King Fahd University of Petroleum and Minerals

Research & Innovation

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Dr. Ali A. Al-Shaikhi
Vice President of Research & Innovation

Vision: To be globally recognized for impactful, interdisciplinary, forward-looking, cutting-edge research.

Mission: To steer, enable and oversee an ambitious research portfolio, and to facilitate its translation to tangible knowledge-based contributions to the economy and society of the Kingdom and beyond.

Biography

Dr. Ali A. Al-Shaikhi is currently the Vice President of Research and Innovation at King Fahd University of Petroleum and Minerals (KFUPM), Dhahran.

Dr. Al-Shaikhi served as Chairman of Electrical Engineering Department and the Dean of Engineering College at KFUPM in 2011 and 2019, respectively. Also, he was the founder and Director, Center for Energy and Geo-Processing (CEGP) which is a collaboration between KFUPM and Georgia Institute of Technology in seismic signal processing.

He received B.Sc. and M.Sc. degrees in Electrical Engineering from KFUPM, in 1997 and 2001 respectively. He received his PhD degree in Electrical Engineering from Dalhousie University, Halifax, Canada in 2008.

He serves/served in a number of committees such as, National Power Academy (NPA), Academic Leadership Center (ALC) at MOE, Electricity Dispute Resolution Committee at ECRA, Lighting Team at SASO, and External Advisory Board of Electrical Engineering Department at Umm Al-Qura University.

His research interests lie in the areas of wireless communication, communication theory, digital communications, signal processing, and computer networks. He has several publications in journals, patents, and reputed conferences.

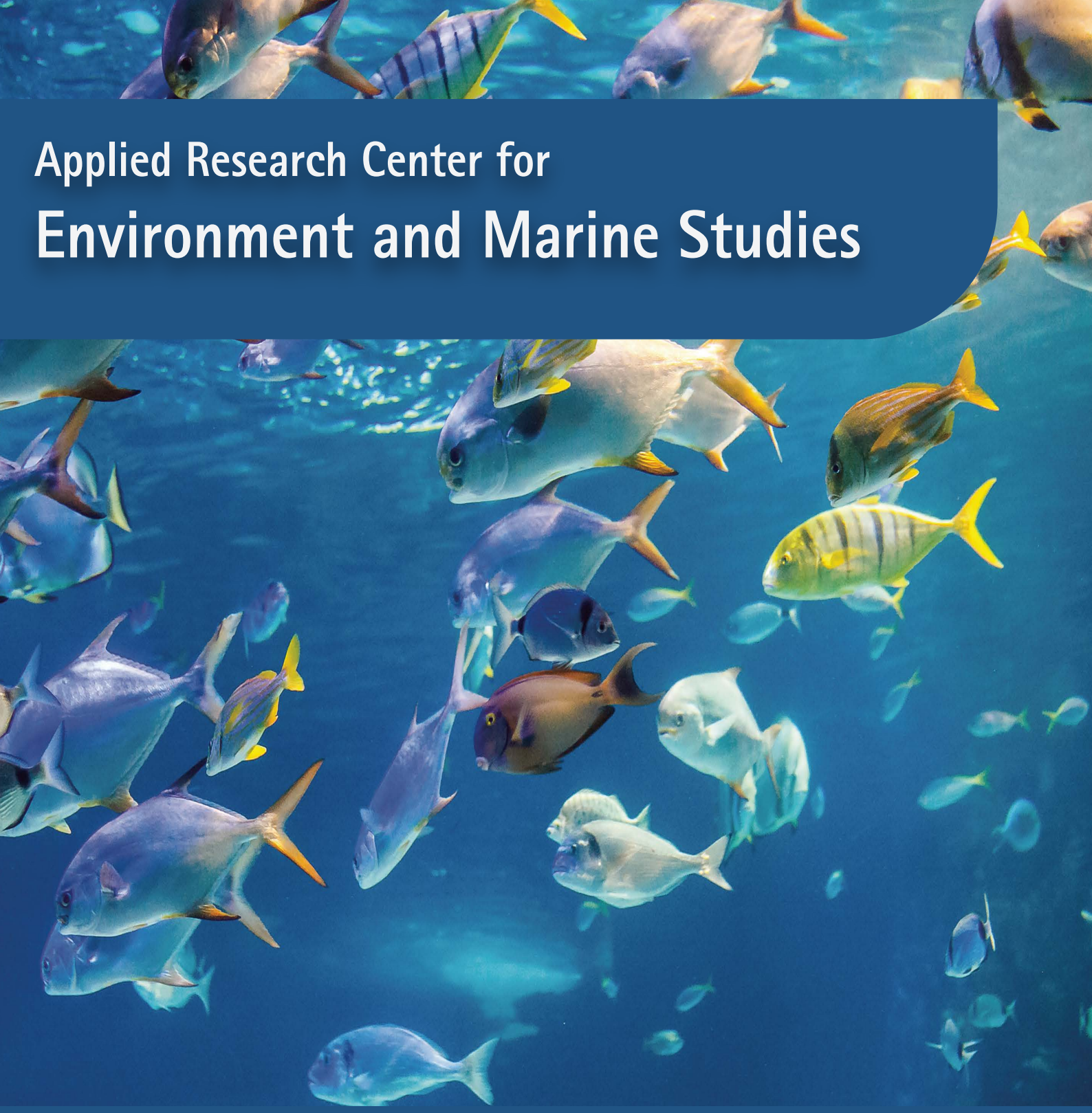
Research & Innovation

Research and Innovation (R&I) was formerly known as Research Institute (RI). The old Research Institute was the cornerstone of applied research activities at KFUPM and it was recognized for solving critical scientific and technical problems as well as converting knowledge into practice. Working in collaboration with the faculty from academic departments and researchers from other research entities, The RI's full-time researchers annually produced hundreds of research reports and publications for industrial and government sponsors.

Today, KFUPM has completely overhauled both its research structure and its programs. Our new research activities are designed to amplify the impact on society, solve challenging problems, and enrich knowledge for all humanity. In light of this, the new revised structure "Research & Innovation (R&I)" was birthed.

One of the most important aspects of this new strategic transformation of the research sector at KFUPM is the emphasis on interdisciplinary research as we believe that it takes the combined knowledge of multiple disciplines to make truly impactful research. Therefore, the newly established Research & Innovation arm comprises the old Research Institute units, the newly established interdisciplinary centers, as well as other administrative units, under the leadership of Dr. Ali A. Al-Shaikhi- The Vice President of Research & Innovation at KFUPM.

Applied Research Center for
Environment and Marine Studies



The Applied Research Center for Environment and Marine Studies (ARC-EMS) at KFUPM was formerly the Center for Environment and Water (CEW). Since its establishment in 1977 to provide research and consultation services in the field of environment and water, ARC-EMS has transformed to a top-notch Research Center, with more than 330 projects of a total value of more than 850 million Saudi Riyals conducted over the past 44 years.

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Dr. Fahad Saleh Al-Ismail

Director, ARC-EMS

Biography

Dr. Fahad Saleh Al-Ismail is currently the Director of the Center for Environment and Marine Studies at KFUPM. He leads a diverse team working on Environmental Impact Assessment and climate change mitigation. Major environmental stakeholders are his partner in projects related to rain seeding, GHG emission reduction, and circular carbon economy under Saudi Green Initiative. He was the former Director of K.A.CARE Energy Research & Innovation Center at KFUPM, emerging national R&D programs in technology localization. During his 14+ years of experience Dr. Fahad has held senior roles for IEEE and the Central Energy Committee representing the Ministry of Energy collaboration with the World Energy Council.

Education:

- (2016) Ph.D. in Electrical Engineering, Texas A & M, College Station, TX, USA.
- (2013) Master of Electrical Engineering, KFUPM.
- (2009) Bachelor Electrical Engineering, KFUPM.

Experience:

- (2020 – Present) Director CEMS, KFUPM.
- (2017 – Present) Assistant Professor, Electrical Engineering KFUPM.

Number of granted patents: 4 US patents.
Number of research papers in peer-reviewed journals: 50+.

Currently, ARC-EMS is engaged in 46 active projects being carried out in the Arabian Gulf and Red Sea, with a workforce of 75 members including 24 Ph.D. holders in multiple disciplines and 51 researchers with either a Master's or Bachelor's degree. ARC-EMS is specialized in conducting environmental impact assessment, environmental monitoring, marine biodiversity, marine ecology, fisheries resources, terrestrial baseline assessment, toxicity investigations, carbon capture & greenhouse gas (GHG) management, water & waste water treatment and climate change.

The Marine Studies Group of the Center has considerable capabilities to study the ecology of coral reefs, seagrass meadows, and mangroves, marine biodiversity, and ecology of marine megafauna. The Fisheries Group is responsible for the stock assessment of fisheries resources and characterization of essential fish habitats. The Terrestrial Group has the research competency to conduct studies on terrestrial biodiversity and ecology, terrestrial geology, soil biology, geomorphology, and conservation of threatened terrestrial habitats. The Environmental Chemistry Group handles the analysis of pollutants in marine and terrestrial ecosystems. Climate Modeling and Data Handling Group is responsible for activities related to GHG emissions, Geographical Information system (GIS) and Database management.

Over the past 40 years, ARC-EMS has signed several client-funded projects with leading national and international agencies, with Saudi Aramco occupying the top position. Some of the other major clients of ARC-EMS are NEOM, The Red Sea Development Company, Public Investment Fund, KBR, Worley, NPCC, Wood PLC, Subsea 7, McDermott, Ministry of Environment Water & Agriculture, National Center for Wildlife, and National Center for Environmental Compliance.

Applied Research Center for Metrology, Standards & Testing

The Applied Research Center for Metrology, Standards & Testing (ARC-MST) has the vision to be a leading engineering research and consulting services provider in the Kingdom of Saudi Arabia.

The mission of the center is to conduct applied research in both short and long-term, and provide consultancy services to local industry, government, and private organizations in the areas of electrical/mechanical/radiation calibrations, engineering standards, high voltage testing, multiphase flow and metrology consultancy.

