Research at IUST

- Cooperation with Industry
- Publications
- IUST Scientific Journals
- IUST Press
- Centers of Excellence

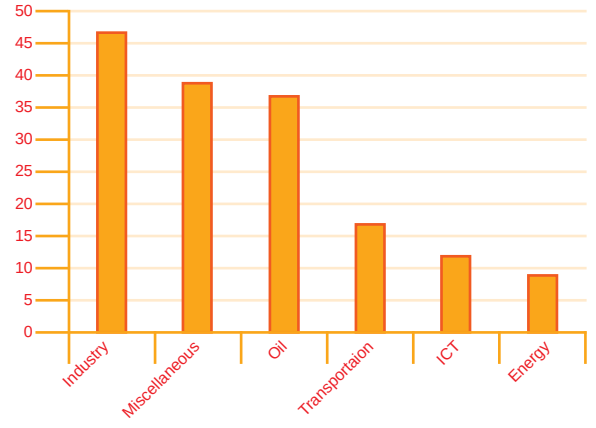
Research, is the main mandate of Research and Technology Division of the University, which is supervised by Vice Chancellor for Research and Technology. This Division makes policies and organizes research and technology related activities conducted by faculty members and graduate students at IUST. It also has the responsibility of general supervision, assessment and providing research grants to the faculty members. Providing financial resources to research projects and facilitating the highly advanced research laboratories and libraries are also important roles that Research and Technology Division plays for promotion of knowledge and technology at IUST.

Cooperation with Industry

IUST has a long history of fruitful cooperation with the Iranian leading industries since 1929. According to the assessment conducted by the Ministry of Science, Research and Technology, IUST has acquired the first rank among Iranian technical universities in terms of research contracts signed with industries during the year 2007. Total income from industrial contracts shows a 30 percent growth during 2007. Total income of around 35 million dollars, from 700 industrial projects has been earned during the last ten years. Such projects have been conducted by the faculty members as well as the graduate students.

Private sector has been the main partner for IUST, in the fields of steel industries, composite materials, advanced materials, and automation, just to name a few. Besides various flagship projects carried out with private sector have resulted in actual technology transfer to the industries for implementation in their production lines. The number of regional as well as international patents has grown rapidly during the recent years; in particular, the number of nationally and internationally recognized patents during year 2007 was more than 30. Meanwhile, IUST has been recognized as one of the ten accredited institutes by the Ministry of Science, Research and Technology for scientific assessment of patents.

Commercialization of research achievements is a program with high priority at IUST, which is being planned in collaboration with some local Venture Capital companies as well as the Iranian National Science Foundation.



Research and Technology Conrtacts since 1998 ($ million)

Publications

The IUST faculty members have been very active in writing, compiling and translating a remarkable number of books as well as publishing and presenting papers in various national and international journals and seminars. During year 2007 and the first six-month of 2008, at least 950 journal papers, including ISI, have been published by IUST faculty members in various scientific and technical fields.

A total number of 1989 conference papers have been also presented in both national and international scientific gatherings. This number include 569 national and 1420 international conference papers.

IUST Scientific Journals

IUST publishes four scientific journals with the aim of providing a medium for exchange of knowlege among Iranian scientists and engineers as well as the world's scientific community. The quarterly published journals are:

- International Journal of Industrial Engineering and Production Research.
- International Journal of Civil Engineering.
- Iranian Journal of Electrical and Electronic Engineering.
- Iranian Journal of Materials Science and Engineering.

IUST Press

The IUST Press is one of the most advanced university publication and print centers nationwide. This is in part due to access to the latest software and hardware facilities. Being equipped with facilities that enhance the pre-publication, publication, and post-publication phases and enjoying the services of highly experienced experts and personnel, the Center not only meets the publication demands of the university at a very high quality, but takes publication orders from other universities and cultural institutes.

