

### The program is online in two sessions

- Part I: August, 26<sup>th</sup>/27<sup>th</sup>/28<sup>th</sup>
- Part II: September, 9<sup>th</sup>/10<sup>th</sup>/11<sup>th</sup>

Link to  
web page



#### ➤ Topic 1: Renewable Energies

Materials for PV. Materials Computational Design Approach, DFT, Machine Learning / Cell and Panel Fabrication and testing. Life cycle Assessment / State-of-the-Art Perovskite Emerging Technology / Panel reliability under Desert Environment / PV System Design / Simulation of PV System Yield / Connection to the Grid Issues and Assets for a friendly PV Integration / Storage Technologies: Batteries and Green hydrogen

#### ➤ Topic 2: Biology, Biotechnology & Health

Regularity framework for food supplements and medical devices / Development and effects of drugs on the immune system / Development of vaccines / Phytovigilance / Imaging modalities and uses in the health system / Pharmacovigilance in industry / Quality assessment in Magnetic Resonance Imaging / Marketing / Marketing/Developing an idea into a business/Entrepreneurship/ Soft skills development

#### ➤ Topic 3: Civil Engineering

Seismic design principles for new and existing buildings/ Emerging concepts in modern building and bridge codes/ Advanced topics in concrete (materials, confined concrete modeling, seismic design) / Non-destructive testing and ambient vibration testing / Innovative technologies for structural strengthening and retrofitting of existing structures / Geotechnical earthquake engineering / Modeling of catastrophic risk / Resilience of interdependent infrastructure systems and communities. / Interactive workshops on case studies and software demonstrations

#### ➤ Topic 4: Advanced Computing

Cloud computing: comparison of public cloud infrastructures, Setting up your first AWS Elastic Compute and Simple Storage, Confidential Computing the the Cloud, Container Frameworks, Introduction to Data clouds - Snowflake, Big Data / CyberSecurity for the cloud: Dynamic analysis of files in transit, DNS Security, IoT Security, Round table: Careers in CyberSecurity / Machine Learning and AI: Problem Solving Techniques in AI

#### ➤ Topic 5: Mechanical Engineering

Design for eXcellence (Six Sigma, Reliability, ...) / Statistical Thermodynamics / Dynamics of Multibody and Rotating Systems / Product Validation (Virtual/Physical/Statistical) / Applications in the Medical Sciences / Noise, Vibration, and Durability in the Off-Highway Industry / "Smart" Applications in Agriculture and Construction / Data Analysis and Practical Signal Processing / Startups, Certification, and Homologation / Project Management Techniques

**Targeted Audience** Graduate students, Researchers, Faculty members, Industrials, Professionals



## **Renewable Energies:** **Supporting the Energy Transition in the Country**

### **1-Program Team:**

Nouar Tabet, Chair, UAE (Chair)	Nazeeruddin M. Khaja, CH	Saad Mekhilef, AUS	Belabbes Merzougui, USA
Yacine Boulfrad, NO	Seddik Bacha, FR	Malek Benmansour, FR	Mounir Aksas, DZ
Fadwa El Mellouhi, QA	Benjamin W. Figgis, QA	Amara Mohamed, FR	Amor Gama, DZ
Smail Mougari, DZ	Saheed Bukola, USA	Mohamed Ghezli, GER	

### **2-Program Description:**

In 2020, Solar Energy has become the cheapest source of energy in history. Many recent studies indicate that up to 50 percent of the world's energy will come from solar and wind by 2050. Storage technologies are also being developed at a high pace including batteries and green hydrogen. The energy transition to solar and other alternative renewable resources has become unavoidable. The current production capacity of solar installations in Algeria does not exceed 0.5GW. However, the country has launched this year its first call for bids for a major PV project of 1GW.

The AAF Summer University 2022 will focus on PV and Storage technologies, from the materials, device and panel fabrication to the system design, the analysis of the reliability issues of panels under desert environment. The injection of solar and wind energies into the grid, poses important technical challenges. Issues and assets for a friendly integration of RE will be discussed. The list of invited speakers includes well known researchers from universities in Europe and Asia, Australia and USA.