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Dr. Luai M. Alhems

Director, ARC-MST

Biography

Dr. Luai M. Alhems is the Director ARC-MST, and Professor in Mechanical Engineering Department, in KFUPM. His research interests are Mechanical Engineering, Multiphase and Energy Conservation, Thermo-fluids, Fouling, Wind/Solar Energy, Heat Transfer, Thermodynamics, Power Systems, Heat Exchanger, Gas Turbine, and Failure Analysis Studies. He is the Project Manager of many client-funded projects for Saudi Aramco, SABIC, KACST, and NSTIP. He won the Inventor Award in the 18th Gulf Engineering Forum in March 2015 and was listed in 2020 by US-based prestigious Stanford University as one of "World's Top 2% Scientists.

Education:

- (2002) Ph.D. in Mechanical Engineering, Texas A & M, College Station, TX, USA.
- (1997) MSc. in Mechanical Engineering, KFUPM.
- (1994) BSc. in Mechanical Engineering, KFUPM.

Experience:

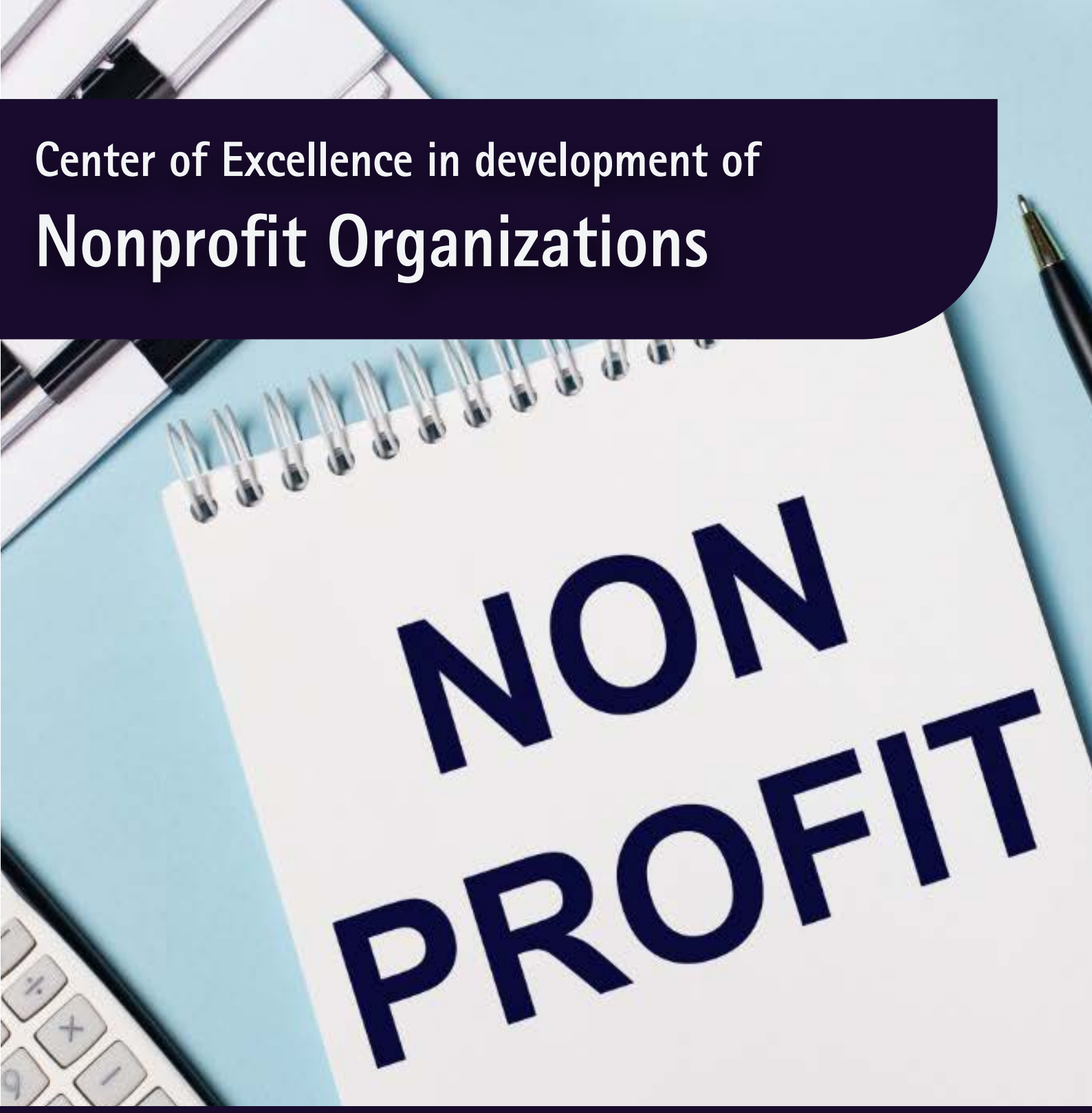
- (2021 Present) Director ARC-MST, KFUPM.
- (2005– 2021) Director for Center of Engineering Research, KFUPM
- (2014 – Present) Professor, Mechanical Engineering KFUPM.

Number of granted patents: 15+ US patents.
Number of research papers in peer-reviewed journals: 110+; and 1 book chapter, 1 book.

The Applied Research Center for Metrology, Standards & Testing (ARC-MST) provides high caliber contractual research, testing and consultancy services to the oil/gas, energy, manufacturing, non-destructive testing (NDT), health and business sectors in Saudi Arabia. The Center's service portfolio is mainly focused on engineering disciplines such as electrical/mechanical/radiation calibrations, engineering standards, high-voltage testing, multiphase flow, and metrology consultancy. Currently, many local and multinational companies avail the center's services to solve process-related technical issues, improve and certify their products, validate material quality, ensure innovation in the marketplace while achieving a significant competitive edge.

In addition to serving the external clients, the center actively collaborates services with other academic departments and centers of research excellence in the University. The applied research activities are conducted through graduate students or as research projects sponsored by the University or external funding agencies, such as KACST, MOE, KACARE and others. The center's research output to date includes 600 journal publications in high-impact journals and 65 issued patents.

Center of Excellence in development of Nonprofit Organizations



The Center of Excellence in Development of Non-profit Organizations (CNPO) has a mission to shape the future of the Non-profit sector and organizations in the Kingdom through well-grounded scientific and market research that informs our educational, training, and consulting programs. CNPO's vision is to be a pioneer in studies related to the Non-profit sector in order to contribute significantly towards building the sector's capacity through developing Non-profits human and financial resource base so as to maximize their economic and social impact in achieving the developmental objectives of Saudi Arabia.

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Dr. Hattan Z. Tawfiq

Director, CNPO

Biography

Dr. Hattan Z. Tawfiq is the Director of CNPO, Assistant Professor in the Department of Mathematical Sciences and the current Dean of General Studies. His research interests include Numerical Analysis and Solution of Partial Differential Equations with Applications to Flow in Porous Media and Numerical Linear Algebra. Among his published works are, Numerical Modeling of Reactive Infiltration Instabilities, An Extension of Gauss Quadrature Formula, Simulation and Visualization of Safing Sensor, Preconditioned Krylov Subspaces Methods for Incompressible Viscous Flow Bramble--Pasciak-Type Conjugate Gradient Method for Darcy's Equations.

Education:

- (2002)Ph.D. in Mathematics University of Pittsburgh, Pittsburgh, PA, USA.
- (1999)MSc. in Mathematics University of Pittsburgh, Pittsburgh, PA, USA.
- (1991) MSc. in Mathematics KFUPM.
- (1988) BSc. in Mathematics, KFUPM.

Experience:

- (2019- Present) Dean, College of General Studies.
- (2016 -Present) Director of CNPO, KFUPM.
- (2015-2016) Assistant Director of CNPO.
- (2010-2013) Chairman of Department of Mathematics & Statistics.
- (2005-2009) Assistant Dean of Prep Year Affairs.
- (2004-2005) Director of Gifted Student Program KFUPM.

As part of its education and training programs, CNPO established the Alfozan Academy for Leaders Development in Non-profit Organizations in collaboration with Al-Fozan Social Foundation. The academy aims to provide formal education and training to Non-profit leaders, partners with the leading international institutions including City University of London, Indiana University, Purdue University, Grand Valley State University and Arizona State University.

As the academy continues to strengthen its role to the Non-profit sector, various short-courses, certification programs and workshops were conducted across the Kingdom. Currently, the academy has beneficiaries in more than 110 cities and towns in KSA.

One of the major activities of the CNPO is organizing the first-ever annual Non-profit Sector Development Forum in the Kingdom, normally held every December. The forum's objective is to foster the Non-profit sector's role in society and help Saudi Arabia achieve its 2030 vision by bringing in international best practices in the Non-profit sector.

The CNPO, Alfozan Academy, sponsors, and the university's high-level of commitment and compassion will continue to work together as one and use all its resources and capacity to realize the hopes and ambitions in improving the lives of the Saudi community.

Research, Projects and Initiatives:

- Establishment of Standards of Voluntary Work Units in Profit Organizations (EDAMA).
- Establishment of 290 Voluntary Work Unit According to the National Standard of Voluntary Work (EDAMA).
- Developing Governance Standards for Non-profit Organizations and Foundations.
- Developing Standards and Professional Qualifications for Non-profit Sector Jobs.

Core Research Facilities

Core Research Facilities (CRF) is tasked with multiple functions including the purchase and distribution of lab chemicals, gases and personal protective equipment for the whole university, chemical waste disposal, ensuring safe practices in research buildings, providing lab equipment repair services, implementation of a university-wide core labs management software program, and development and operation of core (central) labs.

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Dr. Anwar Ul-Hamid

Director, CRF

Biography

Dr. Anwar Ul-Hamid is the Director of CRF at KFUPM. He has worked in areas of materials characterization, failure analysis, coatings, and development of nanomaterials for water treatment. For over 20 years, he managed a centralized facility at KFUPM that undertook materials-related projects, provided analytical services to external clients and academic departments and conducted independent research. He has made important contributions to dozens of projects at R&I, KFUPM. He has written hundreds of technical reports for industrial clients. He has been awarded the best researcher award at KFUPM. He is listed in the "Top 2% Scientists in the World" published by Stanford University.

Education:

- (1996) Ph.D. Materials Science, University of Cambridge, UK.
- (1992) Master's, Metallurgical Engineering and Materials Science, University of Engineering and Technology, Lahore, Pakistan.
- (1990) Bachelor, Metallurgical Engineering and Materials Science, University of Engineering and Technology, Lahore, Pakistan.