Centers of Excellence

Based on the declaration of the review committees assigned by the Ministry of Science, Research and Technology, three academic/research centers from IUST have been officially recognized as Centers of Excellence in the country. The national review committee procedures have been based on quantitative and qualitative assessment of research potentials of faculty members and their international scientific achievements. These centers are as follows:

Center of Excellence for Fundamental Studies in Structural Engineering

The main aim of this center is to develop novel methods and techniques for optimal analysis and optimal design of structures. Analysis is known as optimal if the structural matrices used are sparse, well-structured and well-conditioned. The main tools used for such optimization consist of graph theory, algebraic graph theory, linear algebra, mathematical programming, heuristic and meta-heuristic algorithms. An extension of these approaches to finite element models and other systems such as hydraulic systems forms other activities of the center. Due to the importance of earthquake resistant structures, attention is also paid to earthquake engineering aspects of the structures.

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Center of Excellence for Advanced Materials and Processing

In 2000, in response to the initiatives of Iran Ministry of Science, Research and Technology, responsible for the promotion of ideas for increased contributions in the emerging sciences and technologies, the Centre of Excellence for Advanced Materials was established at Iran University of Science and Technology. The Centre is built on its recognized expertise in the metals, ceramics and polymeric fields and is dedicated to developing interdisciplinary research and educational programs in high technology materials processing. Major priorities of the Center include promotion of university-industry collaborations and meeting their research problems, increasing contributions in international scientific activities, and developing new technologies in advanced materials processing. The main research focuses of the Center are Advanced Engineering Metals & Alloys, Advanced Engineering Ceramics, Composite Materials, Nano Materials, Bio Materials, and Electromagnetic Processing of Materials.

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Center of Excellence for Power Systems Automation and Operation

Center of Excellence for Power System Automation and Operation has set its mission to develop state of the art techniques in the field of automation and operation to focus on this significant and vital requirement of the country. Researchers of this center in cooperation with their postgraduate students (M.Sc. and Ph.D.) have amended all their research efforts to build up and extend the necessary approach and practice in various automation and operation fields and have focused all their research case studies on electric industry challenges and shortcomings at a national level. Their activities mainly target to improvement of the current power system operation and automation standards as well as enhancement of and upgrading the present methods and techniques used in a variety of related fields of generation, transmission and distribution.

The main objectives of the Centre are to persuade utilization of automation and optimal operation techniques in electric industry, to encourage and increase the application of automation and information technology in industry throughout the country, to develop advanced techniques in power system automation and operation, to motivate cooperation with major industrial decision makers regarding power system automation and operation throughout the country, and to update and upgrade the knowledge of the electric industry personnel and academic skills by offering various professional workshops.

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Part 9

Research Centers

Asphalt Mixtures and Bitumen Research Center

IUST Asphalt Mixtures and Bitumen Research Center (ABRC) is one the first research centers in this field in the country. It has been established to meet research needs in the fields of pavement, bitumen and asphalt mixtures. Through various committees and partnerships, ABRC serves the community as a center for health and safety, and environmental issues. It promotes petroleum asphalt as a safe and environmentally friendly construction material for highways, streets, and roofing systems through a program of scientific research and technological developments.

Investigation and recognition of research needs, conducting empirical research projects, and providing scientific and technical consultation services in asphalt mixtures and bitumen are the major aims of the center.

ABRC laboratories are leading facilities in asphalt industry research, testing and analysis. The laboratories are recognized for leadership in solutions to technical issues that impact the asphalt industry, and serve as focal points for the application of new technologies based on the highest standards of performance.

The Center provides technical support to member companies, users and agencies through on-site job visits, consultation services, training programs, presentations and informative gatherings.

Research Fellows

Behbahani, Hamid,. Ph.D., Professor, University of Florida (USA), 1977; Transportation and Pavement Engineering, Transportation, Road and Asphalt Engineering, Pavement Management.
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Ziari, Hassan, Ph.D., Associate Professor, Iran University of Science and Technology (Iran), 2000; Transportation and Pavement Engineering, Transportation, Road and Asphalt Engineering, Pavement Management.
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Automotive Engineering Research Center

The Automotive Engineering Research Center was established in 1992 as a cooperative venture between the government, the industrial community, and the university to encourage and assist automotive industries to overcome their technical needs and to adopt modern and more scientific methods by participating in bilateral research and designing projects. The Automotive Engineering Research Center, together with the School of Automotive Engineering, cooperates with main Iranian Automotive industries, including Iran Khodro Co., SAIPA Co., Pars-Khodro Co., Iran Khodro Diesel Co., Saipa Diesel Co., Zamyad, Megamotor Co. (Engine Mfg.), IDEM (Engine Mfg. under License of Benz Dymler), SAPCO (Main Part Supplier), Sazehgostar SAIPA(Main Part Supplier), SAIPA Yadak, and ISACO.

