AMERICAN UNIVERSITY OF BEIRUT

MAROUN SEMAAN FACULTY OF ENGINEERING & ARCHITECTURE

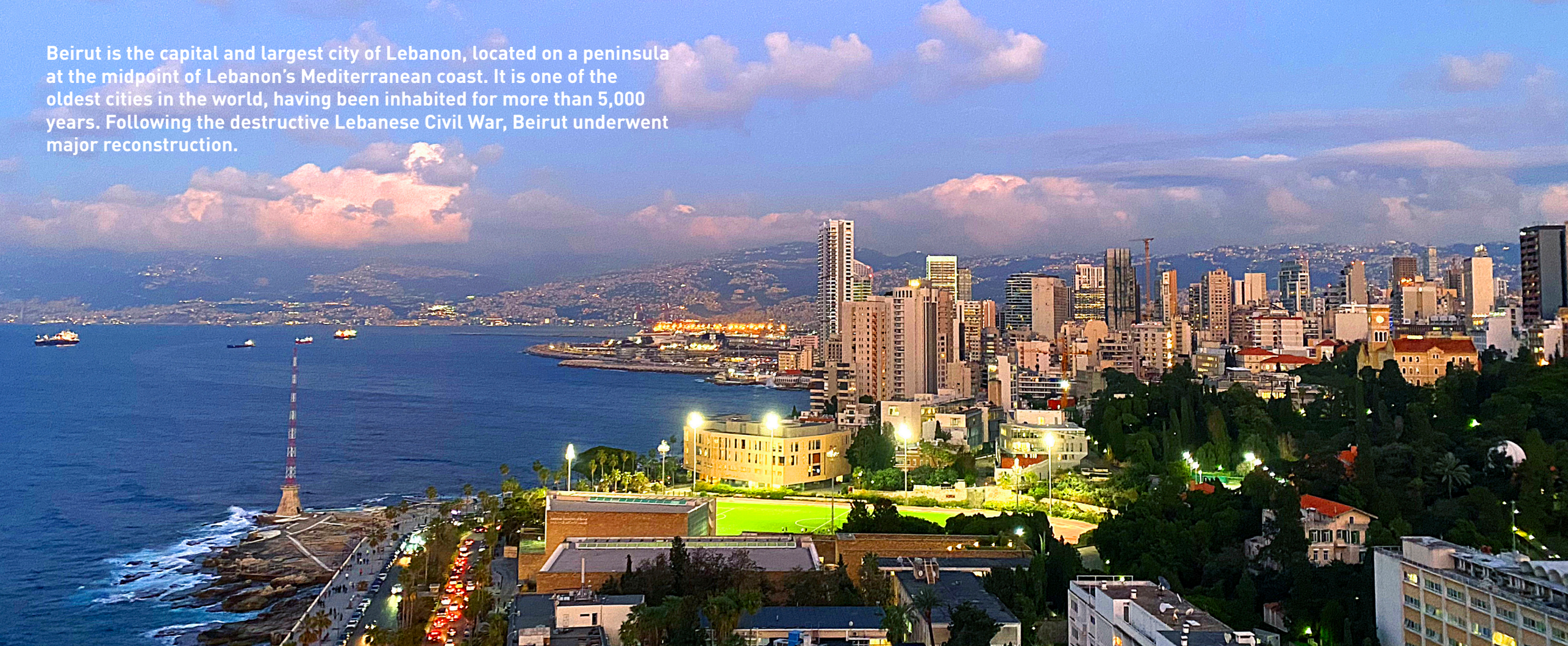
WHAT KIND OF WORLD DO WE WANT TO **LIVE IN?**

AMERICAN UNIVERSITY OF BEIRUT

MAROUN SEMAAN FACULTY OF ENGINEERING & ARCHITECTURE

WHAT KIND OF WORLD DO WE WANT TO **MAKE?**

Front cover image:
Participants – from diverse backgrounds, countries, and professions – in the Humanitarian Engineering winter school on a field visit to refugee camps in Lebanon's Bekaa valley.



Beirut is the capital and largest city of Lebanon, located on a peninsula at the midpoint of Lebanon's Mediterranean coast. It is one of the oldest cities in the world, having been inhabited for more than 5,000 years. Following the destructive Lebanese Civil War, Beirut underwent major reconstruction.

THE AMERICAN UNIVERSITY OF BEIRUT

Founded in 1866, the American University of Beirut (AUB) bases its educational philosophy, standards, and practices on the American liberal arts model of higher education.

You could say that AUB wrote the UN Charter. US Attorney General Robert Kennedy was reluctant to admit it but AUB produced more authors of the UN Charter than any other university in the world. We produce leaders.

FADLO R. KHURI - AUB PRESIDENT

AT AUB*

8,000 STUDENTS

51% FEMALE

49% MALE

80% FROM LEBANON

20% FROM 90 DIFFERENT COUNTRIES

THE MEDICAL CENTER

7 DORMITORIES

2 ART GALLERIES

3 MUSEUMS

THE CHARLES HOSTLER STUDENT CENTER

4 LIBRARIES

7 FACULTIES

Faculty of Agricultural and Food Sciences (FAFS)
Faculty of Arts and Sciences (FAS)
Faculty of Health Sciences (FHS)
Faculty of Medicine (FM)
Maroun Semaan Faculty of Engineering and Architecture (MSFEA)
Suliman S. Olayan School of Business (OSB)
Hariri School of Nursing (HSON)