Experience:

- (2021-Present) Director of Core Research Facilities, KFUPM.
- (1997-2021) Research Engineer, Research Institute, KFUPM.

Number of granted patents: 5 US patents.
Number of research papers in peer-reviewed journals: 170 + ; and 2 published books.

The core labs is centrally managed by CRF through an inter-connected network of research labs across the campus. One-lab concept is used to merge all core labs virtually to serve as a one-stop destination to share lab facilities with scientists from all departments. Core labs was developed to increase operational efficiency and productivity as well as to ensure cost-effectiveness and optimum utilization of equipment and human resources. Strong functional core labs encourage inter-departmental collaboration by breaking down barriers and simplifying access to high-tech research equipment. This enhances research output and quality in the long-term making core labs an important component of the overall research ecosystem. A group of highly trained staff with a diverse skill set run these research labs as well as service and maintain lab equipment.

The core labs is administered by a powerful lab management system, which manages complete workflows such as booking service requests, lab analysis and report generation, etc. It provides exhaustive data analytics on equipment usage and scientist man-hours.

Deanship of Research Oversight and Coordination

The Deanship of Research Oversight and Coordination (DROC) at KFUPM is an independent Deanship responsible for the planning, management, promotion, and support of research activities that are carried out by Faculty and Researchers at the university through internal and external funding.

DROC is made up of three main offices:

- Office of Sponsored Research (OSR).
- Office of Collaborative Research (OCR).
- Office of Research Support (ORS).

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Dr. Abdullah Sultan

Dean, ROC

Biography

Dr. Abdullah Sultan is the Dean of Research, Oversight and Coordination and an Associate Professor, Department of Petroleum Engineering. His research group focuses on complex and reactive fluids to address problems in the oil and gas industry with a focus on enhanced oil/gas recovery, drilling fluids, well stimulation, gel, emulsions, and flow assurance. He established the Complex and Reactive Fluids (CRF) Lab at KFUPM. Dr. Sultan has numerous publications in refereed journals and conferences.

Education:

- (2009) Ph.D., Petroleum Engineering, Texas A&M University, USA
- (2004) M.S., Chemical Engineering, KFUPM
- (2002) B.S., Chemical Engineering, KFUPM

Experience:

- (2021-Present) Dean of Oversight, Research and Coordination
- (2012-2017) Chairman for the Department of Petroleum Engineering
- (2010-2015) Director for the Center of Petroleum & Minerals, Research Institute at KFUPM

Number of research papers in peer-reviewed journals: 80+

DROC does not only support research activities of our faculty, but also contributes to their scholarly and teaching skills through research projects, conference attendance support, and collaboration with international institutions. DROC assumes the role of supporting and facilitating research activities of our faculty and researchers while enhancing the efficiency and effectiveness of research activities at KFUPM.

DROC strives to achieve its goal of leadership in quality research that is focused and directed towards excellence in the areas of expertise of its faculty and researchers. DROC creates the support, guidance and conducive environment that will enhance quality research outputs and will support KFUPM's leadership role in the local as well as the international community.

The support provided by the deanship to the research community at KFUPM includes internally funded projects through KFUPM grants, externally funded projects, book writing grants, sabbatical leave projects, consultancy, and start-up grants. In addition to that and to support the junior faculty to get on board actively in research, the Deanship of Research Oversight and Coordination sponsors the Start-up Grant designed for newly joining faculty members.

Industry Collaboration

The primary mission of the Industry Collaboration Office is to work with and alongside industry partners to build synergies and an environment where all can thrive. KFUPM partners with different types of organizations, companies, agencies, etc., who strive to make an impact, find solutions to complex technical, environmental, and economic challenges, and facilitate innovation to the highest levels. The importance of industry collaboration with university faculty and students is that such synergies lead to benefits for both. KFUPM is striving to undertake research whose results create both a societal and scientific impact while also benefiting the Kingdom of Saudi Arabia.

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Dr. Sadiq M. Sait

Director, Industry Collaboration

Biography

Dr. Sadiq M. Sait is the Director, Industry Collaboration, and Professor, Computer Engineering Department, at KFUPM. His research interests are Digital Design Automation, Very Large-Scale Integration (VLSI) System Design, Computer Architecture, and Enterprise Resource Planning (ERP) Systems.

Education:

- (1986) Ph.D. in Electrical Engineering (GPA 4.0/4.0), KFUPM.
- (1983) MSc. in Electrical Engineering (GPA 4.0/4.0), KFUPM.
- (1981) Bachelor's Degree (First Class Honors) in Electronics Engineering Bangalore University, India.

Experience:

- (2021-Present) Director of Industry Collaboration, KFUPM.
- (2011-2021) Director of the Center for Communication and IT Research (CCITR, RI)
- (2005-2011) Director, Information Technology Center (ITC), KFUPM
- (1999-Present) Professor in the Department of Computer Engineering, KFUPM.
- (1992-2010) Editor of the Arabian Journal for Science and Engineering (AJSE).

Number of granted patents: 26 US patents plus 4 filed.
Number of research papers in peer-reviewed journals: 250+; 2 books and 5 book chapters.

In collaboration, everyone wins. Avenues for cooperation are not limited to research and research projects and joint intellectual property generation but also go beyond helping universities establish start-ups and commercialize the developed technologies. Other avenues include student engagement, which is the core of any university's activity. Quality education of students is enhanced by either engaging with faculty involved or connected with industry or by involving students themselves in activities at the companies. These include:

- Internships (both local and international)
- Summer training
- Senior design projects, etc.

There are also programs such as CX (https://cx.kfupm.edu.sa) where students can be sponsored in the final year of their undergraduate study and then possibly be employed at the company and MX (https://mx.kfupm.edu.sa) program where a one-year Master's degree is given on topics in emerging areas.

KFUPM researchers and faculty aspire to engage with leading industry partners to seek solutions that create a high impact on real-world problems. The environment is fueled by a research park at Dhahran Techno Valley (DTV), where leading companies have established their R&D facilities to support their operations in the Kingdom and the Middle East region. The proximity to prestigious companies, like Saudi Aramco, Yokogawa, Halliburton, Honeywell, Baker Hughes, etc., to name a few, offers a unique and distinctive collaborative research opportunity providing researchers with a unique scientific environment that fosters groundbreaking research, collaboration, and training of young researchers. With the expertise to take research and development (R&D) projects from concept to delivery. This university-industry collaboration will help to set the development of future technology in the industries in which we specialize. By doing so, we can transform people, organizations, and the global economy.

Innovation & Technology Transfer

The Innovation and Technology Transfer (ITT) is the entity of KFUPM responsible for capturing the intellectualities emanating from its academic activities, protecting them, turning them into potential socio-economic assets, and supporting their advancement towards commercialization and implementation. The ITT constitutes four units:

- The Intellectual Property (IP) Protection
- The Technology Licensing
- The Proof-of-Concept (POC)
- The Technology Advancement & Prototyping Center (TAPC)

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Dr. Iyad Alzaharnah

Director General, ITT

Biography

Dr. Iyad Alzaharnah is the Director General of ITT and has direct knowledge in IP management, technology commercialization, innovation ecosystems, university-industry collaboration, technology advancement, prototyping, and Industry 4.0. Dr. Alzaharnah was one of main KFUPM founders for Dhahran-Techno-Valley (DTV) (in 2006). Since then he has been involved in enhancing effectiveness of the DTV innovation ecosystem. which is now considered world largest cluster of energy-related R&D centers for Multinationals in terms of presence within single geography.

Education:

- Ph.D. School of Manufacturing and Mechanical Engineering, Dublin City University.
- MSc. in Mechanical Engineering, KFUPM.
- BSc. in Mechanical Engineering, KFUPM.

Experience:

- (2015 -Present) Director General of Innovation & Technology Transfer (ITT), KFUPM.
- (2017-2021) Managing Director, Technology Commercialization and Enterprising for Dhahran Techno-Valley Company (DTVC).
- (2008-2017) Director of Innovation Center, KFUPM.

Number of granted patents: 1 US patent.
Number of research papers in peer-reviewed journals : 45+ in fields of engineering, physical sciences and innovation; and 1 published book.

The "IP Protection" manages the invention disclosure/patent filing system, and handles all matters of University joint IPs with other organizations. The "Technology Licensing" markets potential IP portfolios for licensing, and handles all IP and technology licensing deals. The "POC" identifies potential patented technologies and provides financial support/grants for faculty/researchers to advance their innovations towards commercialization.

TAPC supports the University entrepreneurial, technology development and translational research activities (product design, prototyping, Minimum Viable Product (MVP) development, etc.) of KFUPM and the Dhahran Techno-Valley (DTV) innovation ecosystem. TAPC is largely founded on Industry 4.0 technologies and includes three main units: the Product Design and Development, the 3D Printing and the Rapid Prototyping & PCB Fabrication.

The main ITT services are:

- Patenting and IP management,
- Licensing technologies to industrial firms, and startup companies and collaborative technology development activities, and
- Supporting the development of potential technologies, functional prototypes and innovative products for commercialization purposes.

Additionally, the ITT acts as an expertise house for providing knowledge transfer, advisory services and training to governmental and corporate organizations on IP management, technology transfer/commercialization, innovation and knowledge economy subjects.

Interdisciplinary Center for Integrative Petroleum Research

The Interdisciplinary Center for Integrative Petroleum Research (CIPR) is the research arm of the College of Petroleum Engineering & Geosciences (CPG) at KFUPM. It embodies a balancing shift towards fundamental research and research-intensive education away from the historical dominance of applied and consultancy service research. The CIPR promotes a resource-based research model with 8 core programs that underpin its mission. These are: Oilfield Chemistry, Colloids and Interface Science, Rock Science, Multi-Scale Multi-Physics Modeling, Geosystems, Rock Mechanics, Geophysics, and Large Data Analytics.