Research Fellows:

Shojaeefard, Mohammad Hassan, Professor, Ph.D., University of Birmingham (U.K.), 1987; Body and Structure, Internal Combustion Engines, Aerodynamics and Aerospace, Turbomachinery, Heat and Fluid, Computational Fluid Dynamics
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Goodarzi, Avesta, Assistant Professor, Ph.D., Sharif University of Technology (Iran), 2001; Chassis Systems, Vehicle Dynamics, Chassis Systems Design, Alternative Technologies, Control, Electric Vehicles.
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Talebi Tooti, Ruhollah, Instructor, M.Sc., Iran University of Science and Technology, 2004; Body and Structure, Sound and Acoustic Transmission, Composite Materials, Vibro-acoustic, Passive Control.
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Cement Research Center

The Cement Research Center (CRC) was established in 1996 at IUST as an interdisciplinary leading center for research and development in science and technology of cement material and production process and various related fields including special and new cements, durability of cement–based materials, process and energy optimization, and environmental aspects, etc.

The center identifies technical problems and requirements in the cement industry, designs and carries out research programs to provide the necessary knowledge and to develop new technologies.

In addition to easy access to different IUST research laboratories, the center benefits from two laboratories equipped with research and analytical facilities for chemical analysis and mineral processing. Besides the IUST central library and electronic search facilities, the specialized library of the center is also very beneficial to researchers. The followings are typical examples of research projects carried out in this centre:

- Natural pozzolan based-geopolymer cement.
- Developing low cost green cements based on supplementary cementing materials.
- Alkali-activated slag cement.
- Investigating the possibility of utilizing RFCC spent catalyst as a cement additive.
- Estimation of coating thickness in rotary cement kiln using shell temperatures.
- Investigating the possibility of utilizing pet-coke as an alternative fuel in a Portland cement production line.
- The center is also well recognized in bringing about valuable innovative research outcomes. The followings are typical examples of registered patents:
- Cementitious composite wall tile, 2007.
- Decoration of cement and concrete surfaces by staining technique, 2007.
- Low cost green cement, 2006.
- Composite cement, 2006.
- Fast set and very high early strength cement, 2006.
- Natural pozzolan-based geopolymer cement, 2005.
- Highly acid resistant geopolymer cement based on fly ash, 2003.

Research Fellows:

Seyed Sadjadi, Seyed Abolfazl, Professor, Ph.D., University of Kiel, (Germany), 1979, Thermodynamics, Kinetic, and Electro-Chemistry.
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Taeb, Abbas, Professor, Ph.D., Technical University Graz (Austria), 1986, X-ray Application, Cement Technology, and Catalysis.

Allahverdi, Ali, Assistant Professor, Ph.D., Institute of Chemical Technology, Prague, (Czech Republic), 2002, Cement Material and Process Technology.
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Electronic Research Center

The Electronic Research Center was established in 1997, in order to initiate an appropriate scientific ground for the development of the electronic industry. An important characteristics of the center is its Molecular Beam Epitaxy equipment, clean room class 2000, and the supporting equipment for applied and fundamental research in the fields of microelectronics and semiconductors. Based on the evaluation made by the Ministry of Science, Research and Technology in 2007, the Electronic Research Center has been ranked the first between near 100 research centers and institutions nationwide.

Laboratories:

There are three specialized laboratories in the Center including the Semiconductor Laboratory, Circuit Design Laboratory, and Instrumentation, Measurement and Automation Laboratory. These laboratories are equipped with the instruments necessary for research in electronics and conducting student projects at Master and Ph.D. levels.