*As of October 2021

WE ARE MSFEA

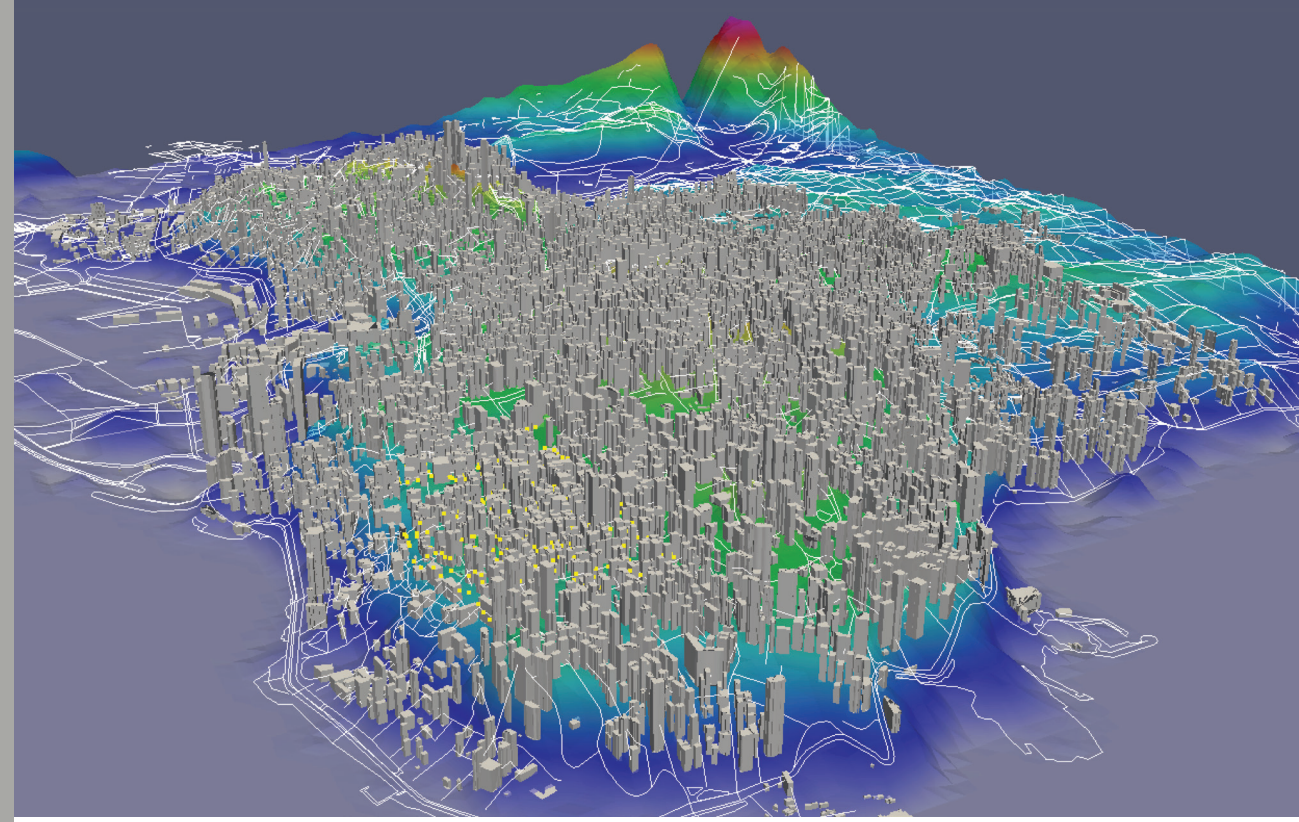
The Maroun Semaan Faculty of Engineering and Architecture (MSFEA) is situated on the shores of the Mediterranean and has at its doorstep the challenges of the Global South.

The contexts of Lebanon and the region inspire our award-winning faculty to research solutions to some of the world's most difficult and pressing problems—whether postwar reconstruction, managing chronic water scarcity, food production for a heating planet, low-energy buildings, or restoring privacy in a hyper-connected world.

We offer world-class educational programs that prepare students for the engineering, architecture, and design professions. We prepare students to be engaged citizens and leaders, entrepreneurs, and researchers who deploy their skills with ingenuity, integrity, and a sense of responsibility towards future generations.

We ask ourselves ‘what problems of the global South are we at an advantage to solve because **we are in Beirut?’**

ALAN SHIHADEH - MSFEA DEAN

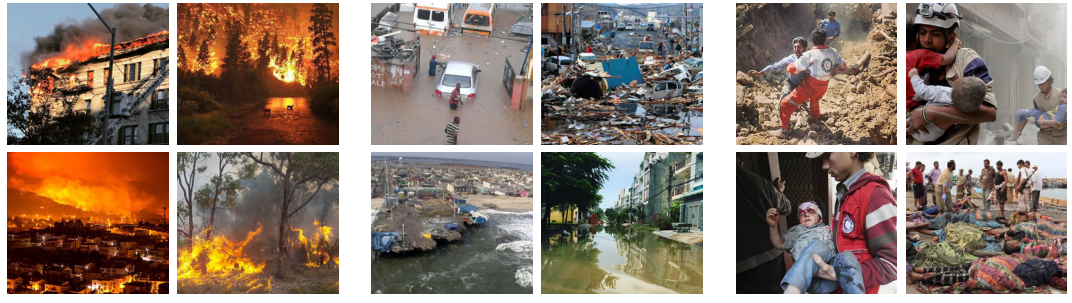


The **Beirut POEM** project studies the interaction of urban form, weather patterns, and air pollution sources to drive building regulations and emission control policies for dense cities.

The **Beirut Street Museum** project is a conceptual museum experience that takes you on a journey through the streets of the city and their unexplored visual and verbal artifacts that usually go unnoticed.

The **MED GAIMS** project leverages technology and the rich archeological heritage of Lebanon by creating virtual games that bring historical sites to life.

Aiming to shed light on the unfavorable aspects of the city that are taken for granted, like the lack of public space, our students and faculty in the **BePublic** project developed installations that engage the public and spark a discussion.



(a) Fires (b) Floods (c) Human

(d) Infrastructure (e) Natural Landscape

Twitter in times of crisis: MSFEA researchers are developping AI algorithms that can detect and classify disaster sites from social media posts as an early warning system for first responders.

WHAT DO WE TEACH?

Bechtel Building - MSFEA's headquarters, on AUB's lower campus.

DEPARTMENTS

PROGRAMS

	ARD ARCHITECTURE & DESIGN	CEE CIVIL & ENVIRONMENTAL ENGINEERING	CHEN CHEMICAL ENGINEERING & ADVANCED ENERGY	IEM INDUSTRIAL ENGINEERING & MANAGEMENT	ECE ELECTRICAL & COMPUTER ENGINEERING	ME MECHANICAL ENGINEERING	BMEN BIOMEDICAL ENGINEERING
BACHELOR'S	Architecture	Civil	Chemical	Industrial & Management	Electrical & Computer	Mechanical	
	Graphic Design	Construction (BS)	Chemical (BS)		Computer & Communications		
					Computer Science		
MASTER'S	Urban Design	Civil	Chemical	Engineering Management	Electrical & Computer	Mechanical	
	Urban Planning & Policy	Environmental & Water Resources	Chemical (MS)	Engineering Management Online		Applied Energy	
		Environmental Technology (MS)				Energy Studies (MS)	Biomedical (MS)
PHD		Civil			Electrical & Computer	Mechanical	Biomedical
		Environmental & Water Resources			AI & Data Science Diploma	Green Technologies Diploma	
ONLINE						Building Energy Systems	

Our graduates have the hands-on skills and creative confidence needed to work in small, collaborative, fast-moving, and design-based enterprises.

INTERDISCIPLINARY DESIGN PRACTICE PROGRAM (IDPP)

The IDPP uses human-centered design principles to develop students' ability to problem find and problem frame as expertly as they problem solve. Through integrating experiential and exploratory pedagogical methods across MSFEA, the Program aims to develop a generation of leaders who will have the intellectual agility, collaborative abilities, and tolerance for ambiguity — along with the rigorous technical expertise — necessary to meaningfully address complex 21st century challenges.

Peer design advisors embedded into a classroom and facilitating the session by empowering students to implement design thinking.