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Dr. Mazen Y. Kanj

Director, CIPR

Biography

Dr. Mazen Y. Kanj is the Acting Director of the Center for Integrative Petroleum Research (CIPR) at the College of Petroleum Engineering & Geosciences (CPG) at KFUPM. Until May 2015, he was the team lead and the founding Champion of the In-Situ Reservoir Sensing and Intervention focus area in the Reservoir Engineering Technology Division of EXPEC Advanced Research Center (EXPEC ARC) at Saudi Aramco. He coined the concept of reservoir nanoagents and developed the reservoir nano- agents suite of tools with two successful field demonstrations for the company.

Education:

- (1995) Ph.D. Civil Engineering, The University of Oklahoma.
- (1990) Masters of Civil Engineering, American University of Beirut.
- (1988) Bachelor of Civil Engineering, American University of Beirut.

Experience:

- (2015 – Present) Center Director, KFUPM.
- (2003 – Present) Sr. Petroleum Engineering Consultant, Saudi Aramco.
- (2012–2014) Visiting Research Scientist, MIT.
- (1996–2003) Sr. Research Associate, The University of Oklahoma.

Number of granted patents: 25+
Number of research papers in peer-reviewed journals : 30+

The CIPR strong research-focused activities are geared towards complementing the educational programs in Petroleum Engineering and Geosciences departments of the college. All 8 Programs work coherently to deliver unique and world-class solutions and workflows that address industry challenges of direct relevance and long-lasting and sustainable impact on the economic development of the Kingdom. As such, the center's research matrix is complemented by its second dimension that includes 5 core research thrust areas: Enhanced Hydrocarbon Recovery, Productivity Enhancement, Drilling Optimization, Reservoir Monitoring, and Reservoir Quality.

Towards realizing its mission of implementing CPG's strong emphasis on integration, the CIPR maintains a strong tie to other world class research institutions through external research collaboration and partnership programs. The CIPR maintains strong ties among others to research groups at UT Austin, Harvard, MIT, Stanford, Cornell, Edinburgh, and University of Western Australia. It has attracted a host of distinguished adjunct professors on its roster from Colorado School of Mines, Cornell, Harvard, Manchester University, and the University of Copenhagen.

On the main campus, B-78 houses the CIPR and its 30 research and imaging labs in addition to 15 teaching labs, collaboration rooms, Knowledge & Exploration Center, state-of-the-art drilling simulators, and a 160-person auditorium. In the Dhahran Techno-Valley (DTV) of the University, the Petroleum Engineering & Geosciences Technology Center (PEGTC) is a constituent of the larger CIPR ecosystem. And it is aimed to promote stronger engagement with the industry. Among others, PEGTC includes a state-of-the-art Isotope laboratory, nanophotonics and nanoscopy labs, a femto laser facility, a multiphase flow and complex fluid flow (HPHT Flow Loop) facility, a HP/HT microfluidics lab, and 6 technology incubator laboratories.

Interdisciplinary Research Center for
Advanced Materials

The IRC-AM aspires to be a leading national center, recognized globally, for impactful research in advanced materials that leads to innovative and practical solutions for:

- National economy, society, and security challenges and
- Global grand challenges.

The center aims to engineer materials with novel properties that enable superior performance in technological applications for energy, oil and gas, defense, water desalination, chemical and petrochemical, metals, construction, automotive, packaging, and other strategic national sectors.

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Dr. Ahmad Sorour

Director, IRC-AM

Biography

Dr. Ahmad Sorour is the Director of the IRC-AM, and an Assistant Professor in the Department of Mechanical Engineering at KFUPM. His research interests lie in tribology & corrosion of materials, nanoindentation, metal matrix composites, and coatings. Dr. Sorour has been a member of several funded projects carried out at KFUPM. He has taught many undergraduate and graduate courses in materials and corrosion and supervised many graduate students.

Education:

- (2014) Ph.D. in Materials Engineering, McGill University, Montreal, Canada.
- (2008) Masters of Mechanical Engineering, KFUPM.
- (2005) Bachelor of Mechanical Engineering, KFUPM.

Experience:

- (2021 – Present) Center Director IRC-AM, KFUPM.
- (2015 – 2021) Center Director CoRE-C, KFUPM.
- (2014 – Present) Assistant Professor, KFUPM.

Number of granted patents: 3+ US patents.
Number of research papers in peer-reviewed journals: 45+; and 1 edited book.

The IRC-AM focuses mainly on the following research areas: coatings and surface engineering, lightweight materials, smart materials, and corrosion & scale inhibitors. Particular emphases are given to:

- Extreme environments (high temperature, harsh corrosion, elevated stress, harmful radiations, high salinity, and extreme wear and erosion).
- Utilizing machine learning for design and selection of materials, data-driven materials discovery, and risk assessments.

The IRC-AM conducts research to address grand challenges such as:

- Increase the utilization of hydrocarbon-based materials (polymers and polymer composites) by:
  - Lowering the cost of expensive polymercomposites.
  - Replacing carbon or glass fibers with natural fibers or wastes.
- Reduce energy/fuel consumption and carbon dioxide (CO_2) emissions by:
  - Taking advantage of new surface, materials, and lubrication technologies to reduce friction and wear.
  - Reducing the vehicles' and drones' weight using light alloys (Mg-, Al-, and Ti-based) or cost-effective polymer composites.
- Reduce residual waste and byproducts for a genuine circular economy by:
  - Turning waste into higher value materials.
  - Making polymers more biodegradable, reusable, and recyclable.
- Reduce materials degradation (corrosion, wear, fatigue, radiation effects, etc) to:
  - Withstand harsh conditions.
  - Extend product lifetime and durability.

Interdisciplinary Research Center for Communication Systems & Sensing

The Interdisciplinary Research Center for Communication Systems and Sensing (IRC-CSS) is established as part of the University's plan to focus on research that spans multiple disciplines in areas that are dearly needed in the Kingdom and even globally.

The IRC-CSS is established to advance knowledge in the areas of communication systems and sensing; including electrical, optical, acoustic systems for localization and radar systems, and to facilitate the transformation of this knowledge into commercial innovations.

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Dr. Ali Hussein Muqaibel

Director, IRC-CSS

Biography

Dr. Ali Muqaibel is the Director of the IRC-CSS, and a Professor of Communications Engineering in the Electrical Engineering Department, KFUPM. His research interest span communications and sensing applications, include direction of arrival estimation, through-wall-imaging, localization, channel characterization, and ultra-wideband signal processing. He was a recipient of many awards for excellence in teaching, advising, and instructional technology.

Education:

- (2003) Ph.D. in Electrical and Computer Engineering, Virginia Polytechnic Institute and State University , Blacksburg, VA, USA.
- (1999) MSc. in Electrical Engineering, KFUPM.
- (1996) Bachelor of Electrical Engineering, KFUPM.

Experience:

- (2021–Present) Center Director IRC-CSS, KFUPM.
- (2020–Present) Professor in Electrical Engineering Department, KFUPM.
- (2018–2019) Visiting Scholar with KAUST.
- (2015) Visiting Professor, Georgia Tech, USA.
- (2013) Visiting Associate Professor Villanova University, Villanova, PA, USA.

Number of granted patents: 3 US patents.
Number of research papers in peer-reviewed journals: 50+; and 2 Book Chapters.

The IRC-CSS seeks sustainable and robust solutions to problems of regional and global importance. To address the new challenges imposed by next generation communication and sensing systems, holistic designs that span multiple disciplines of signal processing, wireless communications, networking, optimization, radar, localization, machine learning, big data, and cyber security are required. This necessitates developing new foundations, mathematical models, and experiments that can capture the new characteristics of next generation networks (e.g., high node density, wide spatial existence, multitude heterogeneity, context awareness, diverse QoS constraints) and jointly account for the multidisciplinary design perspectives. The research center focuses on laying the foundations to achieve intelligent, self-organized, self-optimized, and context-aware management/operation for next generation communication and sensing systems, and hence, realizing and unleashing the potentials of the foreseen smart world era. In addition to the advanced signal processing techniques, application of Artificial Intelligence (AI) and Machine learning (ML) are among the tools to achieve these objectives. The center is also committed to contribute to the development in sensing, including remote sensing, biosensing, and wearable sensors.

Applications covered by the center include wired and wireless communications (5G/6G) and networking, Machine-to-Machine (M2M) communications, sustainable and reliable communications for Autonomous Unmanned Vehicles (AUV), virtual and augmented reality, collision avoidance, localization, navigation, and remote sensing. The initiative will also examine public safety requirement and energy constraints (Green Communications). The IRC-CSS will be a major contribution towards the Saudi and the Middle East Green Initiative that were announced recently by the Kingdom of Saudi Arabia.

Interdisciplinary Research Center for Construction & Building Materials

The Interdisciplinary Research Center for Construction and Building Materials (IRC-CBM) has been recently established to conduct interdisciplinary research projects in the field of engineering and sciences with the objective to design, analyze, and optimize for the development of construction and building materials for local industry and society for socio-economic development in line with the Kingdom's Vision 2030. The main target is to develop materials that are compatible with the aggressive environmental conditions of the Kingdom, energy-efficient, and environment friendly.

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Dr. Mohammed Al-Osta

Director, IRC-CBM

Biography

Dr. Mohammed Al-Osta is the Director of IRC-CBM and an Associate Professor of the Civil and Environmental Engineering, KFUPM. His research interests encompass applications of optimization techniques in civil and environmental engineering; molecular-level simulations of materials; non-linear finite element analysis; computation modeling; corrosion of reinforcing steel in concrete; advanced civil engineering materials; prestressed concrete and steel bridges. Dr. Al-Osta has 10 years industrial experience, designing and constructing many engineering projects. He has extensive experience overseeing and completing 150+ projects ahead of schedule and within the budget.

Education:

- (2013) Ph.D. in Civil and Environmental Engineering, KFUPM.
- (2009) MSc. in Civil and Environmental Engineering, KFUPM.
- (1999) Bachelor Degree in Civil Engineering, University of Sana'a, Yemen.

Experience:

- (2021-Present) Director of IRC-CBM, KFUPM.
- (2013- Present) Board member, ACI, (KSA).
- (2020- Present) Associate Professor in Civil Engineering Department, KFUPM.

Number of granted patents: 1
Number of research papers in peer-reviewed journals: 50+; and 2 book chapters.

