in the Academic System, ۲۰۱۳
- ۶th Conference of Quality Assessment in the Academic System, ۲۰۱۲
- ۲nd National Conference on Engineering Education, Isfahan University of Technology, ۲۰۱۱
- ۵th Conference of Quality Assessment in the Academic System, ۲۰۱۱

ii. A selection of conference presentations by the chairholder

۱. **Passing from quantitative to qualitative development in engineering education of Iran.** A talk for academic affairs heads and deputies from faculties of engineering nationwide (June ۱۹, ۲۰۱۴).
۲. **The minor role of creative thinking in engineering education of Iran.** In the 3rd Conference on Engineering Education, 30-31 Oct. 2013, Sharif University of Technology, Iran (October ۳۰, ۲۰۱۳).
۳. **Extracting suitable indicators to develop a model for revision of engineering education programs.** In the national Conference on Change and Revision in Technical and Engineering Education, held by Technical and Engineering Department, Ministry of Science, Research and Technology in Amirkabir University of Technology (June ۲۶, ۲۰۱۲).
۴. **Re-evaluation of engineering education programs.** A panel on engineering education, at the annual conference of the electrical and computer engineering of Iran, College of Engineering, University of Tehran (May ۱۶, ۲۰۱۲).
۵. **Quality assessment of engineering education in Iran.** A panel at the ۶th Conference of Quality Assessment in the Academic System (May ۲, ۲۰۱۲).
۶. **Student-based education.** In Student Conference on Iranian Mining Engineering, College of Engineering, University of Tehran (November ۲۸, ۲۰۱۲).
۷. **Engineering Education for the Future.** Keynote lecture presented in the joint first Asian tunneling conference and ۹th Iranian tunneling Conference, Amirkabir University of Technology (November ۲, ۲۰۱۱).
۸. **Combination of traditional lecture and active learning methods for teaching engineering.** In the ۲nd conference of engineering education in Iran, Isfahan University of Technology (November ۱, ۲۰۱۱).
۹. **Revision of engineering education for ۲۱st century.** In the general council of the department of engineering at the Academy of Science of Iran (October ۶, ۲۰۱۱).
۱۰. **Mechanism of accreditation of engineering education programs: from ideal to reality.** In the ۵th conference of Quality Assessment in the Academic System, University of Tehran (May ۱۷, ۲۰۱۱).

٢-٣. Partnerships/ Collaborations

Presenting a successful engineering education program and training graduates with necessary skills to do effective jobs in the industry require consultation and collaboration with all the beneficiaries in engineering education. UNESCO Chair on Engineering Education creates an opportunity for the exchange of ideas and findings among these centers by signing MOU's with the beneficiaries of the engineering education. The scope of the MOU are as follows:

١. Exchange of information on world changes in engineering education.
٢. Identification of challenges of engineering education in Iran.
٣. Evaluation and accreditation of engineering education programs.
٤. Suggesting procedures for re-evaluation and continuous promotion of engineering education programs.
٥. Developing new educational programs and courses.
٦. Proposing feasible approaches to improve the teaching-learning processes and its measurement.
٧. Developing joint research to promote engineering education.
٨. Cooperation in holding seminars, conferences, symposiums, get-together meetings, and offering course, workshops and lectures on engineering education.
٩. Cooperation in dissemination of findings at national and international levels
١٠. Introducing Iranian engineering education potentials to the educational centers at national, regional and international levels.
١١. Cooperation to establish regional center for engineering education.
١٢. Promotion of the global position of engineering education of Iran.

So far the mentioned MOU is signed with the following institutions:

١. Center for Quality Assessment, College of Engineering, University of Tehran
٢. Iran E-Learning Association
٣. Mining Engineering Council of Iran
٤. University of Shahrood, Iran
٥. Alumni Association of Faculty of Engineering, University of Tehran
٦. Iran Society of Engineering Education (ISEE)
٧. Iran Accreditation Institute for Engineering Education (IAIEE)
٨. Road, Housing and Urban Development Research Centre (BHRC)
٩. Department of Engineering Science, Academy of Science of Iran

۲-۴. Publications

i. Books

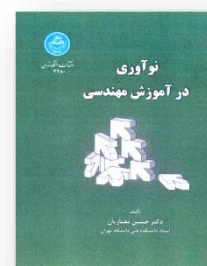
Engineering Design, by Hossein Memarian ۲۰۱۳, University of Tehran Press, ۴۷۸ pages.

Design is the climax of engineering activities and engineers played a great role in forming our present world. This book has been designed to be useful for the courses on engineering design and also the capstone final project of any BSc engineering program.



Innovation in Engineering Education, by Hossein Memarian, ۲۰۱۲. University of Tehran Press, ۴۳۹ Pages.

Professional ability is a complex and delicate link between knowledge, skill and attitude. The purpose of this book is to present methods to enhance the quality of engineering education. It includes a set of activities which spans from the level of presenting a course to developing an educational program



Engineering Profession, by Hossein Memarian, ۲۰۱۲ (۲nd edition), University of Tehran Press, ۵۲۴ Pages.