HUMANITARIAN ENGINEERING PROGRAM

The course encourages participants to engage in designing engineering solutions that alleviate health challenges in protracted humanitarian crises. Featuring interactive lectures and field visits to Syrian refugee settlements and facilities for interviews with care workers and refugees, local and international exchange students work in teams to conduct needs assessments, identify problems, ideate, design, and prototype solutions.

"Designing Solutions for Health Challenges in Crises" is a course given annually that attracts participants from all over the world.

MSFEA trains future engineers, architects, and designers who can advocate policy, are aware of the major challenges and questions of our times, appreciate the interdependencies of social, engineered, and natural systems, and possess the creative confidence to productively engage the most difficult problems facing society.

Students gathering data in the Bekaa Valley for the Humanitarian Engineering Course.

ENTREPRENEURSHIP INITIATIVE

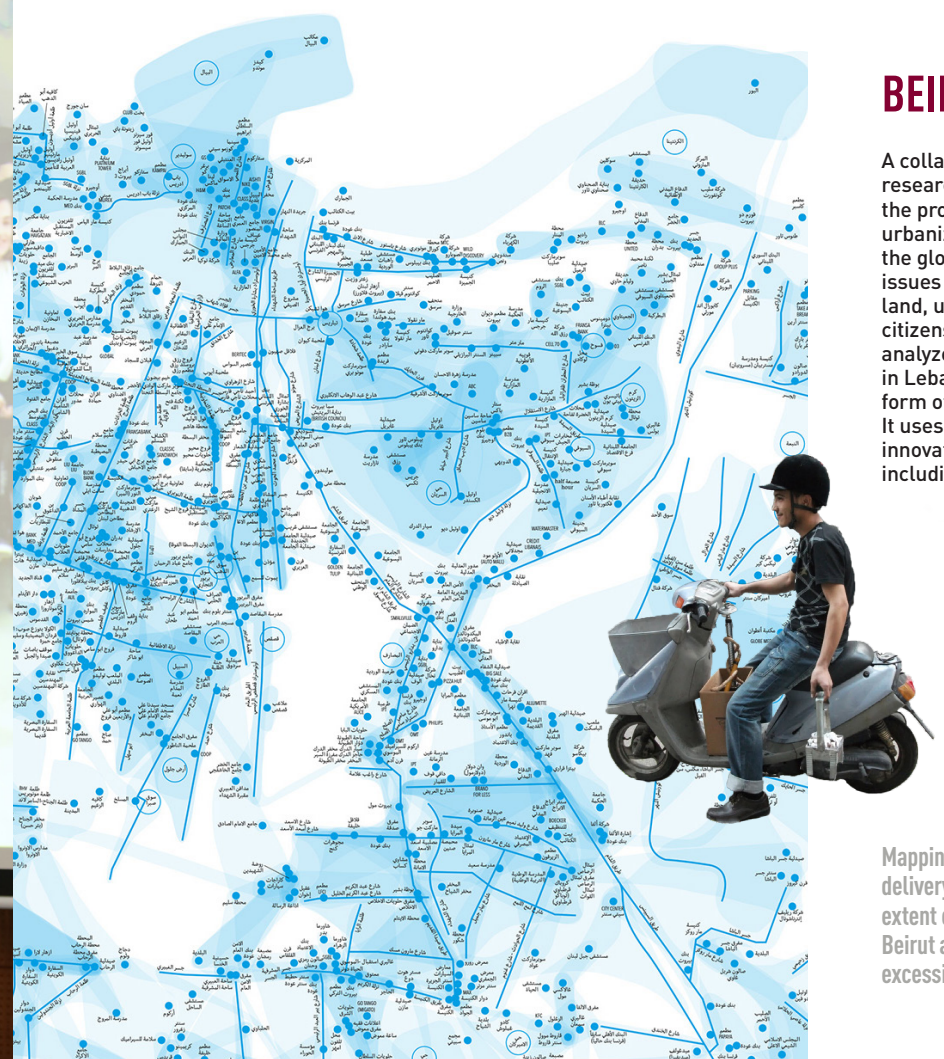
The entrepreneurship initiative positions MSFEA as a regional innovation powerhouse. With guidance from experienced entrepreneurs, workshops, and competitions, our capstone design project experience offers students the opportunity to develop a company while solving an engineering challenge.

BIG DATA AI AND MEDIA HACKATHON

Student pitching at the Student Startup Competition organized by the Entrepreneurship Initiative.

BEIRUT URBAN LAB

A collaborative, interdisciplinary research space that contributes to the production of knowledge about urbanization. From its position in the global south, it engages with issues such as the social value of land, urban recovery, and urban citizenship. The lab documents and analyzes ongoing urban processes in Lebanon and intervenes in the form of design and policy proposals. It uses experimental methods and innovative tools of investigation, including critical mapping.

