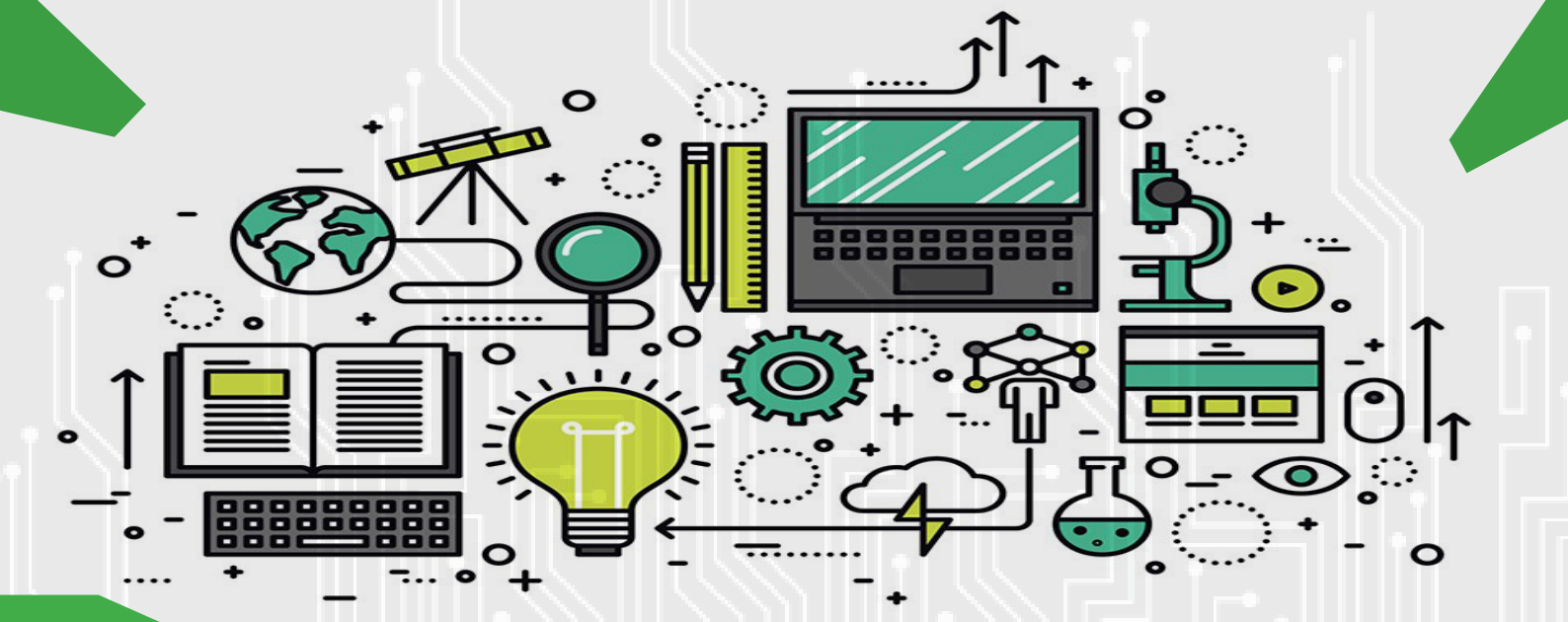
Yarmouk University
Hijjawi Faculty for Engineering Technology

Hijjawi Faculty Research Projects

Issue I | 16 April 2022



Dean's Message

I'm delighted to introduce another publication this year for the Hijjawi Faculty for Engineering Technology. In this publication, our students and faculty members express their research perspectives by presenting their recent research projects.

Research is one main pillar of higher education, everywhere, and we at the Hijjawi Faculty for Engineering Technology give more attention to research in both the curriculum as well as in the entrepreneurial and innovation activities. Today, students need to practice and produce research that is relevant to their surrounding needs. On the other hand, students have demonstrated their desire to include research components in their graduation projects and they have excelled in that regard.