In this book, a set of concepts, skills and attitudes, which are not usually taught in the engineering courses but students and professional engineers need to know and practice, have been provided.



ii. Journal papers

۱. Memarian H. ۲۰۱۴. The role of creative thinking in engineering education of Iran. *Iranian Journal of Engineering Education*, The Academy of Science of Iran, Vol. ۱۶, No. ۶۱, pp. ۲۷-۴۵.
۲. Memarian H. ۲۰۱۴. Revaluating the final projects in Iran's undergraduate engineering programs., *Iranian Journal of Engineering Education*, The Academy of Science of Iran, Vol. ۱۵, No. ۶۰, pp. ۱-۲۶.
۳. Memarian H. ۲۰۱۳. Revaluation of engineering education. *Iranian Journal of Engineering Education*, The Academy of Science of Iran, Vol ۱۵, No. ۵۷, pp. ۱-۱۸.
۴. Memarian H. 2012. New student-centered methods in engineering education. *Iranian Journal of Engineering Education*, The Academy of Science of Iran, Vol.13 No 52, Winter 2012, Pp 1-21.
۵. Memarian H. 2012. Revision of engineering education for 21st century. *Iranian Journal of Engineering Education*, The Academy of Science of Iran, Vol.13 No 52,

Winter 2012, Pp 41-65

٦. Memarian H. 2011. Deficiencies of Iran's engineering education programs. *Iranian Journal of Engineering Education*, The Academy of Science of Iran, Vol.13 No 51, Fall 2011, Pp 53-74.
٧. Memarian H. 2011. Mechanism of internal assessment of Iran's engineering education programs. *Iranian Journal of Engineering Education*, The Academy of Science of Iran, Vol.13 No 51, Fall 2011, Pp 1-31.
٨. Memarian H. 2011. Yesterday's outcomes and tomorrows challenges of engineering. *Journal of Mining Council of Iran*, No 11, pp. 1-9.
٩. Memarian H. 2011. Global movement for engineering education accreditation. *Iranian Journal of engineering education*, The Academy of Science of Iran, Vol.13 No 50, Summer 2011. Pp 1-31.
١٠. Memarian H. 2011. Accreditation process of Iran's engineering education programs, *Iranian Journal of Engineering Education*, The Academy of Science of Iran, Vol.13 No 50, Summer 2011, Pp 33-61.
١١. Memarian H. 2011. Preparation of objectives and outcomes for engineering education. *Iranian Journal of Engineering Education*, The Academy of Science Iran, Vol. 13, No. 49, pp. 26-49.
١٢. Memarian H. Engineer and Engineering. 2011. *Journal of Mining Council of Iran*, No 10, pp. 27-35.

iii. Conference Papers

١. Memarian H. ٢٠١٤. External assessment of engineering education programs of Iran, ١st National Conference on Quality Assurance of higher education, Paper No. ١٢٣٠-QAUS, May ٢٠١٤, Sharif University of Technology. ٩ p.
٢. Memarian H. 2013. The minor role of creative thinking in engineering education of Iran. 3rd Conference on Engineering Education, 30-31 Oct. 2013, Sharif University, Iran. 12 pp.
٣. Memarian H. 2011. Engineering Education for Tomorrow. 1st Asian and 9th Iranian Tunneling Symposium, Nov. 2011, Tehran, pp. 1-10.
٤. Memarian H. 2011. Integrating traditional lecturing with active learning approaches for engineering instruction. 2nd Engineering Education Conference of Iran, Esfahan University, pp 1-26.
٥. Memarian H. 2011. Accreditation mechanism of engineering program, from ideals to reality. 5th Conference on Quality Assurance in University System, 27 April 2011, University College of Engineering, University of Tehran. pp 1-10.

iv. Website

Designing a bilingual dynamic website for the UNESCO Chair on Engineering Education (to be operational in 2015)

٢-٥. Cooperation with UNESCO Headquarters, Field Offices

Participating in the meetings held by Iranian National Commission for UNESCO

۳. Future Plans and Development Prospects

Predicted five-year action plan for UNESCO Chair on Engineering Education (۲۰۱۴-۲۰۱۸)

۱. Cooperation with universities and related centers to expand the process of accreditation of engineering education programs
۲. Supporting research projects on challenges of engineering education
۳. Defining annual prizes for the best research projects on engineering education
۴. Holding training courses and workshops for professional development of faculty members and teaching assistants (TA)
۵. Promoting the process of retraining engineers employed in industry and seeking industry collaboration to promote the professional engineer (PE) program in the country
۶. Collaboration for design and participation in launching educational courses, including master's degree program, in engineering education.
۷. Presenting educational and research advice and services to universities, organizations and industry.
۸. Expanding the activities of chair to neighboring countries and others in the region, toward establishing the "Regional Center for Engineering Education"
۹. Establishing links with related centers and UNESCO chairs at international level, in order to exchange the findings.
۱۰. Planning to join the world conventions in the area of engineering education (e.g. Washington Accord).

Appendix:

i. Human Resources

The chair structure consists of strategic council, board of advisors and the office of the chair holder.

- **Strategic Council:** The role of strategic council is to propose the general guidelines and monitor the macro policy of the chair. The ۱۰ members of this council (۱۴ full professors and ۱ associate professors) represent different fields of engineering at the College of Engineering, University of Tehran.
- **Advisory Board:** The purpose of advisory board is to gain consultation in the area of macro engineering education and establishing links between UNESCO Chair on Engineering Education and other related centers at national, regional and international levels. The members of the advisors board are pioneer professors in the fields of engineering and pedagogy, expert from industry.
- **Chair office:** Technical staff and secretary.

ii. Financial Resources (annual)

- University of Tehran ۳۰۰۰۰ \$
 - Office space rent (۱۲۰۰۰ \$)
 - Office staff salaries (۱۵۰۰۰ \$)
 - Other (۳۰۰۰ \$)
- Donation ۲۰۰۰ \$

The chairholder and ۱۴ other members of the strategic board activities and contributions are voluntary.

Progress report

From:

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