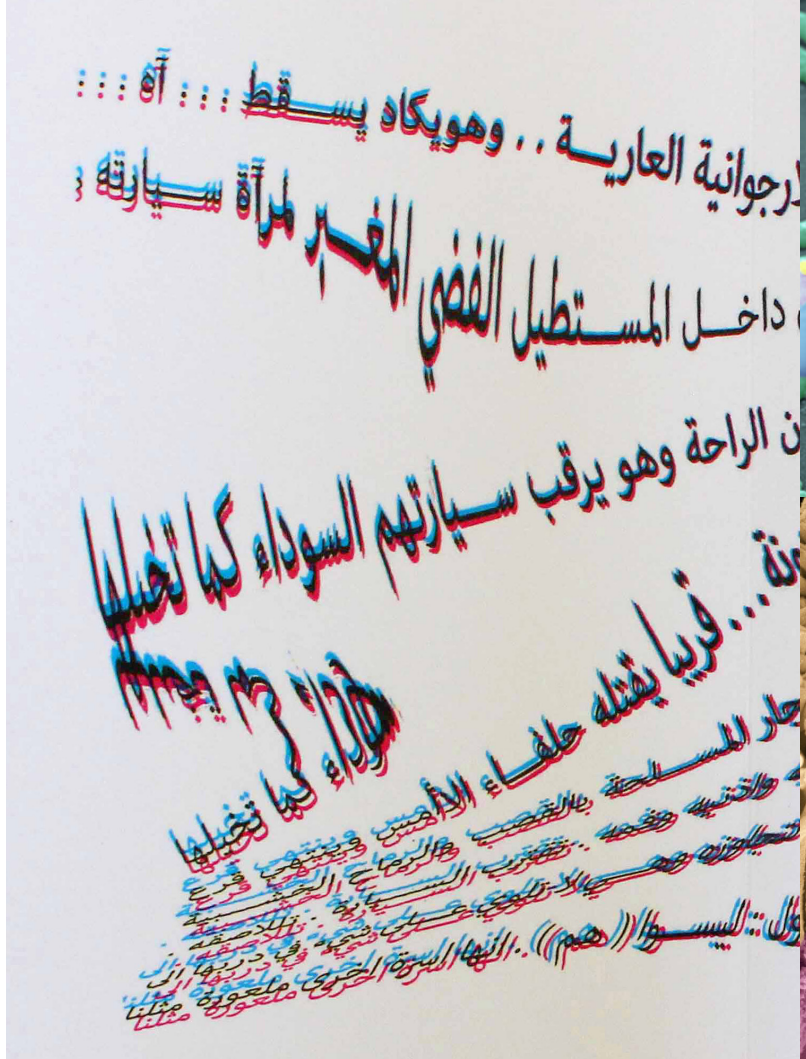


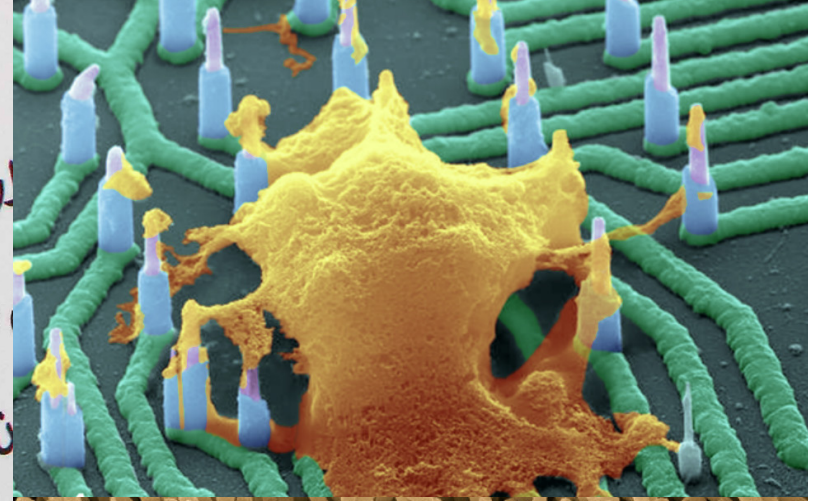
Mapping the trajectories of food delivery drivers on mopeds reflects the extent of their knowledge of Greater Beirut and their ability to navigate its excessive militarized security.

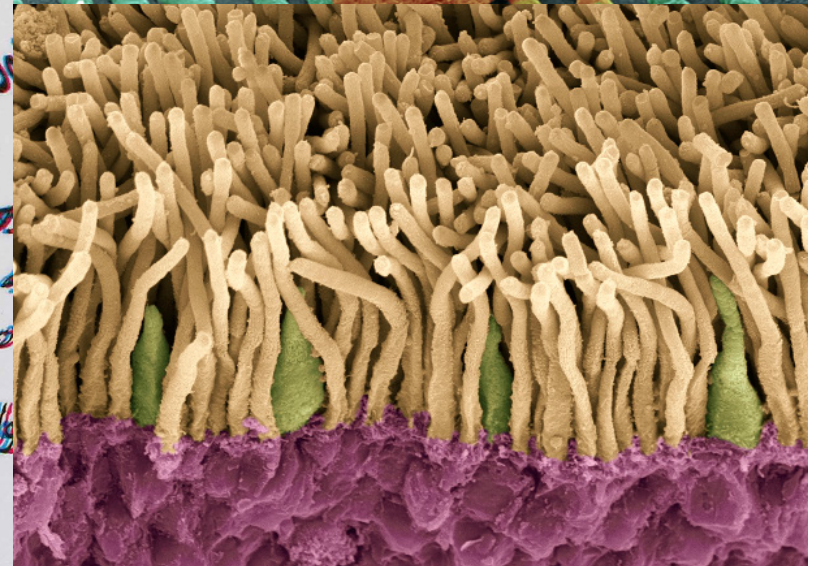
ARABIC TYPE UNIT

The Arabic Type Unit researches and develops standards of graphic design in Arabic type, lettering, and typography. It is a repository for the historical development of modern Arabic type.

Graphic design students choose their favorite Arabic language novel and express the content visually using Arabic typography.