At Hijjawi Faculty for Engineering Technology, we are currently in the process of evaluating our recently developed study plans to incur some minor changes in these plans based on the direct and indirect assessments. We have found so far that there is a need to include more research and job skills in the curriculum. The updated study plans will have a clear track for that.

This publication is divided into three parts. In the first part, we leave a free space to our students to speak about themselves, their project ideas, and their perspectives on relevant topics to their studies in the Faculty. In the second part, we present sample of students' graduation projects from the different programs that have been recently conducted. These projects include both theoretical and applied research, demonstrating the research capabilities of the students. Finally, our faculty members from different departments speak about their recent publications, which reflect the type of research we do in our Faculty.

I hope you enjoy reading this first publication about our recent research projects. We look forward to hearing from you to improve the subsequent editions of this publication. We also consider working with you in these projects and other projects for the mutual benefit of all.

Prof. Mwaffaq Otoom, PhD

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Students' Articles

Islam Obeidat

Hello, I am Islam Obeidat, A student in the last year of my study trip, I study in the Department of Electronics Engineering / Hijjawi College / Yarmouk University, and I would like to talk about my study trip in the Department of Electronics Engineering. I was accepted into the electronics engineering department in 2017 and And I didn't have previous experience in the field of electronics. Therefore, my experience at the beginning of my study journey was difficult, but after the support and guidance of my doctors and professors in the department, Things have become started to get easier for me. The department of Electronics Engineering at Yarmouk University is considered one of the strongest departments, as it is characterized by the presence of highly qualified faculty members who work to Expand the range of thought the student in the field of electronics and communications. In addition to development the student's skills for creativity and innovation . So that the student will gain sufficient experience that qualifies to enter the labor market. During my study trip, I acquired many skills such as dealing with electronic components and electrical circuits, analyzing electrical circuits, solving problems that occur in electrical circuits, designing electrical circuits by engineering methods from a theoretical and practical perspective, in addition to dealing with the simulation software. Programs that assist in the design of electrical circuits ,and check the results before you start designing on practicaly as well as designing a printed circuit (PCB). and i now become have the ability to design complete electronic circuits on PCB boards.

The world today is moving towards technology, because technology has become an integral part of our daily lives. Which works to facilitate human life by increasing inventions in various practical fields. and which used in tasks that require a large amount of human time and effort or tasks that are difficult for a person to perform, as well as for tasks that are dangerous to humans. In conclusion, and through my experience, I advise those who have a sense of creativity and innovation to enter the field of electronic engineering, as it is one of the distinguished fields that help develop human skills for creativity, innovation and excellence.

Wesam Nader Bany Saeed

Hello, my name is Wesam Nader Bany Saeed. I am 23 years old. I am a fifth year student majoring in electronics engineering at Hijjawi College of Engineering Technology _ Yarmouk University. At the beginning of my talk about university life, I believe that personal gains are perhaps more important than educational gains, as the university is considered the main incubator for the maturation of young personalities and the enhancement of their awareness. I entered the university in 2017, where I got accepted in the field of electronics engineering, at first I did not have any information related to the specialization and I heard a lot about how difficult it is, but those words were the main motivation that motivated me to love that specialty and the desire to study it. After I finished "Almost" my studies of that major, I found that I loved it, I loved our fields of work and knew that it was the main science on which various other engineering depends on it. The faculty and the teaching staff have always encouraged us and worked hard and efficiently to deliver their knowledge to us and help prepare a Good generation of engineers, the electronics engineering plan is considered full study plan and contains courses from all other engineering disciplines, which made us able to Working in the future in all these specializations, I learned a lot of skills during the study of that specialty, such as soldering, programming, how to configure electronic circuits and understand the mechanism of their work. We also learned to make PCB boards, i'm in love with this field, we learned a lot about VLSI circuits, I liked it very much, and it is the most part of the electronics engineering specialization I want to study and work in depth with it. I intend to continue learning and get new skills related to electronics engineering. I would like to thank my colleges in general and the Department of Electronics Engineering in particular for the cooperative teaching staff who made us engineers capable of working in different conditions and different engineering disciplines. It's been a really great five years.