### **3-Covered topics:**

The covered topics are the following:

- Materials for PV: Materials Computational Design Approach, DFT, Machine Learning
- Cell and Panel Fabrication and testing, Life cycle Assessment
- State-of-the-Art Perovskite Emerging Technology
- Panel reliability under Desert Environment
- PV System Design
- Simulation of PV System Yield
- Connection to the Grid: Issues and Assets for a friendly PV Integration
- Storage Technologies: Batteries and Green hydrogen
- Wind technology

### **4-Desired Learning Outcomes:**

Participants will learn about solar technologies from the use of computational approach for material design, cell and panel fabrication and testing to the design of PV systems and the use of some important simulation tools. They will be introduced to the emerging Perovskite technology and will also develop a good understanding of the key challenges facing the PV deployment in desert environment and solutions for a "friendly" integration of solar energy into the grid. Participants will have the opportunity to exchange with national and international experts in the field.

### **5-Who Should Attend the Course?**

Faculty members and graduate students interested or working in the field of renewable energies, materials sciences, engineers, economists, information technology personnel who deal with any aspects of RE technologies, planning and operation. Technical staff of Sonelgaz and energy companies could also benefit from this course.



## Biology, Biotechnology & Health Sciences Program: Bridging the Edges Between Industry and Life Sciences

### 1-Program Team:

Zehor Belkhatir, UK (Chair)	Taha Merghoub, USA	Katia Djenadi, DZ	*Chafia Touil-Boukoffa, DZ	*David Schaer, USA
Mohamed-Habib Belmahi, DZ	Zoubir Ouhib, USA	Mammech Amina, DZ	*Evan Pereira, FR	*Mostapha Diken, USA
Lotfi Boucif, DZ	Djamila Ouarem, FR	Manel Belkhatir, DZ	*Kamel Sanhadji, DZ	*Luis Felipe Campesato, USA
Hind Bouk'hil, FR	Adel Kalla, DZ	Medical doctor, JOR	*J&J, USA	

\*: TBC

### 2-Program Description:

The basic and applied life sciences branches, including human healthcare, are among the most valuable and strategically important sectors for different countries across the World, especially during the SARS-CoV-2 pandemic where we have been more appreciative of life sciences and the interaction between biotech and academia.

This year AAF Summer University "Biology, Biotechnology, and Health" topic will envision to highlight the importance of **both**: the industrial and research/academic life sciences fields. Their best-emerging research and technologies will be introduced and shown. We will also feature how they tackle higher-level complex bioscience-related questions.

### 3-Covered topics:

The envisioned program is broad and will cover basic concepts, advanced techniques, and the most recent scientific and technological achievements in the field. The main topics of the program will include:

- Regularity framework for food supplements and medical devices,
- Development and effects of drugs on the immune system
- Development of vaccines
- Phytovigilance,
- Imaging modalities and uses in the health system
- Pharmacovigilance in industry,
- Quality assessment in Magnetic Resonance Imaging,
- Marketing,
- Developing an idea into a business,
- Entrepreneurship, ... and many more.

### 4-Desired Learning Outcomes:

The main learning outcome of the program is to enable participants to learn about developments in the industrial LS field, in addition to the academic one, allowing them ultimately to appreciate more the importance of **collaborative and interdisciplinary** work (across academics (scientists), regulators, health services (clinicians), industrial partners (companies) in the life sciences sector which is key in bringing life-changing innovations to patients, or solution concepts to bioscience challenges more quickly.

The goal of the program is also to open the discussion floor between participants and instructors and build a network of multiple actors in various fields in Algeria and abroad to build future collaborative projects that will answer real needs and solve problems encountered in Algeria.

### 5-Who Should Attend the Course?

Graduate students, researchers, faculty members from a life/medical sciences, physical science or engineering, computational and mathematical science background, and technical staff from LS industries (pharmaceutical, medical, ...etc.) who wish to learn and/or conduct leading-edge research in industrial and/or academic LSs sector.