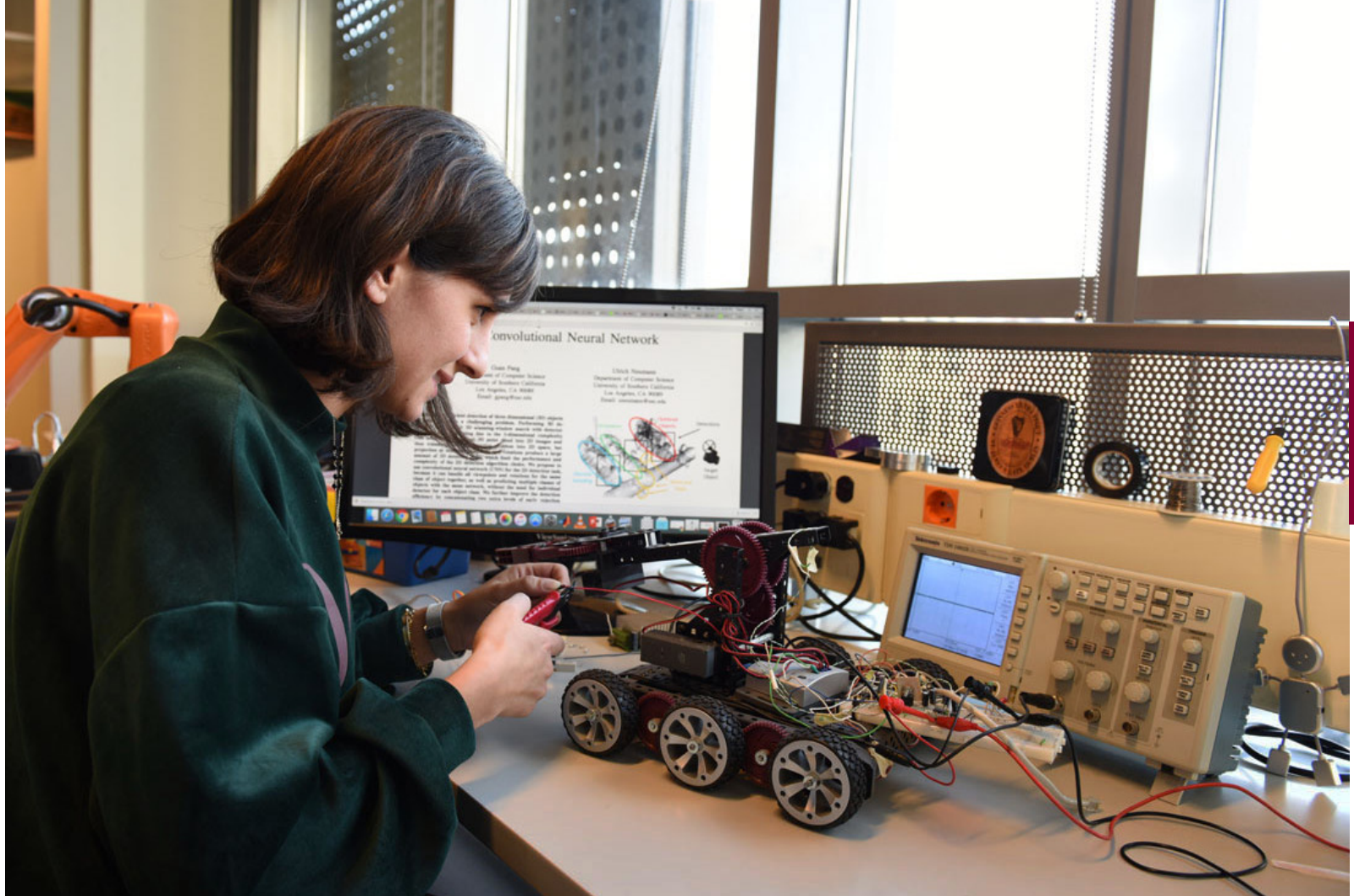
BIOMEDICAL ENGINEERING

Born from the collision of the Middle East's oldest medical school and tertiary care hospital with our technology centered engineering programs, the Biomedical Engineering (BMEN) graduate program is a joint interdisciplinary program between MSFEA and the Faculty of Medicine.

Restoring vision by penetrating retinal interfaces. Death of photoreceptor cells in the retina leads to blindness. At MSFEA we are developing nanotechnology for Neural Interface Lab to replace these damaged cells.

WHO ARE OUR STUDENTS?

MSFEA students get hands-on experience in the labs, studios, and makerspaces.

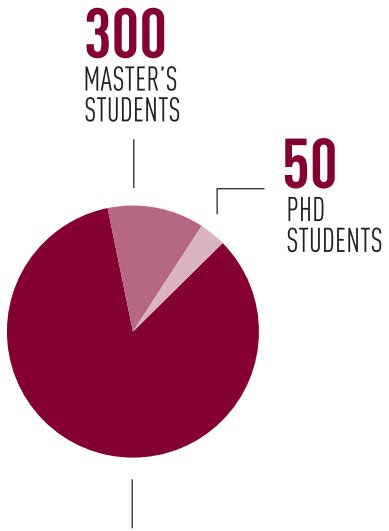


40%
OF MSFEA STUDENTS
ARE WOMEN

INTERNATIONAL
AWARD-WINNING
STUDENT SOCIETIES & CLUBS

AUB RANKED IN 2022
#73
IN THE WORLD
QS GRADUATE EMPLOYABILITY

STUDENT DISTRIBUTION



300
MASTER'S STUDENTS

50
PHD STUDENTS

2040
UNDERGRADUATE STUDENTS

> **The transformative role of MSFEA is the product of determined students benefiting from the resources provided by administrators and stellar professors. This has truly been a hub championing both self-development and the development of our overall community.**
>
> ALI ZEINEDDINE - CCE STUDENT (BE'2020)

MSFEA ONLINE

The **Abdallah al Ghurair Hub for Digital Teaching and Learning** at MSFEA is making learning individualized, interactive, and flexible using digital technologies.

Our online certificate, diploma, and degree programs provide industry-vetted training for working professionals and for students of all ages and geographies who would not otherwise have access to high quality higher ed programs. The Hub also promotes data- and research-driven innovation in education.

Transformative programs

Tailored schedule

Renowned expert faculty

Affordable cost

Artificial Intelligence & Data Science
Professional Diploma

Building Energy Systems
Graduate Diploma

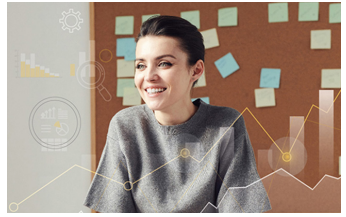
Engineering Management
Master's Degree

Green Technologies
Professional Diploma

Introduction to Computation & Programming Using Python
Course

Mobile App Development & Full Stack Web Development
Certificate

Project Deliverance & Contracts
Course



Project Management
Professional Diploma

New programs are constantly in development.
For more details: **aub.edu.lb/msfea/online**

Our engineering PhD programs come with a view, overlooking the Mediterranean sea.

Bechtel Design Hall (BDH), the common studying and lounging space for MSFEA students.

> Supporting the competitiveness and sustainability of businesses and government initiatives around the world.

THE INSTITUTE AT MSFEA

The Institute at MSFEA leverages our faculty experts and advanced testing, fabrication, and simulation facilities to support the sustainability and competitiveness of the region's enterprises. The Institute provides industry and government partners R&D needed to support technological and process innovations that address global challenges.

R&D for Industry
Environmental impact, technology transfer, industrial retrofitting, automation, re-engineering processes, and efficiency improvements.

Professional Education
Customized degrees, diplomas, short courses, and workshops for public and private sectors.

New Businesses
Techno-economic analyses of new design concepts and projects. Planning, and training.

Capacity Building for Private & Public Sectors
Short courses, seminars, and training.

Studies
Support for strategic planning and policy making. Feasibility studies.

Testing and Calibration
Material testing, prototype testing, and certification.

For more visit: **aub.edu.lb/msfea/institute**

ALUMNI SUCCESS STORIES

BASSAM JALGHA
MECHANICAL ENGINEERING, 2011

Roadie Tuner founded by Bassam Jalgha enables guitarists to quickly and easily tune a guitar with precision.

AYA BDEIR
COMPUTER AND COMMUNICATION ENGINEERING, 2004

Ayah Bdeir's littleBits empowers people of all ages to be creators and inventors with technology, not just consumers of it.

HIND HOBEIKA
MECHANICAL ENGINEERING, 2010

Instabeat founded by Hind Hobeika is the first waterproof heads-up monitor that tracks, stores, and displays instant feedback of the heart rate during the workout.

FOUAD MASKOUD
CHEMICAL ENGINEERING, 2016

Inventor of a nanofiber mesh manufacturing machine, Fouad Maksoud looks to develop novel wound-healing materials.

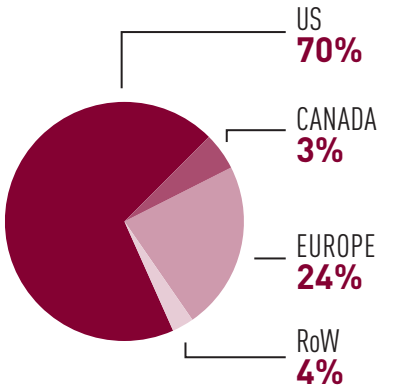
MASHROU' LEILA
ARCHITECTURE / GRAPHIC DESIGN, 2008

The indie rock band members Hamed Sinno, Haig Papazian, Carl Gerges, Firas Abou Fakher, and Ibrahim Badr went from a music workshop in an MSFEA studio spaces to sold-out world wide venues.

WHO ARE OUR FACULTY?