The current building and construction materials consume significant energy and emit tremendous greenhouse gases (GHG) during production. With the current restrictions on GHG emissions and energy consumption, there is an urgent need to develop energy-efficient and environment-friendly construction and building materials. For efficient and progressive implementation, the Center will work towards the involvement of all relevant stakeholders. The Center will focus its research on developing sustainable and environment-friendly materials, composite materials, and systems for corrosion prevention, energy-efficient materials, and systems, smart construction materials, non-metallic materials, innovative inspection techniques, health monitoring of structures, modeling the behavior of materials, using machine learning and artificial intelligence and 3D printing of concrete. The Center will also consider developing other construction materials suitable for the local environment, such as asphalt, insulation, coatings, glass, etc.

Some of the issues this Center will tackle include a multidisciplinary approach in developing a wide variety of specialty areas, including sustainable construction systems/materials for severe conditions; use of advanced techniques for assessment of materials and in-situ inspection (buildings, bridges, highways, airports, etc.); use of machine learning and artificial intelligence; use of innovative digital manufacturing techniques; developing reliable non-destructive techniques for the assessment of structures; CO_2-related climate change concerns; eco-friendly recycling of domestic and industrial plastic waste for local asphalt, concrete, and blocks; carbon-negative concrete and blocks; concrete rechargeable batteries; functionally graded materials with nanocomposite structures; predicting carbon emission levels from the existing building industry; and developing a renovation framework to turn them into green buildings using a data mining approach.

Interdisciplinary Research Center for
Finance & Digital Economy

The interdisciplinary research center for Finance and Digital Economy (IRC-FDE) has been established as a new research engine at KFUPM Business School. The IRC-FDE is a game changer and represents the first true integrated and well-supported research platform that will enhance KFUPM's research portfolio in the fields of finance and digitalization by accelerating research productivity; tackling grand research challenges and priorities on a local and global scale; and engaging effectively with industry to provide viable solutions for thriving economy.

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Dr. Mousa Al-Bashrawi

Director, IRC-FDE

Biography

Dr. Mousa Albashrawi is the Director of IRC-FDE and an Assistant Professor in Management Information Systems (MIS) at KFUPM Business School. Industry wise, he is engaged in organizing the first regional FinTech hackathon, giving public workshops, and volunteering as a data scientist consultant for Ministry of Communication and Information Technology. On the academic side, he chaired business analytics concentration and professional master's program and he is an active member of research committee at the university and college levels. His research interests include mobile analytics, social media, entrepreneurial intention, and ML.

Education:

- (2017) Ph. D. in Information Systems- University of Massachusetts USA.
- (2012) MSc. in MIS, University of Colorado, Denver, USA.
- (2009) BSc. in MIS, KFUPM.

Experience:

- (2021 to Present): Director of IRC-FDE, KFUPM
- (2021 to Present): A Program Coordinator for Business Analytics.
- (2017 to Present): Assistant Professor of MIS (KFUPM).

Number of research papers in peer-reviewed journals: 10+

The IRC-FDE comprises five themes that span important topics in finance and digital economy. Finance, as a first part, covers two themes, namely, "quantitative economics and policy" and "corporate finance, governance, and risk". Digital economy, as a second part, covers three themes: "digitally-enabled entrepreneurship, marketing, and innovation", "analytics and digital technologies", and "digital ecosystem".

The center would seek to address essential grand research challenges, for example, accelerate the transformation of the Saudi economy from an oil- based economy to a knowledge economy that has multiple and more diversified sources of output. Secondly, develop financial markets, institutions, products, and regulations to support public and private funding needs and to increase society welfare with emphasizing Islamic finance and banking. Thirdly, improve Saudi company corporate strategies, governance practices, disclosures, and regulations. Fourthly, develop and maintain a digital ecosystem that promotes innovation, creativity, entrepreneurship, and hence economic development. Fifthly, how emerging technologies (e.g., machine learning and analytics, blockchain, big data, FinTech, ecommerce, cloud computing, social media, cybersecurity, etc.) influence economies and societies through creating an impact and building a sustainable practice. Investigating those grand challenges under the above-mentioned themes can advance the society welfare by enabling public and private sectors to find the missing pieces required to build creative and thriving economy.

Interdisciplinary Research Center for
Hydrogen & Energy Storage

KFUPM launched its interdisciplinary research center for hydrogen and energy storage (IRC-HES) in order to contribute in creating an economical and environmental impact through basic and applied research.

The center aims to focus on grand national and strategic challenges, related to Hydrogen, Carbon Capture & Conversion, and Energy Storage.

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Dr. Zain Yamani

Director, IRC-HES

Biography

Dr. Zain Yamani is the Director of Interdisciplinary Research Center for Hydrogen and Energy Storage (IRC-HES), and Professor of Physics, at King Fahd University of Petroleum and Minerals (KFUPM).Dr. Yamani earned his condensed matter Ph.D. in Physics from the University of Illinois at Urbana/Champaign (UIUC, 1999). Dr. Yamani is a founding member of the Saudi Physical Society (SPS), and served as its Vice President for six years. He is also a member numerous international professional societies. Dr. Yamani had served as KFUPM's Coordinator for Downstream Research in the research partnership with the oil giant, Saudi Aramco, overseeing major programs between the two institutions, and is currently the Coordinator of the Saudi Aramco sponsored KFUPM Omar Yaghi Chair on Carbon Capture. Professor Yamani's current research interests are in the fields of photo-induced chemistry and nanomaterials development for energy applications. He received a number of awards amongst which was The King Abdul-Aziz Medal for his scientific accomplishment, in 2006, and The Custodian of the Two Holy Mosques Award for Honoring the Inventors and Gifted Ones, in 2017.

Education:

- (1999) Ph.D. in condensed matter Physics, University of Illinois (UIUC), Champaign, IL, USA.

Experience:

- (2021-Present) Director of IRC-HES, KFUPM.
- (2007 - 2021) Director of Center of excellence in Nanotechnology, KFUPM.

Number of granted patents: 30+ US patents.
Number of research papers in peer-reviewed journals: 200+

As part of the Center's interests, hydrogen is one of the leading options for clean and sustainable energy, attributed to its minimal environmental side effects. The economic value of hydrogen is globally known, with high demand from energy agencies and other industrial sectors.

Specifically, The IRC-HES's Hydrogen Program envisions to promote blue hydrogen production through hydrocarbon gasification with carbon capture. Specific topics include:

- Blue and Green H_2 production
- H_2 separation
- H_2 storage
- H_2 sensing
- H_2 utilization

Through its Carbon Capture & Conversion Program, IRC-HES aims to devise CO2 emission mitigation solutions in favor of environmentally friendly hydrocarbon based economy by focusing on:

- Pre-Combustion
- Post-Combustion
- Oxy-Fuel Combustion
- Thermo-Catalytic Conversion
- Electrochemical Conversion

Energy Storage Program at IRC-HES aims to enable safe, cost-effective, and high performance rechargeable batteries by focusing on:

- Development of energy storage technologies for stationary as well as mobile applications.
- Safety and reliability of energy storage devices integrated with systems.
- Sustainability of energy storage technologies.

Interdisciplinary Research Center for Intelligent Manufacturing & Robotics

Intelligent Manufacturing and Robotics (IMR) is the University's strategic response to the manufacturing requests recommended by several national investing reports including National Industrial Development and Logistics Program (NIDLP) and Vision 2030. KFUPM took the opportunity to channel the research under known ceilings to serve the country and beyond. On this note, the Interdisciplinary Center for Intelligent Manufacturing and Robotics was launched.

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Dr. Samir Mekid

Director, IRC-IMR

Biography

Dr Samir Mekid is Professor of Mechanical Engineering, a Chartered Engineer registered with IMechE (UK) and ASME member. He joined Caterpillar, then worked as Assistant Professor at UMIST (UK) and The University of Manchester (UK). He was member of the EU funded Network of Excellence for Innovative Production Machines and Systems and member of the Scientific Advisory Board of the Centre of Excellence in Metrology for Micro and Nanotechnology in the UK. He was consultant to several companies.

Education:

- (1994) Ph.D. in Mechanical Systems DesignCompiegne University of Technology,France.
- (1989) MSc of Mechanical Engineering Compiegne University of Technology,France.

Experience:

- (2021-Present) Director of IRC-IMR, KFUPM.
- (2013- Present) Professor at KFUPM.
- (2001-2008) Assistant Professor, University of Manchester (UK).
- (2002-2010) Expert Evaluator to EU framework projects programs e.g., FP6, FP7.
- (1994-1998) Design Engineer at Caterpillar (France).

Number of granted patents: 30+ US patents.
Number of research papers in peer-reviewed journals: 100+; and 3 published books.

Manufacturing represents a cornerstone of the Kingdom's aspirations to expand its industrial sector, which needs to automate manufacturing, create opportunities out of IR4.0, and accelerate the implementation of primary and digital infrastructure projects. In addition, the steady rise of robotics in almost all industrial and service sectors is accelerating, and the Kingdom must capitalize on this emerging opportunity. The focus areas of this center includes: Cyber Physical Production Systems, Digital Twin Manufacturing, 3D/4D printing, AI-enabled manufacturing, IR4.0 factory setup for large companies, Internet of Things and Smart Devices, Mechatronics and Control Systems for Intelligent Automation, Autonomous Robots, Downhole Robotics in oil and gas wells, and manufacturing assisted by Swarm Robotics and Cobots (robots intended for direct human interaction).

Some of the challenges to be tackled include: total implementation of IR4.0 in smart manufacturing for improved productivity, quality of production for high-tech requirements, cutting edge technologies for intelligent manufacturing and collaborative robotics, data enabled predictive maintenance, customization and modularization in manufacturing systems. This will also include digital metrology (study of measurement) and reverse engineering, on-request customized properties for added additive manufactured parts, decentralized autonomous production systems, increased operational transparency, and autonomous intelligent functional robots for manufacturing.

The focus of this center as far as robotics is concerned is on intelligent robots – not just robots that do repetitive tasks in a fixed process, but robots that can learn from their environment and improve themselves to respond to variables in their surroundings, thus maximizing their impact and contribution to both manufacturing plants and to services.

Interdisciplinary Research Center for
Intelligent Secure Systems

The Interdisciplinary Research Center for Intelligent Secure Systems (IRC-ISS) is a recently established center at KFUPM to revamp the research activities in the fields of Cybersecurity and Artificial Intelligence (AI). The center will be home for faculty and researchers from various departments, including Computer Science, Computer Engineering, Electrical Engineering, Systems Engineering, Math, Physics, and many other departments.