The Semiconductor Laboratory

The Semiconductor Laboratory, possessing the molecular beam epitaxy (MBE) equipment, provides the opportunity of offering important services in this field in the country. It provides:

- Growing GaAs layers with different thickness and impurities on wafers.
- Growing different layers of semiconductors, homogeneous and heterogeneous, for manufacturing of various electronic devices.
- Carrying out applied research for optimization of the electronic devices.
- Design and manufacturing of various detectors, lasers, diodes and transistors.

Circuit Design Laboratory

This laboratory consists of a general work area and several individual rooms for the faculty members. All students majoring in Electrical Engineering may carry out their research projects in this laboratory. The research topics include the design of novel circuits and systems which can either be built through a laboratory house or implemented on ASIC chips.

Instrumentation, Measurement and Automation Laboratory

a. Instrumentation and Measurement Laboratory

The specialized measurement equipment and Faraday cage facilitates offering of various services in this laboratory, some of which are as follows:

- Measurement of different kinds of physical quantities.
- Design and manufacturing of various kinds of sensors needed for industries.
- Design of circuits and advanced electronic systems.
- Optimization and modification of instrumentation systems.



- Inverted engineering on the electronic equipment with external sources.

b. Automation and Control Laboratory

Undoubtedly, enhancing the quality of the goods, increasing production, canonization, and increasing the life of systems are not achieved without a reliable automatic control system.

The Automation and Control Laboratory, in addition to undertaking fundamental projects, offers the following services:

- Converting manual operations.
- Instruction of advanced industrial control systems such as PLC and DCS.
- Analysis and design of various controllers needed in industry.
- Design and manufacturing of various software needed in industry.
- Design and manufacturing of office automation systems and project control.
- Research on mechatronics systems and mobile robots.

Intelligent Hydroponics Greenhouse

The researchers of the Electronic Research Center have also been working on a production system in an intelligent hydroponics greenhouse for producing high quality, premium strawberries. Hydroponics is a technology for growing plants in nutrient solutions (water containing fertilizers) with or without the use of an artificial medium to provide mechanical support. It is also highly productive, conservative of energy, water and land, and protective of the environment. Since regulating the aerial and root environment is a major concern in such agricultural systems, production takes place inside enclosures designed to control air and root temperatures, humidity, light density, water, plant nutrition, and adverse climate.

Climate control is multi input-multi output system and its control is difficult by means of classical techniques because of the nonlinearity of the system and invalid of the precise model. At the IUST Intelligent greenhouse, computerized algorithms such as fuzzy logic, neural networks and wavelet have been applied for modeling and control of the environment parameters by controlling actuators including, fan/pad, heating/cooling system, high pressure fog generator and side/ceiling windows.

Research Fellows:

Azhari, Seyed Javad, Associate Professor, Ph.D., University of Manchester Institute of Science and Technology (UMIST) (UK), 1990; Electronics Instrumentation, Low Voltage Circuits and Systems Design, Current- Mode Circuits and Systems Design.
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Green Research Center
(Energy & Environment)

The Green Research Center (GRC) was established on the basis of the need for fundamental research in such scientific areas as renewable energy, energy-efficient technologies, energy conversions, energy management and environment. Established as a federal research and development facility in 1999, the GRC is administered by IUST. GRC is one of the leading pioneers of energy and environmental technologies in Iran. The Center is comprised of three research groups:

Renewable Energy Group

Undertakes research on the use of renewable energy sources and energy conservation technology. Because of their sustainable character, renewable energy technologies are capable of preserving resources, of ensuring security and diversity of energy supply, and providing energy services, virtually without any environmental impact. Therefore the research work of the group focuses on fuel cell, electrochemical systems, energy conversions, natural gas conversions, biodiesel (Fuels), and renewable energy resources.

Energy Management Group

The group assists industrial enterprises in implementing energy management systems, which integrate energy efficient planning, design and procurement with computerized process control based on collected energy data. The group services also include energy audits, which enable the clients to record the actual level of energy consumption, to point out areas with significant heat losses and to indicate potentials for improving energy efficiency. The group offers the services of experienced energy auditors and energy management specialists. The research fields include energy management, load management, restructured power system operation and control, The development of new approaches to improve power quality, and distributed power generations.