Integrating human-centered design into the classroom.

TERMINAL DEGREE BY REGION



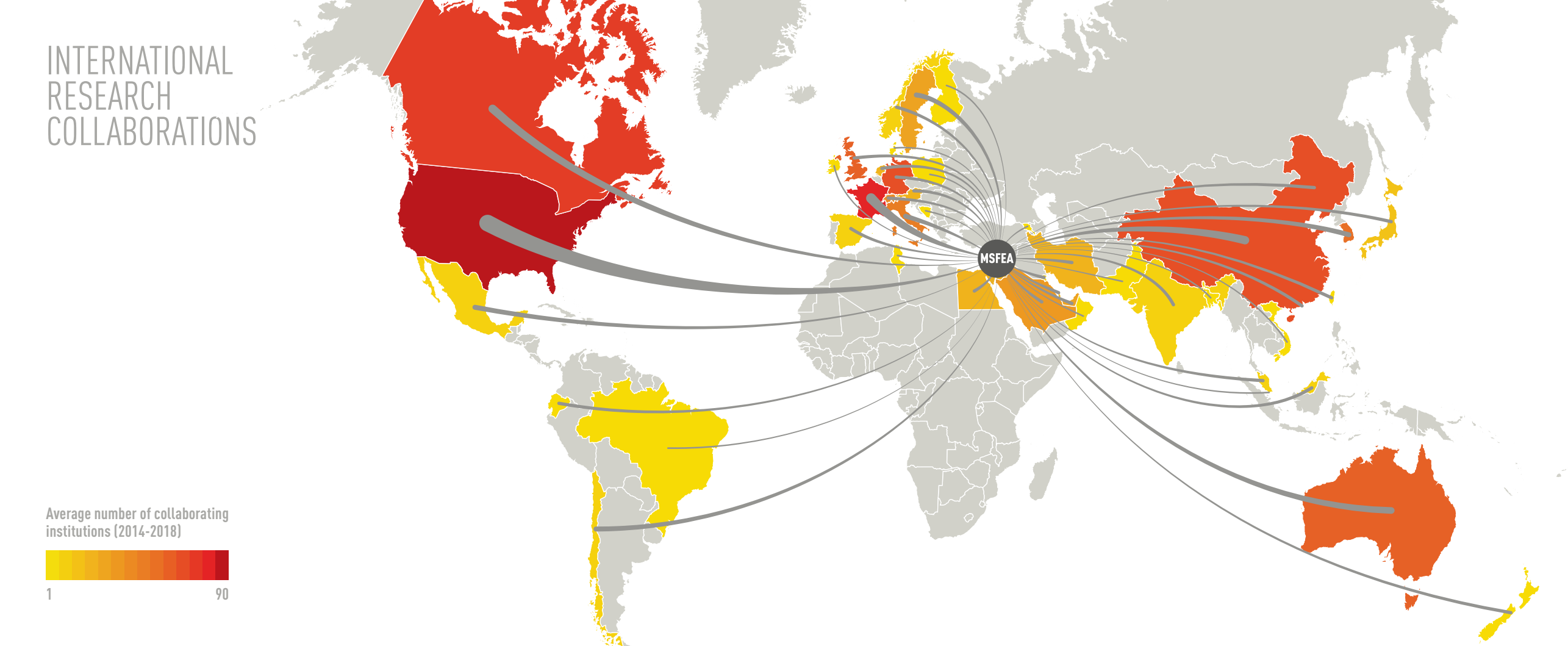
RANK

Professor	41
Associate Professor	30
Assistant Professor	31

WHAT RESEARCH DO WE PRODUCE?

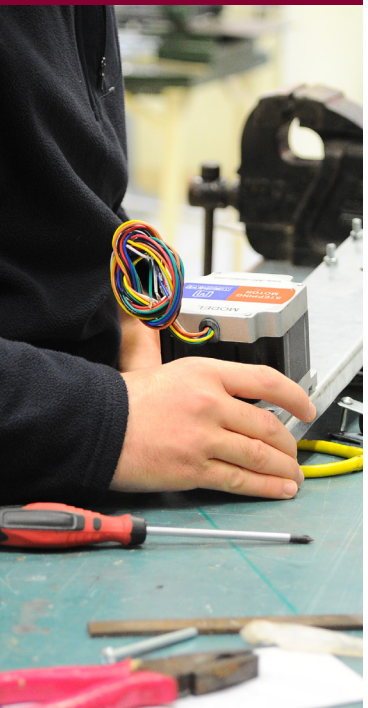
Our award-winning faculty leverage Lebanon's special contexts to define highly novel and relevant research programs. Through innovation and discovery, we are passionate about helping bring about a more viable, livable, and equitable world.

INTERNATIONAL RESEARCH COLLABORATIONS



RESILIENT INFRASTRUCTURE

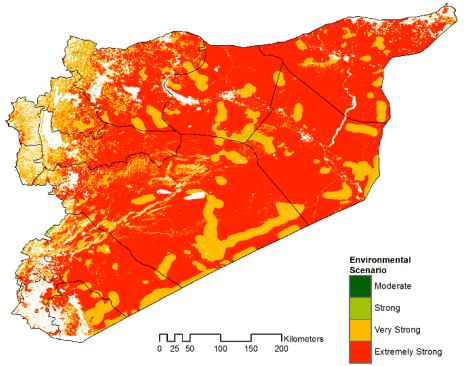
MSFEA labs develop innovative materials, robust technologies, and advanced mathematical models that promote smart and resilient infrastructure in the face of limited resources while reducing exposure to natural and human caused hazards.

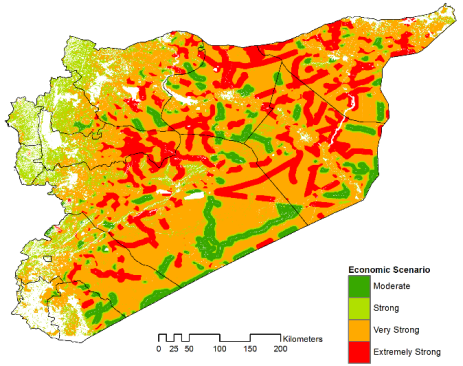


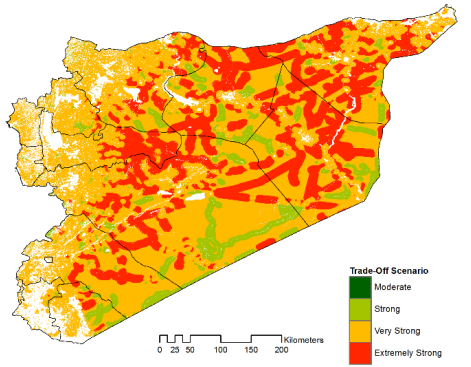
Construction Engineering and Management Lab