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Dr. Muhamad Felemban

Director, IRC-ISS

Biography

Dr. Muhamad Felemban is the Director of IRC-ISS, and an Assistant Professor in the Computer Engineering Department, the College of Computing and Mathematics at KFUPM. His research interests include modeling and designing secure and resilient computer systems, and developing privacy-preserving solutions. He is also interested in Quantum Computing, particularly in application of quantum computing in Optimization and post-quantum security.

Education:

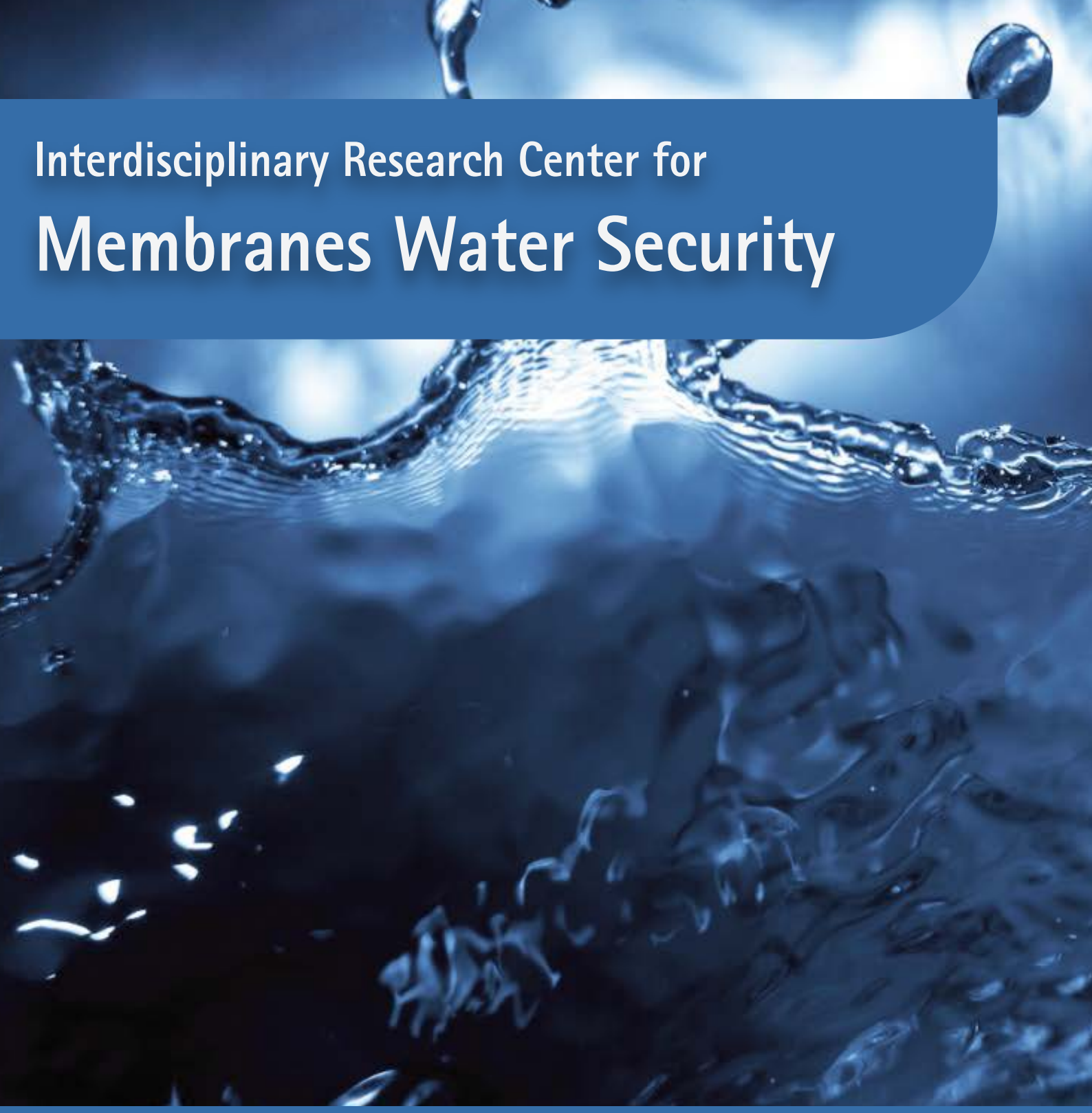
- (2018) Ph.D. in Electrical and Computer Engineering, Purdue University, West Lafayette, IN, USA.
- (2011) Master's in Computer Science, King Abdullah University of Science and Technology (KAUST).
- (2008) Bachelor of Computer Engineering, KFUPM.

Experience:

- (2021 -Present) Director of IRC-ISS, KFUPM.
- (2018-Present) Assistant Professor, Computer Engineering Department, KFUPM.

IRC-ISS is expected to play a leading role in tackling research challenges related to the design and development of intelligent secure systems, both from the point of view of physical and cyber security. IRC-ISS will address various problems under these focus areas including advanced surveillance systems, proactive security systems, advanced security sensors, and resilient cyberinfrastructure. In addition, IRC-ISS will tackle open problems related to auto-healing systems, cloud and edge computing security, blockchain novel applications, IoT and Industrial IoT security, quantum-resistant cybersecurity, and post-quantum cryptography.

Another grand challenge is to develop proactive security systems through AI, Machine Learning, and Behavior Analytics. For example, taking physical security from rudimentary facial recognition into advanced emotional interpretation, such that the system can identify threats before they materialize and before incidents. The center will also seek to increase the security and resiliency of industrial control systems and industrial Internet-of-Things devices by tenfold, research security systems that auto-heal and require no intervention once a breach has occurred, use blockchains to enhance security in educational, financial, and health sectors by tenfold, and research impenetrable edge computing devices. IRC-ISS aspires to be a leading regional research center in quantum computing by conducting fundamental theoretical and experimental research in quantum information and computing. In addition, the center will seek to develop quantum-resistant security protocols and investigate the capability of post-quantum cryptography, such as lattice-based, hash-based, and code-based, that can defeat post-quantum computing power.



Interdisciplinary Research Center for
Membranes Water Security

Saudi Arabia is one of the largest arid countries without permanent rivers or lakes and is challenged by water scarcity. Water touches every aspect of development and it links with nearly every sustainable development goal. It drives economic growth, supports healthy ecosystems, and is essential and fundamental for life itself. On the other hand, membranes represent an important element that is utilized in numerous industrial sectors, including refining, chemical processing, mining, and most importantly water desalination and waste water treatment. Therefore, long-term strategies for water security as well as the development of sustainable, energy efficient, and inexpensive membrane technologies are urgently required.

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Dr. Isam H. Aljundi

Director, IRC-MWS

Biography

Dr. Aljundi is the Director of IRC-MWS and a Professor of Chemical Engineering at KFUPM. He received his Bachelor and Master's Degrees in Chemical Engineering from Jordan University of Science and Technology. In 2001, he received his Ph.D. in Chemical Engineering from Cleveland State University, Ohio, USA. During his career, he supervised many graduate students and published papers in peer-reviewed journals.

He managed different multi-million SR projects and established a state-of-the-art membrane/adsorption separation laboratory. His research is currently focused on membrane separation processes.

Education:

- (2001) Ph. D. in Chemical Engineering, Cleveland State University, Cleveland, OH, USA.
- (1995) MSc. in Chemical Engineering, Jordan University of Science and Technology.
- (1993) BSc. in Chemical Engineering, Jordan University of Science and Technology.

Experience:

- (2021-Present) Director of IRC-MWS, KFUPM
- (2021- Present) Professor of Chemical Engineering (KFUPM)

Number of granted patents: 3 US patents.
Number of research papers in peer-reviewed journals: 35+

The vision of the center is to be renowned as a research center pursuing vital solutions to global challenges in membrane separation processes and water security. We would like to help shaping the water policy in KSA by providing decision-makers relevant scientific data and would like to establish real collaborative research with national and international institutions. The focus areas of the center are : Water security, desalination, water treatment, and membrane technology.

The objectives of this center include: providing effective solutions to industrial challenges such as desalination/water treatment, gas separation, and liquid mixture separation, with special focus on advanced membrane materials development, characterization, formulation, and performance evaluation. It aims to localize membrane technologies (due to their impact on the national economy and strong relevance to the 2030 Vision), provide the Kingdom with the needed technological advancements in the industry of gas, water, and solvent processing, and improve the efficiency of utilizing the Kingdom's gas reserves and industrial water management. The Center will emphasize developing effective techniques for water purification and desalination. The center will also provide superior educational and research experience for faculty members, research scientists, graduate and undergraduate students.

Some of the big questions the center will tackle: How to address the impacts of climate change on the quality and quantity of water resources? How to manage brine effluents? How to design and develop better, cheaper membranes to separate specific mixtures of chemicals with better permeability and selectivity? How to develop membranes that are resistant to fouling even from polluted water sources? How to develop thin membranes with nanoporosity and high stability for organic solvent separation and dehydration? How to scale up membranes in a cost-effective manner?

Interdisciplinary Research Center for Refining & Advanced Chemicals

The main mission of the Center for Refining & Advanced Chemicals (CRAC) is to develop catalytic technologies for the production of clean fuels, petrochemicals, and polymers. The Center aims to maximize value of crude oil by converting to high-demand chemical products at the interface of catalytic chemistry and reaction engineering. CRAC has over three decades of R&D-business experience related to downstream industry. It provides technical support to the downstream industry via catalyst screening, selection and generate reactor models at molecular level.

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Dr. Hassan S. Alasiri

Director, IRC-RAC

Biography

Dr. Hassan S. Alasiri is Director, Center for Refining & Advanced Chemicals, and Assistant Professor, Chemical Engineering Department, at KFUPM. His research interests are catalysis, kinetic reaction and modelling, surface reactions, adsorption & separation, molecular simulation, interface properties and phase behavior. He is skilled in computational kinetics, modeling and simulation. He is the project manager of many client-funded research projects for Saudi Aramco and Sinopec RIPP. He has published research papers in ISI journals and is the inventor of several USPTO patents and invention disclosures.