*"The peace of progress in biology creates a foundation that naturally gets picked up by the biotech and pharmaceutical industry to solve rich-world diseases. This is attractive science. It's a science that people want to work on"*

*By Bill Gates (co-founder of Microsoft).*



## **Civil Engineering: Design, Construction, Rehabilitation, and Resilience of the Built Environment**

### **1-Program Team:**

Amar Chaker (Chair), USA	Said Kenai, DZ	Others (TBD)
Hakim Bouadi, USA	Tarik Hadj Hamou, USA	
Nouredine Bourahla, DZ	Mohammed Matallah, DZ	

### **2-Program Description:**

Major advances have taken place in recent years in: the design, construction and rehabilitation of the built environment; the understanding of the hazards it is exposed to; and the approaches for reducing disaster risk and enhancing the resilience of the built environment (resilience being the ability to reduce the impact of catastrophes and to recover quickly after a disaster).

The civil engineering program will mainly cover broad areas of structural design and behavior. Most of the concepts and techniques to be presented are applicable to infrastructure elements such as bridges and buildings, with a greater emphasis on infrastructure renewal, evaluation and retrofitting (or rehabilitation) of existing buildings, including historical buildings. The program will also cover the earthquake design requirements for new buildings. They are addressed by the building code, but those for existing buildings (a major component in the fabric of many cities in Algeria) represents a real concern, particularly due to the lack of detailed information regarding concealed original assemblies and material properties, their current condition, and the difficulty associated with selecting performance objectives for the retrofitted buildings. Additional topics to be presented include NDT techniques, and monitoring of bridges and buildings.

### **3-Covered topics:**

This broad program will cover basic concepts, advanced techniques, and recent scientific and technological advances in the field, including:

- Modeling and analysis methods for structures and continua
- Seismic design principles for new buildings
- Emerging concepts in modern building codes
- Non-destructive evaluation and rehabilitation of existing concrete and masonry buildings and structures
- Advanced topics in concrete (materials, confined concrete modeling, seismic design)
- Seismic evaluation and retrofit of existing buildings
- Non-destructive testing and ambient vibration testing
- Innovative technologies for structural strengthening and retrofitting of existing structures
- Geotechnical earthquake engineering
- Modeling of catastrophic risk
- Resilience of interdependent infrastructure systems and communities.
- Interactive workshops on case studies and software demonstrations
- Structural health monitoring of existing buildings
- Presentations by doctoral students and faculty highlighting their research, followed by a question-and-answer period.

### **4-Desired Learning Outcomes:**

The goal of this AAF Summer University program is to provide advanced training to doctoral students who will be educating the future civil engineers, and to enhance their ability to conduct relevant, up-to-date research in new technologies and the use of advanced construction materials, as well as in earthquake engineering and disaster risk management, and to expose them to specific challenges, including through presentations on writing statements of research interests and vitas, useful sites and resources, ethics, and publishing.

### **5-Who Should Attend the Course?**

Doctoral students, post-doctoral researchers, faculty, graduate students and practicing engineers in the design and construction industry will benefit from this program.





## **Advanced Computing:** **Cloud Computing, Cybersecurity for the Cloud, Machine Learning and AI**

### **1-Program Team:**

Mounir Hahad (Chair), USA	Mourad Cherfaoui, USA	Abderrezak Kamel, USA
Abdelfettah Amamra, USA	Mourad Ouzzani, QA	Others (TBD)
Nadjet Kamel, DZ	Khaled Yagoub, USA	

### **2-Program Description:**

The pace of transition towards service-based offerings (Software As A Service, Platform As A Service, Infrastructure As A Service, etc.) is accelerating, with organizations both private and governmental adopting cloud services more than ever.

Cloud technologies provide a cost-effective way to quickly deploy business solutions and scale them while offering high availability and low latency for users around the globe.