Tala Al-Zoubi

Let me introduce myself first, my name is Tala Alzou'bi I am 22 years old and I am a student enrolled in industrial engineering at Yarmouk University since 2018. Having several interesting experiences in many entities operating in different sectors, I am full of life and energy who likes to be active in extracurricular and professional life.

Today I can say that I am none of those things, never did I think that I would be up here saying that four years in University changed my life for the better.During that, I had the chance to be a logistics coordinator for almost a year at Hult Prize YU, and I'm in my second year of being a volunteering Ambassador at Nahno, In parallel, I had held other positions such as internal auditor at Matar Project, volunteer teacher at SOS Children's Villages International, and then brand ambassador at Amtea. It was very difficult to balance participating in all these activities with academic commitment and maintaining a high GPA, that taught me in the most appropriate method how can I manage and use my time, I will always be grateful for the pressures I have been through throughout and for the people I've met, that have made this place what it is to me, and made me want to succeed.

Thanks to all these experiences, I was able to see several aspects of the working world, I was able to rub shoulders and collaborate with professionals who to this day remain a model for me. I will end this presentation by saying that "It's not what you achieve, it's what you overcome. That's what defines your career; And DON'T STOP TO SAY HOW?

Razan Talal

Hey i am Razan Talal, an international student at Yarmouk university, Jordan. I am currently in my senior year studying electronics engineering at the Engineering faculty. Where should i start it has been a long four years of my life alot of fluctuations all the exciting and frightening moments now seem a beautiful memory carrying with it alot of lessons and experiences in the aspects of my academic and intellectual life. This experience has reinforced my interest in technology and innovation especially while being surrounded with a motivational atmosphere and a supporting tutoring team that had me explore many working fields that i didn't know existed, at the end of my bachelor degree, i have set my track according to my fond of nanotechnology fabrication and medical electronics.

Taha Gharaibeh

My name is Taha Gharaibeh, I'm 21 years old. A computer engineering student at Yarmouk university.

Taha is an engineer a developer a researcher and a gamer, during my time at Yarmouk I have discovered things about myself that I won't truly know without advancing in the courses and getting to know my colleagues and Drs. They taught me to work under pressure in professional way, some courses included a project I loved like building a kernel or so. Since day one, I knew what I have to do and what I'm signing up for. I knew that I need to work on myself and learn to rise and becoming a respected figure. I invested my time to learn about things in my major to be specialized, I have chosen to be a full stack software developer as well as working in research field.

To do so, I believed in hardworking that's whenever I see a contest I will sign up and compete. I have participated in several programming competitions inside and outside my university and got a "respectable" position. I was the leading member in all these teams "Mushroom Less, G(Antiguo), Pro x Tech". I have experience with a number of programming languages, and I don't see programming languages as something that can stop me from achieving my goals.

Thanks to the programming club at computer engineering department, Yarmouk university. I managed to get the skills needed to become professional in problem solving. This is important because without this I won't really be as much as I wanted to be. This training gave me confidence to learn new things and unleash my true skills to solve any problem.

When you think that things are not going well, during the hard times of covid-19. I was contacted by a lab engineer her name was Enas. She knew that I have set of skills and to give me a chance to work with her and other Dr. in my department. In the matter of one year, we managed to publish 2 research in the Networking and Communication field. Afterwards, I saw an email by the international office at Yarmouk university stating that there's a training field opportunity in Germany. I have applied and I got it, I'm and 2 girls from the same department. My field training started on 7th of September 2021. I was pleased to meet the international office at the beginning of my field training, Professors, Dr's, And lab engineers from Hochschule Bonn Rhein Sieg (H-BRS), And the dean of Hijjawi college and other department deans from Yarmouk university (YU). I have taken 4 courses and they were fruitful and fun. I have helped Garrulus with their project findings and to be the second author in writing a paper with a title "Forest Floor Analysis Using Unmanned Aerial Vehicle".