Education:

- (2016) Ph.D. in Chemical Engineering, Rice University, Houston, TX.
- (2011) MSc in Chemical Engineering, KFUPM.
- (2006) Bachelor of Chemical Engineering, KFUPM.

Experience:

- (2018-Present) Director of CRAC, KFUPM.
- (2017-Present) Assistant Professor, Chemical Engineering Department.
- (2019-2021) Member of Technical Plastic Committee, Saudi Standards, Metrology and Quality (SASO).
- (2020-2021) Member of Technical Plastic Committee, International Organization for Standardization (ISO).

In addition to research programs on refining, petrochemicals, polymers and computational kinetics, the center concentrates on crude oil sustainability and conversion of plastic wastes. The Center thrives to accelerate efforts to develop technologies that support green energy transition and foster outstanding talent. In collaboration with KFUPM faculty members, the Center reinforces the competitiveness of downstream industries and contribute to the resolution of industrial problems by performing R&D in chemical and catalytic technologies. CRAC also participates in graduate studies, supervision and training.

With state-of-the-art facilities and partnerships with leading companies in the Kingdom (Aramco and Sabic) and around the globe (Honeywell UOP and Sinopec RIPP), CRAC provides researchers with a unique scientific environment that fosters groundbreaking research, collaboration and training of young researchers. In collaboration with Aramco, the Center is establishing the Petroleum Conversion Research Center at KFUPM DTV dedicated for catalyst and process evaluation.

CRAC drives innovation in catalysis research (heterogeneous and homogeneous) for various applications and work on expanding global cooperation. It also supports innovative pursuits of the chemical industry and strengthens R&D capacity to resolve social issues. Currently, the Center houses 15 laboratories equipped with modern facilities for: catalyst synthesis, materials characterization and analysis, bench scale reactors for catalyst evaluation and process development, polymer synthesis, processing and testing. The Center has the organization, core facilities, expertise and the dedication for solving technical problems of the domestic downstream industry.

Interdisciplinary Research Center for Renewable Energy & Power Systems

Interdisciplinary Research Center for Renewable Energy and Power Systems (IRC-REPS), was launched as a pioneering coordinated structure to advance applied research focusing on renewable energy and fundamentally enabling power system technologies in 2007. IRC-REPS is a unique fully integrated industrial and academic research entity able to bring all engineering disciplines and technological research capabilities under one umbrella.

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Dr. Fahad A. Al-Sulaiman

Director, IRC-REPS

Biography

Dr. Fahad A. Al-Sulaiman has more than 20 years of experience in renewable energy, energy efficiency, cogeneration, water desalination, cooling systems, power systems, sustainability, techno-economic studies, life cycles analysis, policies and regulations, training programs, and projects and programs management.

Education:

- (2012) Post-Doctoral in Clean Water and Clean Energy, Massachusetts Institute of Technology (MIT), Cambridge, MA, USA.
- (2010) Ph.D. in Mechanical Engineering with specialty in Energy, University of Waterloo, Canada.
- (2001) BSc. and (2003) MSc. in Mechanical Engineering, KFUPM

Experience:

- (2021-Present) Director of IRC-REPS KFUPM.
- (2016-Present) Director of JRC-CEEE.
- (2015) Visiting Professor, National University of Singapore.
- (2014-2021) Director of the Center of Research Excellence in Renewable Energy.
- (2021-Present) Program Coordinator for the Intelligent Energy Systems Management.
- (2011) Visiting Professor, Massachusetts Institute of Technology (MIT), Cambridge, MA.
- (2008) Energy Researcher, National Research Council Canada.
- Won AEE's Energy Professional Development Award 2021.

IRC-REPS multidisciplinary research approach is focused on excellence in alternative and clean energy efficient related academic research and development solutions for the benefit of the Kingdom of Saudi Arabia and supporting the local energy industry to attain development and growth in renewable and sustainable energy technologies. IRC-REPS is focused on the KSA's diverse and challenging development of sustainable and energy efficient solutions that address the social, environmental, and economic impacts of the electric power industry and help achieve the Saudi Vision 2030 objectives.

We offer a set of unique resources under one roof to investigate how to prepare the Kingdom's energy infrastructure for an infusion of renewable power, to upload and download energy, to optimize storage devices, and to control strategies for power delivery. It is an ideal place for collaborative partnerships, where industrial vendors and operators can test their new ideas, technologies, and architectures.

Interdisciplinary Research Center for
Smart Mobility & Logistics

Smart Mobility and Logistics (SML) is an interdisciplinary research center dedicated to address both mobility of people and freight as well as logistics. The center aims at creating and disseminating new knowledge in smart mobility and logistics that makes a scholarly impact, provides innovative solutions, and adds value to the thriving national economy. The research in mobility and logistics and the digital technology that can add intelligence autonomy and decision making in these fields are strategic research and development areas.

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Dr. Sami El Ferik

Director, IRC-SML

Biography

Dr. Sami El Ferik is the director of SML and a Professor in Control and Instrumentation Engineering Department, KFUPM. His research interests are in Sensing, Monitoring and Control with strong multidisciplinary research and applications. His research contributions are in control of autonomous multi-agent systems, biological models of fleet of unmanned aerial vehicles, process control, control loop performance monitoring, modelling and control of stochastic systems, analysis of network stability and condition-based maintenance.

Education:

- (1996) Ph.D. Control and Automation Electrical and Computer Engineering, University of Montreal, Montreal, Canada.
- (1991) Masters of Control and Automation Electrical and Computer Engineering, University of Montreal, Montreal, Canada.
- (1988) Bachelor of Electrical Engineering, Laval University, Quebec, Canada.

Experience:

- (2021-Present) Director of Smart Mobility and Logistics, KFUPM.
- (2000-Present) Professor in the Control and Instrumentation Engineering Department, KFUPM).
- (1996-2000) Senior Staff Control Analyst: Pratt and Whitney, Canada.

Number of granted patents: 12 US patents plus 4 filed.
Number of research papers in peer-reviewed journals: 35 +

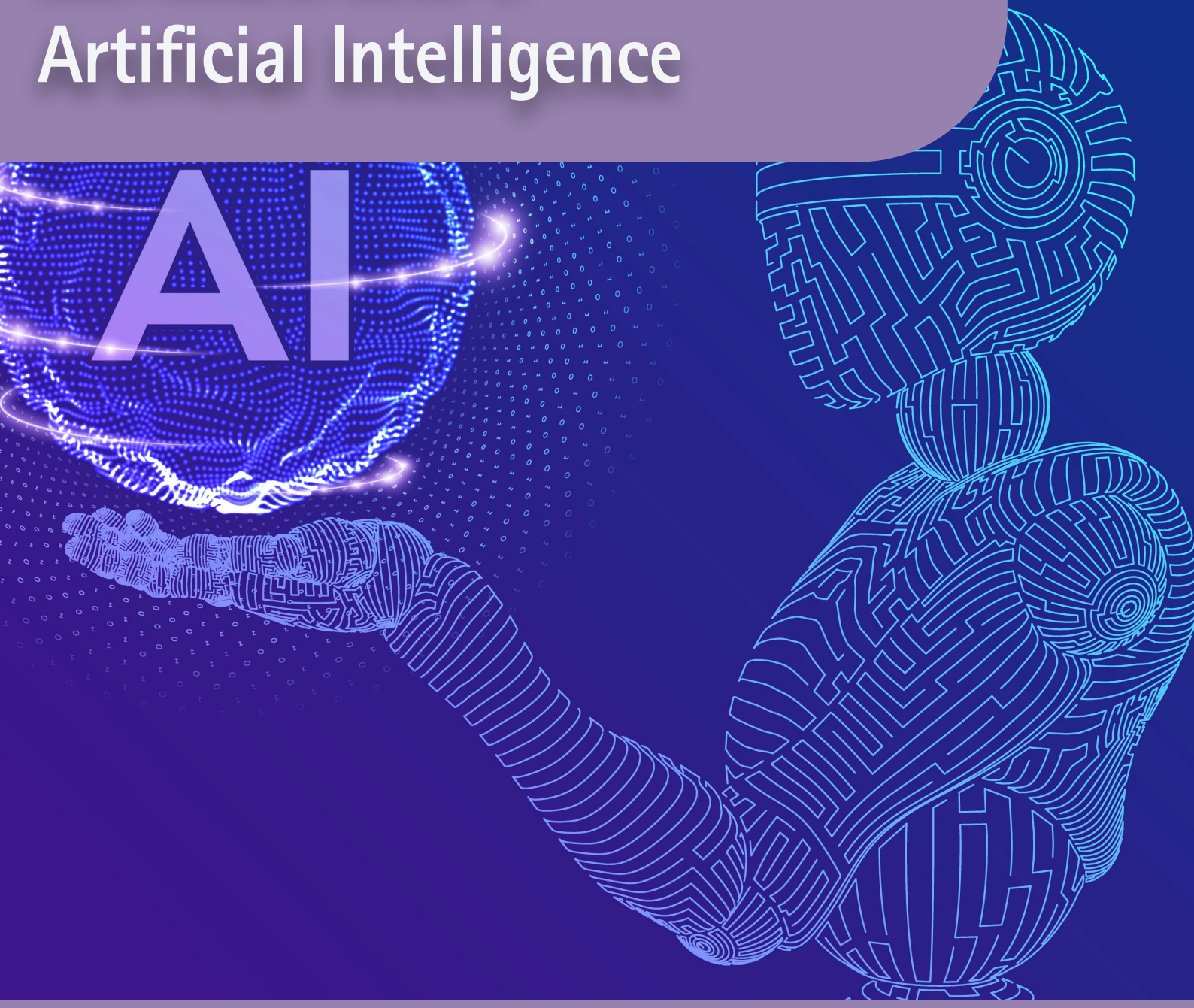
Future mobility is seeing a tremendous worldwide competition. Many industrial and research institutions are trying to get a lead in the development of the technology and therefore establish themselves in these emerging markets. The center's research efforts focus on the following pillars -smart technology, AI/ML, sustainable smart infrastructure, mobility modes, mobility as a service, clean energy, efficient and optimal logistics, as well as transportation studies.