GeoEngineering Research Group

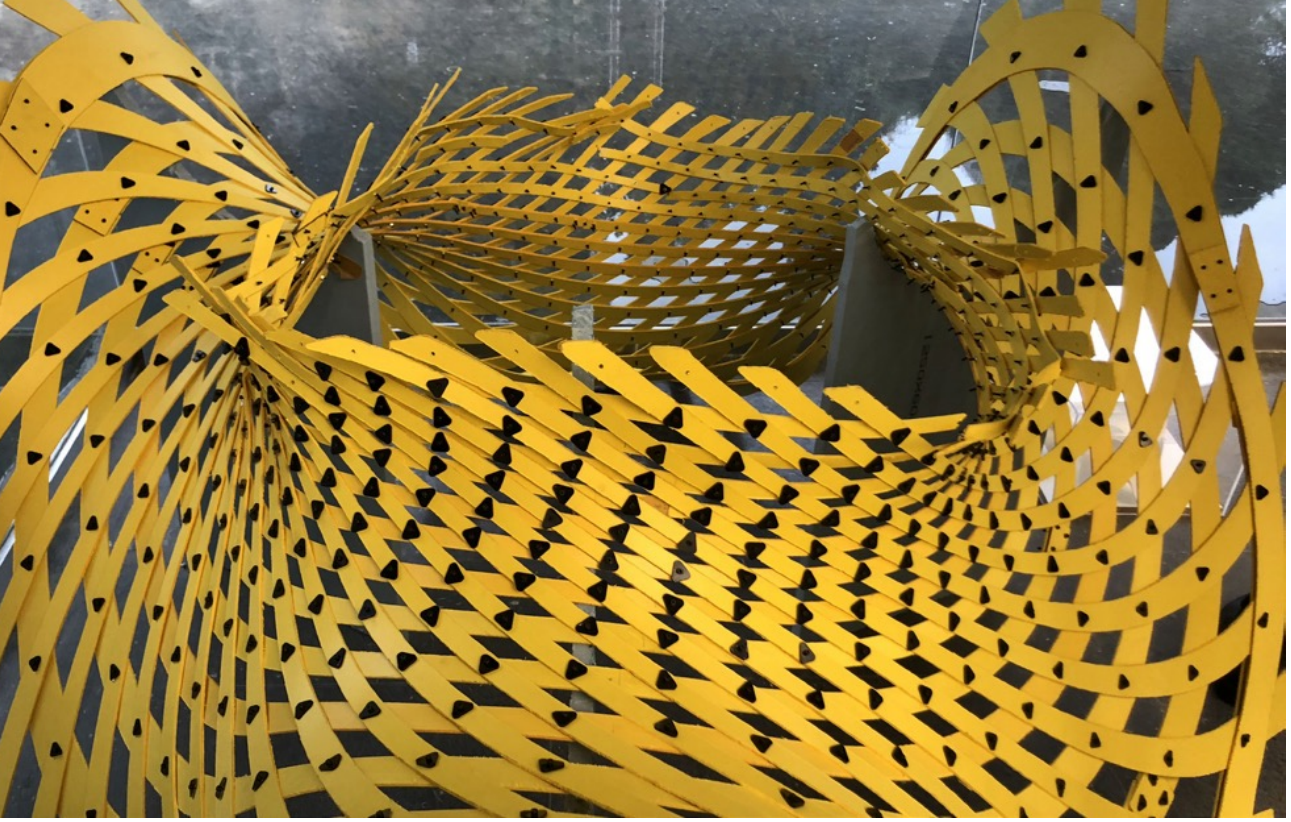
Smart Structures and Structural Integrity







War Demolition Waste Project: this on-going work uses EIA (Environmental Impact Assessment) and GIS-based methods to identify appropriate sites to store rubble from war-torn cities in Lebanon and Syria.



Parametric structures created using digital algorithms and physics engines. These responsive and innovative designs were inspired by natures surfaces and 3D printed and assembled in the Architecture and Design TechLab.

ENVIRONMENT AND ENERGY

We develop novel, sustainable, low footprint energy, water, wastewater, and environmental solutions to address the challenges of urbanization, population growth, and accelerated economic development in the Global South.

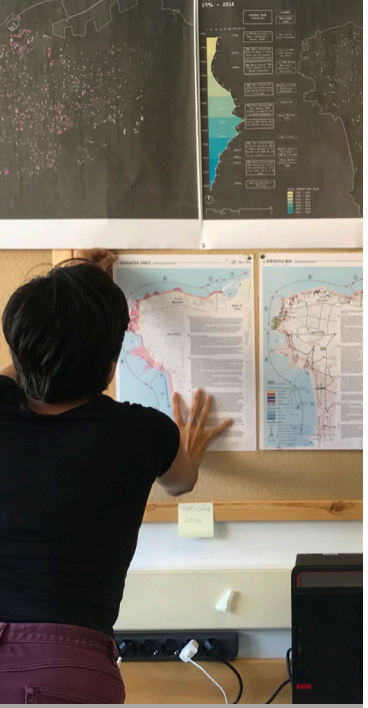
Climate Design Lab

Chemical Reaction Engineering and Catalysis

Comfort, Health, & Productivity in Built-in and Outdoor Environments

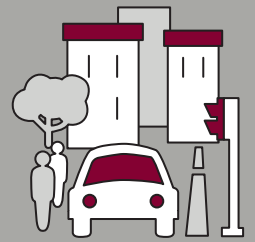
Dry Reforming Research Group

Process Intensification Group



URBAN CHALLENGES

With the Greater Beirut as our urban laboratory, we produce knowledge to improve livability, sustainability, and resilience in cities by focusing on sustainable transportation systems, affordable housing and property rights, post-war recovery, sound governance, and urban pollution.



Beirut Urban Lab

Transportation Research Unit (TRU)

Design Impact Lab

Be Public

The Transportation Research Unit studies people's travel choices and how to make them more environmental-friendly. Researchers at the unit analyze driving behavior under different conditions, such as distraction, to come up with recommendations for improving road safety.

One of MSFEA's award winning entries in the SAE Supermileage competition in Michigan. This cabon-fibre vehicle was entirely designed and manufactured by students in the Smart Structures and Structural Integrity lab.

MATERIALS AND MANUFACTURING

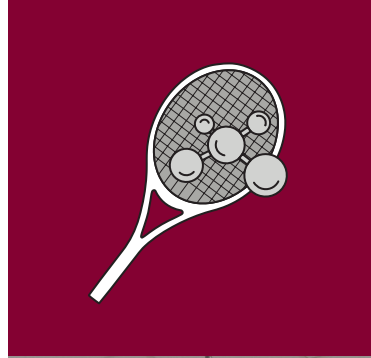
We conduct basic and applied research into synthesis, processing, characterization, and modeling and simulation of materials for structural, environmental, medical, and energy-related applications.