I have proposed to rebuild the "Remote Labs" system, because the system is old and lacks the scale ability and strong backend and user-friendly management system. Since there are more and more universities joining and integrating this system, including YU, I had to ask Eng. "Schwandt, Andrea" the implementer of this system on what are the problems that you are facing, and how the system connects? During that time with courses, I have finished 3 projects, each one of them is specific to the course like, android development project "A tank robot following a red ball via android app", integration architectures which is responsible of building a new system and integrating an old legacy system.

As you can see, I have got the idea from this course to rebuild the system with modern technologies. The third project is to build a realistic simulation of a drone using Unity3d engine. My fourth course was "German Class" to learn and apply what we learn in interactive way. This training field was supported and managed between "Yarmouk University Remote Lab" (YURL), "H-BRS Remote Labs", And funded by the DAAD German-Arab Transformation funding program (project ID: 57588012).

What Am I looking to do in future?

This a question that I have been asking myself for long time, my answer is simple. Having fun because I want to continue what I'm doing to be the best. Currently, I'm taking part in a training with a company named Atypon to be a software developer.

Rania Najjar

I want to begin by introducing myself, I am Rania Najjar an Industrial engineering student in my final year, have a high experience in volunteering work, I am a leader of many teams in my university, a very social and active member of the Jordanian Engineers Association.

University life is the best time that a student lives at the beginning of his youth it's the road to start your career in life, the most adventurous experience I have experienced in my life because it helps us to develop our skills by using the library, Labs, and the playground free without any restrictions. I was so lucky to join Yarmouk University, having the best and kindest teachers that support us on any step we want to take and direct us to the golden road to begin our career and to start thinking about our jobs. I should mention my friends who also supported me in honorable competitions, teamwork, and sharing our thoughts, they were second-hand in enjoying and improving my self-confidence and this shows us the importance of ourselves. The most important thing in university is freedom you can have friends, classes, and teachers of your choice and this helped me to take my choices wisely. Another amazing aspect of this life is the tours, sports activities, science fairs, labs, and educational activities; it was so fun and memorial events with beautiful pictures with our friends and teachers. Since I was a freshmen student and now I'm on my way to graduation my college, teachers, and friends still supporting me to reach my goals. Yes it was a tough stage in my life, classes, projects, and exams were hard but all this was for our sake to graduate with high degrees, it's a fateful period for all of us and it build a new better character of us.

Finally , you need to know something very well, you make yourself in this life, not what you study. This is an opportunity everyone should take advantage of it.

Haneen Bawab

The college experience is my initial step into finding my future career. Leaving home and finding out if I have the skills to make it in the real world. Continuing my education in hopes of finding a great career and making lots of money for a leisurely lifestyle. opening a new chapter in life and adjusting to a different kind of lifestyle. It is a make it or break it moment in life.

24th of September 2017 my journey started in Yarmouk university, it was the greatest 4 years. My name is Haneen and I'm a communications engineer who's about to graduate with a very good GPA (82.4%). Studying telecommunications engineering has opened my eyes to the world and studying is not just books about math and science, it's a whole world of remarkable study outcomes and never ending development.

During my 4 years tele team was part of my life in university, this team offered all the help to the students from the bottom. during the period I was in charge of the team, we build the teamwork spirit, guidance as well as the studies and notebooks needed for each subject also providing explanations of distinguished students from the department to get the best grades and understanding.

Yarmouk university and Hijjawi facility offered us the best doctors even during the pandemic of covid-19 virus they showed us that it's not just about grades but also how much they care about making sure that we understand every word and if needed they repeat the information as much as we need though the department subjects have been challenging but exciting. Nevertheless, being an Elia Nuqul Foundation scholarship student was one of my reasons to be the best not just in academic life, but also in social life which enhanced my thinking process as well as my leadership personality. I'm so proud that I have reached this level through all the limitations that I have faced from staying up all night to the need of researching on your own to understand more and more which is something even it's hard but it builds a huge knowledge with the help of our precious doctors.