The center intends to address the challenges in the above areas by dividing the research activities into 3 main types: System Integration, Applied Research, and Fundamental Research. The research areas in SML cover 3 main and complementary areas: Smart cities/ Technologies, Mobility as a system, as well as Logistics. We intend to maximize the impact of the center by engaging in research that produces solutions that responds to the local needs/environment as well as the regional and global market.

The center aims at:

- Equipping Cities/urban areas with the necessary intelligence that will allow modeling, prediction and growth.
- Offering different mobility services that are driven by AI/ML.
- Managing crowd during major events using smart cities technologies.
- Generating green power sources with optimized performance operability and stability.
- Reducing cost and enhance reliability of smart systems.
- Maximizing the autonomy in different mobility modes.

Joint Research Center of
Artificial Intelligence



SDAIA-KFUPM Joint Research Center for Artificial Intelligence (JRC-AI) was recently established at KFUPM to advance the research in the field of Artificial Intelligence (AI). The center aims to establish the Kingdom as a global leader among the league of data-driven economies by conducting and supporting research and innovation in AI, developing use-cases and solutions in accordance with the Saudi National Strategy of Data & AI to achieve the Kingdom's Vision 2030.

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Dr. Motaz Alfarraj

Director, JRC-AI

Biography

Dr. Motaz Alfarraj is the Acting Director of JRC-AI at and Assistant Professor in the Electrical Engineering Department at KFUPM. His research interests include Machine Learning, Deep Learning, Computer Vision, and Image Processing. His research focuses on the integration of Physics in data-driven systems to enable effective learning from noisy or data for applications in oil and gas exploration and production. He is a member of Society of Exploration Geophysicists (SEG), and Society of Petroleum Engineers (SPE).

Education:

- (2019) Ph.D. in Electrical and Computer Engineering with a minor in Math, Georgia Institute of Technology, Atlanta, GA, USA.
- (2015) M.Sc. in Electrical and Computer Engineering with a minor in Math, Georgia Institute of Technology, Atlanta, GA, USA.
- (2013) Bachelor of Electrical Engineering with First Class Honors, KFUPM.

Experience:

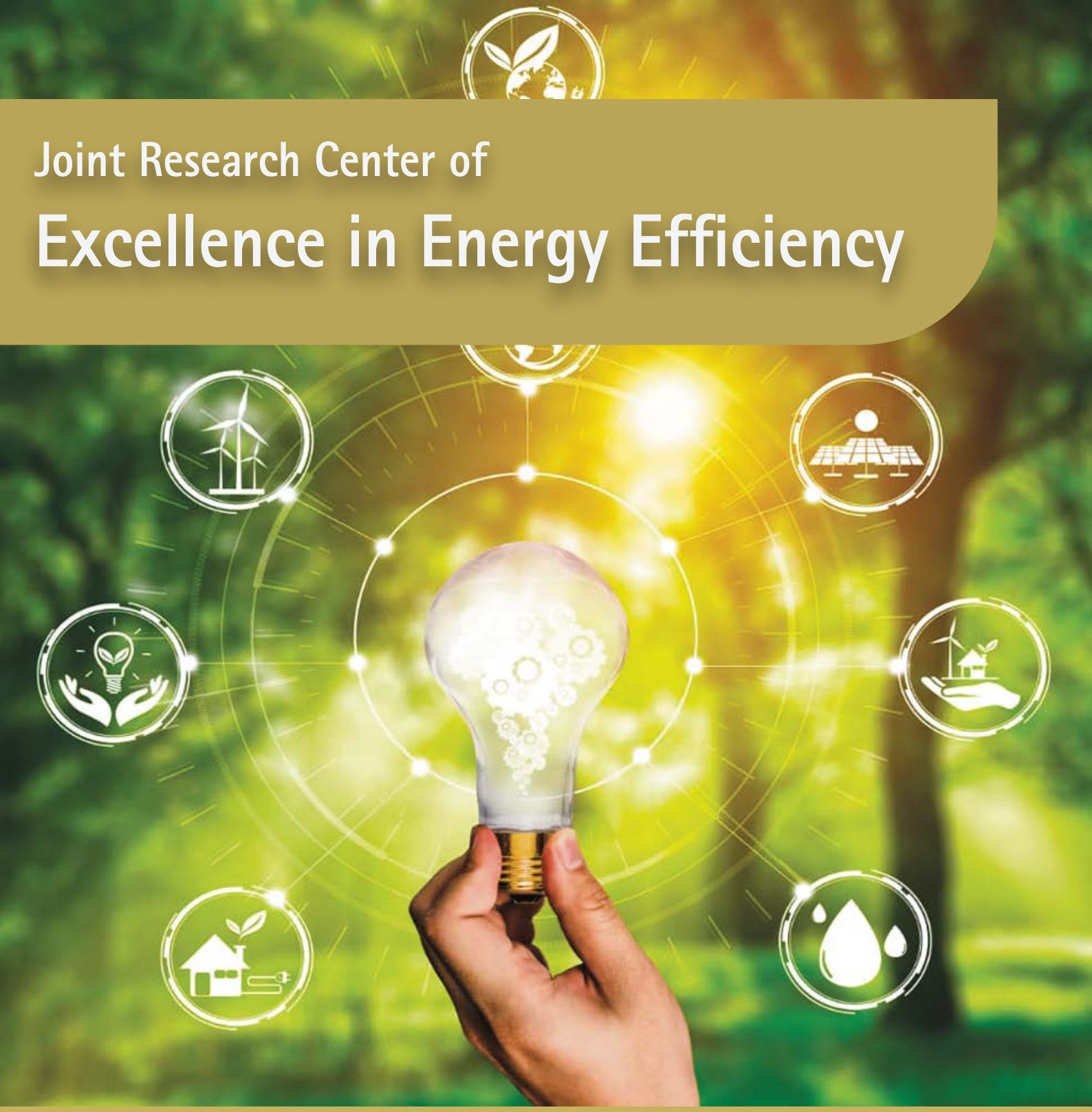
- (2021-Present) Acting Director of SDAIA-KFUPM Joint Research Center for Artificial Intelligence (JRC-AI), KFUPM.
- (2020-Present) Chairman of the Executive Committee of the Center for Energy and Geo Processing (CeGP), KFUPM.
- (2020-Present)Chair of Saudi Arabia IEEE Signal Processing Society Chapter.

The center focuses on various topics in the field of AI including Machine Learning, Deep Learning, Computer Vision, Reinforcement Learning, Knowledge Representation, Learning Theory, Natural Language Processing, and Bioinformatics. In addition, the center mainly focuses on applications of AI in two fields: Oil and Gas, and Energy and Utility.

The applications of oil and gas field include the oil and gas exploration and production pipeline such as seismic acquisition and processing, data compression and enhancement, seismic interpretation and inversion, reservoir characterization, real-time drilling, fault detection and risk assessment, production optimization, modeling and simulation, and site security and safety monitoring. On the other hand, the applications of the energy and utility cover energy generation, monitoring, scheduling, forecasting, efficiency, and control for conventional, renewable, and hybrid power systems.

The center's research activity aims to develop the projects it undertakes into Proof-of-Concept (POC) and Minimum-Viable-Product (MVP), in addition to establishing a presence in global academic venues in the fields of its expertise. Also, the center aims to attract, support, and train talents in the Kingdom in the field of AI by developing and conducting training programs for young talents, academic faculties, and executives.

Joint Research Center of
Excellence in Energy Efficiency



The vision of the Joint Research Center of Excellence in Energy Efficiency (JRC-EEE) is to help buildings, industries and cities become smarter and more energy efficient, and save money by prioritizing the introduction of innovative and new energy solutions, and above all, make Saudi Arabia's vision 2030 a reality. The Center's mission is to support and advance innovative solutions and economically viable technologies that improve the effectiveness and efficiency of building operations and industrial facilities, and encourage energy efficiency in residential, commercial, and industrial sectors.

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Dr. Fahad A. Al-Sulaiman

Director, JRC-EEE

Biography

Dr. Fahad A. Al-Sulaiman is the Director of Center of Excellence in Energy Efficiency (CEEE) as well as the Director of Interdisciplinary Research Center for Renewable Energy and Power Systems (IRC-REPS).

Education:

- (2012) Post-Doctoral in Clean Water and Clean Energy, Massachusetts Institute of Technology (MIT), Cambridge, MA, USA.
- (2010) Ph.D. in Mechanical Engineering with specialty in Energy, University of Waterloo, Canada.
- (2001) BSc. and (2003) MSc. in Mechanical Engineering, KFUPM

Experience:

- (2021-Present) Director of IRC-REPS KFUPM.
- (2020-Present) Director of the Office of Cooperation with KACARE.
- (2016-Present) Director of JRC-EEE.
- (2020-2022) Vice President- Association of Energy Engineers, Saudi Chapter.
- (2019 & 2002) Visiting Consultant at Aramco.
- (2017) Visiting Professor, Oxford University, United Kingdom.
- (2015) Visiting Professor, National University of Singapore.

Number of granted patents: 12 US patents.
Number of research papers in peer-reviewed journals: 120+.

The Center of Excellence in Energy Efficiency (CEEE) at King Fahd University of Petroleum and Minerals (KFUPM) was established in October 2016 with the primary objective of improving energy efficiency in Saudi Arabia and the Middle East region. The CEEE was established with support from the Saudi Energy Efficiency Program (SEEP) in response to Saudi Arabia's Vision 2030. The center's aim is to contribute towards sustainable development by focusing on energy efficiency and renewable energy solutions, as well as promoting advanced energy technologies and techniques throughout the country. CEEE aspires to be an interdisciplinary research institute dedicated towards energy efficiency improvement.

The sectors that CEEE aims to target include:

- Energy Productivity for Public and Private Stakeholders.
- Energy consumption improvement for manufacturing facilities and plants.
- Utilities (Electricity and Water).
- Buildings, Industries, Transportations, and Agriculture, and Other Sectors.
- Education, Training and Consultation.

CEEE seeks to tackle the following challenges:

- The assessment of energy consumption practices and conservation opportunities for industrial clients.
- Achievement influenced by economic activity and structural change.
- Energy consumption reduction as per unit of activity and relative to a base year, projection, or benchmark. (Such as GDP)
- Encouraging Policy Progress.

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