Integrated Energy Systems Group

The overall objective of Integrated Energy Systems Group is to better understand the nature of alternative future energy transitions, their implications for human well-being and the environment and how they might be shaped and directed by current and future decision makers. Given the interactions between energy and almost all economic and social activities, it is imperative to better understand the long-term implications of alternative energy policies, investments and technological developments now. The Integrated Energy Systems Group will contribute to addressing the challenges confronting the integrated energy system by conducting research in diferent areas including:

- coordinating an energy assessment that will evaluate the social, economic, environmental, security and other issues linked to energy to provide the technical and scientific basis needed to address the major energy challenges of the future.
- Advancement in the state-of-the-art in inclusion of technological change within energy models;
- Development of modeling energy infrastructure within energy models in order to assess alternative long-term investment strategies;
- Maintaining and expanding up-to-date, extensive,

accessible databases on technologies and resources in order to support research on technology dynamics, grid evolution, and their incorporation in energy models;
- Developing new methods and modeling techniques for exploring alternative energy pathways of both systems-engineering and other modeling approaches;
- Promoting feasible paths to sustainable energy systems by developing new technologies and perspectives to overcome barriers to the widespread adoption of sustainable energy;
- Conducting original research to develop key technologies for sustainable energy systems and promoting the development of sensible, clean energy alternatives.

In order to fulfill its research activities, the Center enjoys the facilities available in three laboratories, namely: Fuel Cell Laboratory, Energy Management Laboratory, and Energy & Environment Laboratory.

Research Fellows:

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Information Technology Research Center

Inaugurated in summer 2002, the IUST Information Technology Research Center aims at keeping abreast of the latest developments in IT and its contribution to the ever-growing computing environment of industry. The scope of research interests in the Center covers a range of activities such as developing software for designing and testing systems, modeling machines and controlling their qualities, image and speech processing systems. The Center also offers courses to familiarize IUST faculty members and the staff of other organizations with computer- based interactive learning and the potentials of IT and multimedia technology in education, industry and work places. The center has three research groups, focusing on Web Based Systems, Soft Computing and Real-Time Systems, and Image and Speech Processing Systems.

Laboratories

There are 2 well-equipped laboratories in the IT Research Center. The Web-based laboratory was established in 2001. The second laboratory, comprising a computerized network, its relevant servers, software and hardware, was equipped by the Ministry of Telecommunication and Information Technology.

Research Fellows

Akbari, Ahmad, Associate Professor, Ph.D., University of Rennes I (France), 1995; Hardware, Speech Recognition, Speech Enhancement , Computer Networks, Signal Processing.
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Iran Aluminium Research Center

Iran Aluminium Research Center has been established in Iran University of Science and Technology in 1995. The goal of this center is to contribute in the promotion of science and technology in the Iranian industry community. This aim is being fulfilled by the best use of the existing facilities in all relative universities and research institutions together with a tight cooperation with the industry.

Iran Aluminium Research Center is active in carrying out researches and contracting research projects to develop aluminium science and technology. The Research Center also organizes national and international conferences, short courses and seminars, as well as Research and Development Centers with respect to the aluminuim industry.

Among the recent duties and achievements of the center are:

- Holding the first Iran Aluminium Industry Congress in Dec. 2004.
- Publishing aluminium scientific magazine (a national magazine that focuses on aluminium production and applications).
- Publishing a national aluminium weekly newspaper about alminium and its related news, including industry news, technological news and latest news about Tehran Metal Exchange (TME) and London Metal Exchange (LME).

Research Fellows:

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Salehi, Mohammad- Taghi, Associate Professor, Ph.D., University of Manchester (UK), 1990; Design and Selection of Engineering Materials, Metals Forming, Heat Treatment, Mechanical Metallurgy.
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Seyedein, Seyed Hossein, Associate Professor, Ph.D., McGill University (Canada), 1997; Extractive Metallurgy, Mathematical and Physical Modeling of Continuous Casting Processes, Modeling and Design of Near-Net Shaped Casting Process, SHS.
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Soltanieh, Mansour, Associate Professor, Ph.D., University of Toronto (Canada), 1998; Extractive Metallurgy, Recovery of Metals, Extractive Metallurgy by Pyrometallurgy and Electro Metallurgy, Chemical Metallurgy.
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Iran Composites Institute

Due to the importance of composites technology in the 21st century, Iran Composites Institute (ICI) was founded in 1999 at Iran University of Science and Technology in collaboration with the Technology Cooperation Office of Iran Presidency. Among the main goals of the Institute are conducting research and development on composite materials, design and construction of composite structures, undertaking graduate and post-graduate studies on composites, collaboration with Industry to solve relevant problems, and development of composites technology in the country.