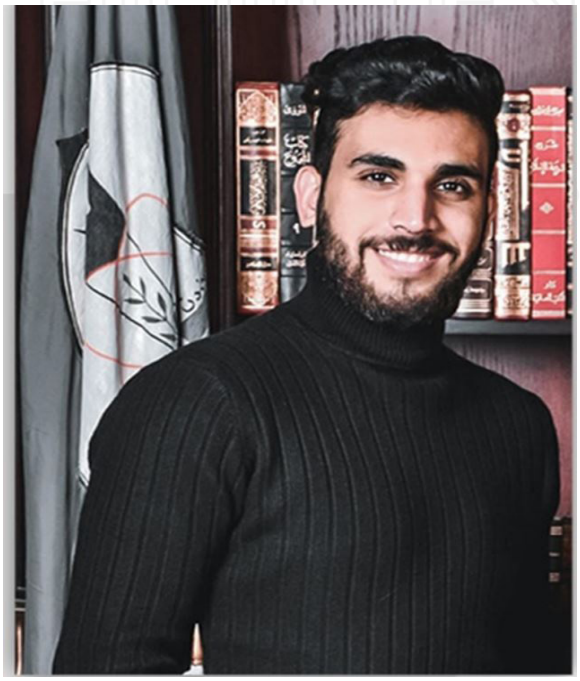
The last days of college were the hardest, knowing that soon you will be departing your friends, the campus, teachers and completely leaving behind a part of life. College Life is an essential time in a person's life. College Life teaches us many things and builds our confidence to face the challenges and struggles in our future. Instead of just focusing on the study, a person must participate in other activities and socialize as much as possible in his/her college life as all these things help in the overall development of a person.

Despite climbing the ladders of success, you will cherish the memories of your college life.

Mousa Murad Alkhub

My name is Mousa Murad Alkhub, in this paragraph I'm gonna talk about my journey inside Hijjawi Faculty for Engineering. My story in the Hijjawi faculty is a story of excellence and achievement led by the vision of a successful engineer. The faculty fulfills its responsibility towards the students through a high standard of teaching members & programs which focus on empowering students. Also, I think the faculty has done a really good job of linking studies with work-based opportunities, and the facilities for Engineering at Hijjawi Faculty really are outstanding. I have been studying Telecommunication engineering for the past 4 years and now I'm about to graduate with an excellent GPA(89.2) and top of my class. The first year was a combination of math, science and engineering courses to begin building a foundation of theoretical knowledge to Telecommunication Engineering. well, during that year I didn't have many relationships but after joining the group of older students there has been so much support and guidance from the TeleTeam group. During the next year things went well, the department subjects have been challenging but exciting . Also I have found that In order to master the content and perform well on exams, you need to study more and depend on yourself. For the last two years when the coronavirus pandemic forced university to close its doors and move classes online that sudden shift was difficult and I have been faced some obstacles the beginning but wmembers studies and online teaching were at a high level and I have lived good experience. Now after getting my Bachelor's degree goals must be set and for me i like to start with micro goals and begin to work toward the ultimate goals of employment and being financially stable.

Ali Tarrada

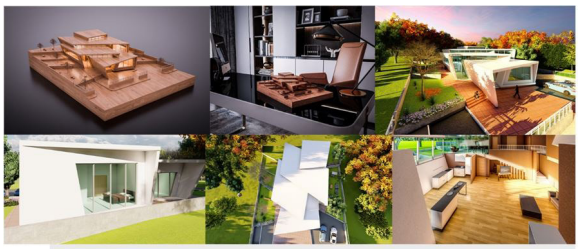


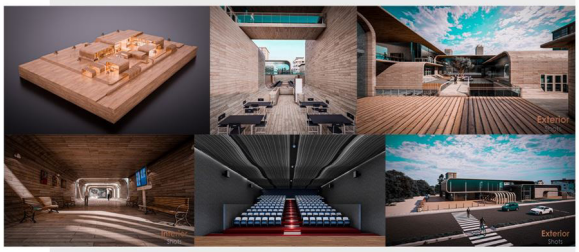
Initially, I chose architecture because of my natural desire to draw and design, as well as my expansive imagination, which aided in the development of my skills in this field. Yarmouk University was my first choice because it is a pioneer among Jordanian universities, particularly in the department of architecture. One of my ambitions was to be one of the school's creative graduates.