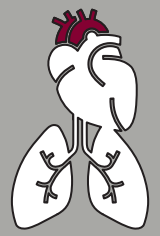
Applied Nano-materials and Surface Science

Ard TechLab

Process, Simulations, and Materials Modeling Research Group

Smart Structures and Structural Integrity





BIOENGINEERING AND HEALTH

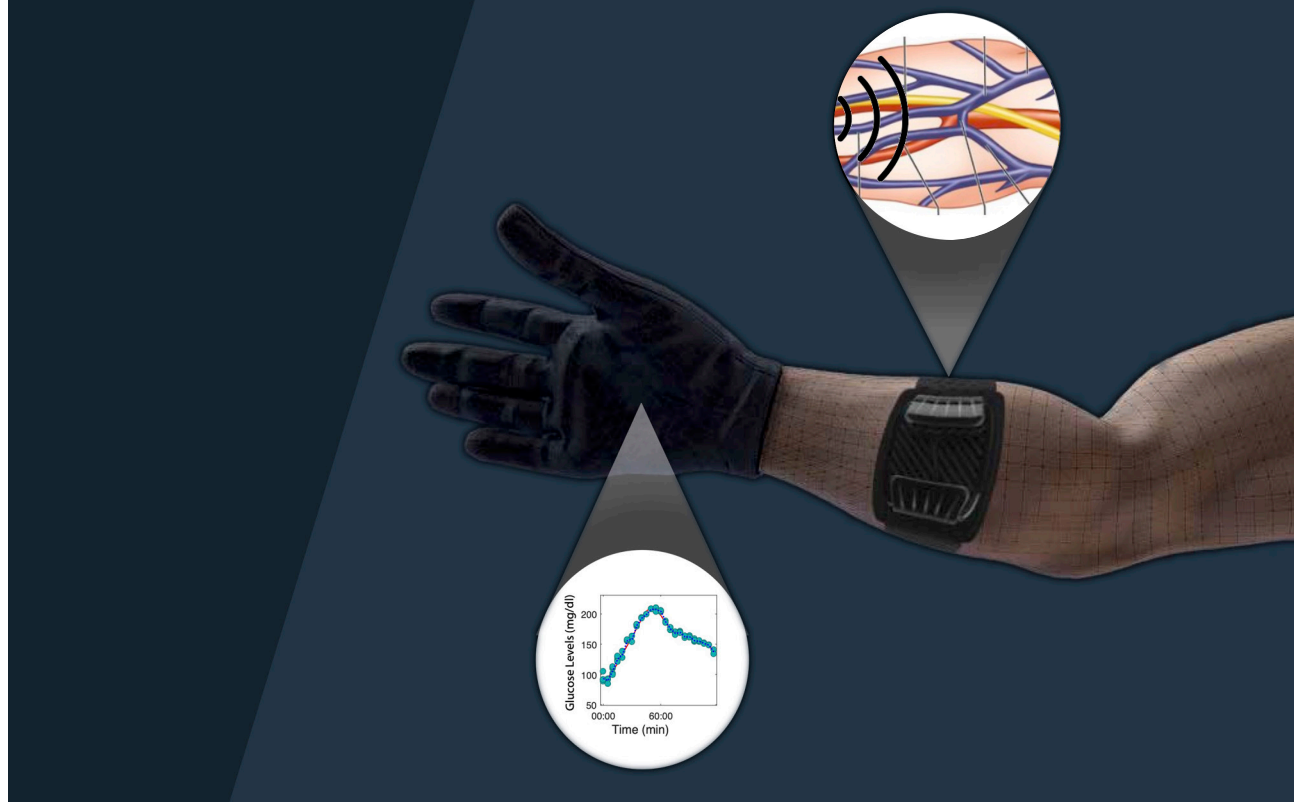
By applying engineering principles and biomechanics to medical applications, we create innovative medical technology for better health through improved drug delivery, sensing techniques, imaging technologies, optimization and numerical modeling methodologies.

Aerosol Research Lab

Biomedical Engineering Lab

Ergonomics Lab

Thermal Comfort Lab



MSFEA researchers are developing wearables that measure blood constituents wirelessly, painlessly, and non-invasively, by leveraging radio frequency systems. ẽdiamond allows users monitor blood glucose levels continuously, and as easily as checking the time of day.

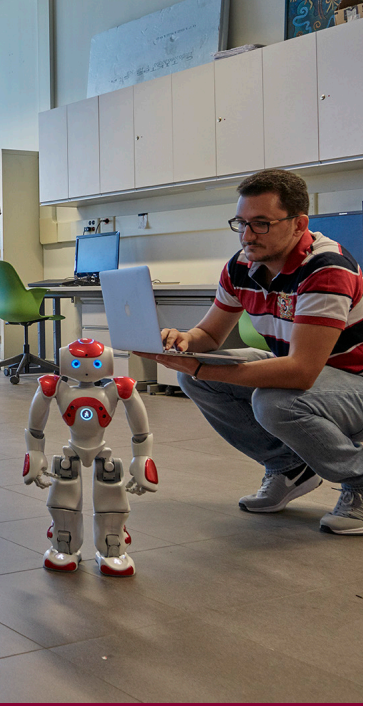
Student stories from the revolution, also turned into the book Graphic Narratives from the Street, as part of the comics course at MSFEA.

ARABIC COMICS AND TYPOGRAPHY

With the goal of preserving and promoting Arabic cultural heritage, we facilitate interdisciplinary research, production, scholarship, and teaching of Arabic comics. We continue to set the standards in design, research, and development of Arabic type, lettering, and typography.

Arabic Type Unit

The Mu'taz and Rada Sawwaf Arabic Comics Initiative



DATA SCIENCE, INTELLIGENT SYSTEMS, AND COMPUTATIONAL ENGINEERING

From optimization methods to human machine interfaces, our research pushes the boundaries of artificial control of service robots and applications.

Automated Reasoning for Program Correctness (ARPC)
Automated Reasoning for Information Extraction Lab (AR4IE)
Big Data and Cloud Computing Research Cluster (BDC3)
Computational Fluid Dynamics Group (CFD)
Computer Vision and Robotics Lab (VRL)
Digital Signal Processing and Adaptive Filtering Group

Our newly lauched computer science and engineering program is actively investigating ways to restore privacy and secure vital data.

How do we power devices when they are in a remote agricultural field, in a wearable medical device, or embedded in a road pavement? MSFEA researchers are developing ways to harvest energy from stray radiation in the atmosphere in order to charge these remote devices.

COMMUNICATIONS SYSTEMS

We design cutting-edge wireless systems, radio frequency circuits, antennas, and networking nodes to serve the 75 billion wireless devices anticipated by 2025.

Electromagnetics, RF and Antennas Lab


AERIAL VIEW 01
Day Care
ARD ANTHOLOGY
HERITAGE

Towards a more viable, livable, and equitable world.

v.0.4 | 202211

Curious to know more?
Visit us: **aub.edu.lb/msfea**