In the program of this year's AAF Summer University, we will focus on the platforms that allow rapid application development and deployment onto public and private cloud infrastructures. We will also address the cybersecurity implications of SaaS, IaaS and PaaS offerings as well as one focus area of data analysis: machine learning and artificial intelligence. Additionally, we will discuss career paths in cybersecurity in an interactive session and how to leverage public cloud infrastructures for running a startup business.

### **3-Covered topics:**

- Cloud computing:
  - comparison of public cloud infrastructures
  - Setting up your first AWS Elastic Compute and Simple Storage
  - Confidential Computing the the Cloud
  - Container Frameworks
  - Introduction to Data clouds - Snowflake
  - Big Data
- CyberSecurity for the cloud
  - Dynamic analysis of files in transit
  - DNS Security
  - IoT Security
  - Round table: Careers in CyberSecurity
- Machine Learning and AI
  - Problem Solving Techniques in AI

### **4-Desired Learning Outcomes:**

The goal of this year's program is to shine the light on the importance of public cloud infrastructures in accelerating time to market for all kinds of projects. The attendees will get an introduction to the most commonly used platforms and learn from a number of use cases related to actual business projects. This program will also highlight the need for interdisciplinary approaches to solve real life problems with subject matter experts bringing application knowledge while computer scientists bring the tools to the table.

### **5-Who Should Attend the Course?**

Graduate students, researchers, faculty members in computer science and other disciplines as well as public and private sector practitioners who are in charge of defining or implementing a cloud migration strategy. This program will cater to both people who are not familiar with cloud technologies and want to get an introduction to the platforms and the cybersecurity challenges that emerge in cloud environments, as well as those with more experience in the field and want to have a direct conversation with experts in this space working for world class organizations.



## **Mechanical Engineering:** **Recent Advances in Innovation, Design and Development**

### **1-Program Team:**

Mohamed Yahiaoui, USA (Chair)	Djamil Boulahbal, USA	Djamel Bouzit, USA
Mourad Bouzit, CHN	Ahmed Damou, DZ	Djamel Hamiroune, USA
Karim Tamarat, FR	Ali Yousnadj, DZ	Others (TBD)

### **2-Program Description:**

The Summer University is an effective platform to connect with experts from academia and industry to share insights into research and innovation, product design and development, as well as best practices across multiple related disciplines. For the first Mechanical Engineering Summer University, the focus is on bridging between theoretical methods in fundamental sciences and modern processes to solve complex problems in product design and development.

Product Design is at the forefront of innovation. Good design processes result in cost-effective and higher quality products. Those processes rely on a good understanding of relevant mechanical engineering disciplines as well as mastery of problem-solving techniques, design concept development, and manufacturing feasibility. Proper application of these techniques ensures that products function safely, efficiently, and reliably at a competitive cost.

### **3-Covered topics:**

Participants will be exposed to fundamental/advanced topics from industry and academia in the field of mechanical engineering and related disciplines. They will also be introduced

to current state-of-the-art practices with some illustrations via targeted case studies. The areas to be covered include:

- Design for eXcellence (Six Sigma, Reliability, ...)
- Statistical Thermodynamics
- Dynamics of Multibody and Rotating Systems
- Product Validation (Virtual/Physical/Statistical)
- Applications in the Medical Sciences
- Noise, Vibration, and Durability in the Off-Highway Industry
- "Smart" Applications in Agriculture and Construction
- Data Analysis and Practical Signal Processing
- Startups, Certification, and Homologation
- Project Management Techniques

### **4-Desired Learning Outcomes:**

The main learning outcomes include

- Bringing awareness about the latest advancements and best practices in problem solving
- Appreciating the importance of interdisciplinary collaboration for successful project outcomes
- Building a network of experts in various fields in Algeria and abroad for future collaboration and constructive exchanges

### **5-Who Should Attend the Course?**

Graduate students, researcher, practicing engineers, project managers, and faculty from the mechanical engineering field. Technical staff from established companies seeking to improve the efficiency of their processes as well as startups looking for state of the art techniques could also benefit from this course.