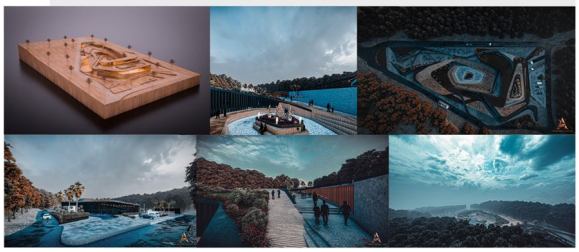
Educational experience in college

Because I am of a different nationality, my study experience in this major was unique. At first, I thought that achieving harmony with students and faculty would be difficult, but I soon found myself integrated between students and faculty because the general atmosphere in the Department of Architecture fostered a strong bond between students through the integration of theoretical and practical material, which led to my involvement in the community as a student.

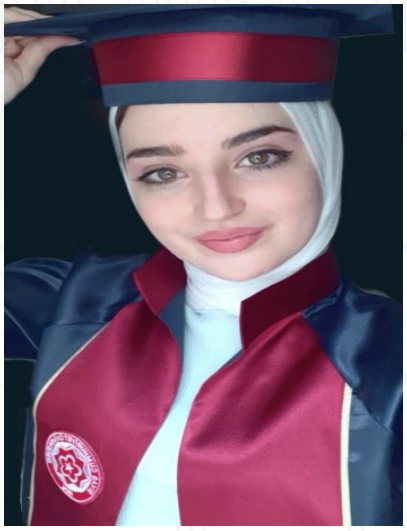
I'm presently in my final year of studies, and I'm on the honors list. In addition, I took part in the Hijjawi College scientific exhibition for the 2021/2020 academic year. Jordan was a wonderful experience for me. Finally, discovered the joy of studying alongside friends from my major and institution. My emotions were a mix of nostalgia for my homeland and family, as well as the years I lived in Jordan. I strongly advise you to begin your adventure in the same manner that I did, if not better!







Aya Al-Khalili



Hello! My name is Aya Al-Khalili, I'm a -23year-old fifth-year architecture student at Yarmouk University's Hijjawi faculty of Engineering Technology. To be honest, collage will always be the most unforgettable period of one's life. I know it was just five years, but the challenge it brought was more than one could have imagined. I've learned, laughed and suffered a lot. But all of these will continue to live in my memory as a wonderful aurora I long to cherish. One of the nicest things about studying architecture is that every day is a new experience and a new challenge, which I think was ideal for someone like me, someone who hates regularity and following others' steps. When I first enrolled in the architectural program, I had a fairly low GPA as a freshman, about an (F), but I challenged myself throughout my study years. Now I have a (B+) GPA, as it has really jolted me up to a lot of things. I didn't only concentrate on my study, but also interacted with my lecturers and paid attention to the collage guidance.

I engaged in extracurricular activities, seminars organized by international entities such as the DAAD and I had the opportunity to be an ERASMUS+ exchange student. Through my training in Turkey, which was provided by ERASMUS+ exchange plan, I've been asked to redesign the firm I worked in. In addition, I have always enjoyed working in landscape and urban planning. I also worked on the renovation of the Irbid camp and remodeled the Irbid local court into a large park for the locals who live nearby. I intend to leave a mark in the field of architecture, and my ambitions are sky-high. Most importantly, I will never give up fighting for what I want. And hope neither will you! One day, I'll be silently smiling with tears of joy, looking at images of my college and friends, recalling all the beautiful moments I had during college years.