Educational Capabilities

The lack of a center for education of composites has caused the Institute to offer educational courses in this field. In fact, the criteria for selection of such course topics are the needs of the composite industry. Accordingly the following modules are offered by the Institute:

- Acquaintance with manufacturing procedures of polymer matrix composites (theoretical).
- Manufacturing of polymer composites by hand lay up method.
- Training for material selection for polymer composites, micromechanics and material characterization.
- Design of composite structures.
- Manufacturing of composite molds.
- Experimental characterization of composite materials.

The Institute is well equipped with technical tools, necessary for supporting research activities, including different type of furnaces, mechanical testing machines, vacuum pumps and compressors. Some facilities available at the Institute are various types of fibers (glass, carbon, and kevlar), various types of polymer resins, a high temperature curing furnace, an oven

(3x2x2m^3), a vacuum pump, an air compressor, various types of tools for hand lay-up, and RTM.

Research at ICI

The research interest of the Institue include:

- Research and Development in Composite Materials and Structures
- Design of Polymer Matrix Composites
- Manufacturing of Polymeric Composites
- Mechanical Characterization of Composites

Only in the course of the short age after establishment of the Institute, fruitful research findings have been achieved, resulting in a number of registered patents as following:

- A fixture for determining the mechanical property degradation of polymer composites in bending loading condition under stress corrosion.
- Replacement of the lead grid in lead-acid battery with carbon/vinyl ester resin.
- Design and manufacturing of a electrically conductive and chemically resistant polymer composite.
- Design and manufacturing of a fixture for measurement of specific surface and volume resistance.
- Reinforcement of Concrete using Composite Materials.
- Measurement of Residual stresses in Composite Materials.
- Design and Manufacturing of Composite Flat Spring.
- Polyethylene composite manufacturing with hydroxyl apatite reinforcement to replace in bone.
- Manufacturing of orthopedic polyethylene/Three Calcium Phosphate (TCP).
- Reinforcement of metallic plates with composites.
- Internal reinforcement of concrete by composite wastage.
- Drop weight impact test machine for composites.
- Weaving glass fiber.
- Manufacturing of a polymer concrete by using glass fiber and industrial sand.
- Design and manufacturing of a fixture for measuring surface and volume resistivity.

The Composites Bulletin

Iran Composites Institute has started to publish the “Composites Bulletin” quarterly since spring 2001. This Bulletin presents the most recent news and developments on composites and is published to make managers of industries, researchers and designers acquainted with composites technology and its applications in various industries.

Research Fellows

A number of professors in Mechanics of Composite Materials, Ceramic Matrix Composites, Polymer Matrix Composites, Mechanical Engineering and Material Science are working on various research projects at the ICI. There are also B.Sc. and M.Sc. students and research fellows doing research or theses projects in the center. The full- time research fellows at the ICI are:

Shokrieh, Mahmood Mehrdad, Professor, Ph.D., McGill University (Canada), 1996; Mechanics of Composite Materials, Fatigue of Composite Materials, Finite Element Analysis.
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Technology Incubator of IUST

Technology Incubator of IUST (TII) identifies technology-based concepts and businesses at early stages of development and provides an environment to speed up their growth. TII not only supports knowledge-based units, but also supplies the requirements for the R&D section of firms and companies. Generally,TII can help units to:

- develop a viable business plan based on knowledge of the market,
- achieve effective business management capability, and
- develop technology to market stage.

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Transportation Research Center

The Department of Transportation and Pavement Engineering at the School of Civil Engineering of IUST as the pioneer in this field has established Transportation Research Center (TRC) to conduct research projects. This Center benefits from experienced professors and sharp students of Iran University of Science and Technology. The main goal of this center is to conduct research projects with a focus on achieving empirical outcomes of interest to the transportation industry.

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