Lujain Raji

Hello, I'm Lujain Kefah Raji, a senior student and a concrete enthusiast at the department of civil engineering. I have always been fascinated by how drastically civil engineering changes the world around us and I have always wanted to be a part of the industry that developed our world. When I was looking up universities study in I was intrigued by the uniqueness of the civil engineering courses in the Hijawai faculty, they are advanced building technology courses aiming to create a modern generation of civil engineers capable of creating solutions to today's problems. Our doctors and administrators are young professionals full of enthusiasm, which made my experience as a student extraordinary.

I volunteered with the university's student union orienting freshmen and did outreach work to society. Yet, the most wonderful experience was when I became the Vice president of the American Concrete Institute student chapter executive board, mentored by an amazing advisor, Dr.faris Matalkah, for two years, which paid off as We organized many on campus, local and international events, won many competitions locally and internationally, our biggest achievement , being classified as an excellent university in a ranking containing more than 215 universities worldwide. We created a network for all civil engineering students in Jordan and the middle East to be able to communicate, share their thoughts and ideas. I was very honored as we represented the Jordanian students in international forums. Our department allowed us to use the laboratories and resources to experience science in an applicable way and I'm so thankful for that. These years have taught me to think professionally, passionately and carefully about every action that I'm going to take, I have learned immensely from each day and I'm so grateful for that

Ahmad Abo Al-Foul

My name is Ahmad, a fourth-year civil engineering student at Hijjawi Faculty for Engineering Technology. Majoring in civil engineering actually it wasn't a coincidence for me. One of the main reasons I majored in civil engineering was my passion and love with the dynamics, the construction of bridges and skyscrapers. I was fascinated by them since I was kid and till today. The art and the application of science, the construction is just too interesting and exciting for me.

In 2018, I started my civil engineering journey. Studying at Al-Yarmouk University was a great full experience in various ways. I consider myself an active student, so I used to participate in many volunteering works ,student activities and sometimes going on field trips, locally and abroad. By holding and organizing conferences with international partners and ambassadors, in which it helps to practice our knowledge in a practical way.

Our department is always special with its exceptional alumni, whom are always ready to give knowledge and advice, and never too busy to teach us things that we won't find in textbooks. They are always teaching us how to put our theoretical studies into practical knowledge and application. Im honored to be a part of it.

Our faculty always has a thing for it's students. Committees, scientific events and graduation projects excellence.

I benefited from that by being a part of some of these communities.I have been on the Yarmouk university ACI student chapter Eboard for almost a year now, it was the first accredited chapter in Jordan! During this time, we organized events and participated in both local and international competitions.

My board members and I are always receiving top 10 rankings around the world as a result of the constant support our advisor gives us.

ASEE is another great committee, which consists of team members from all the faculty's departments. Our aim is to work for the benefit of the students.

Now that I'm close to the end of my journey and that I'm working on my graduation project in transportation engineering, which I consider to be my favorite part of my major, the reason for that, my old childhood love and admiration for roads, pavements and bridge and as you can say our childhood dreams lead us to choose what we love in adulthood. The thought of saying goodbye is starting to make me feel a bit down, but I'm excited to embark on a new journey full of knowledge and experiences that will stay with me for the rest of my life. I aim to put good use to all this to make a positive impact.

2

Students' Graduation Projects

The Bachelor programs at Hijjawi Faculty have been known for their focus on the practical skills of students. The programs offer a four credit hour graduation project in which students work on theoretical investigation and practical implementation of special projects that migh target and solve specific problems. In general, students work on their projects under the supervision of an academic advisor who can guide them to ensure the success of the project. The ideas of graduation projects that students .work on in different departments depend on the topics covered in their study plan
Students work on the graduation project in groups usually including students from the same department. Each group chooses a specific idea after agreement between the group members, and work on the project begins after the project supervisor approves the idea. Students from different departments might work in a joint project to work on ideas that need more than one specialty to facilitate the completion of the project and solve various problems in logical ways to reach the final results

We will include some examples of projects done in different departments with a breif description about each projet

Computer Engineering Department (CPE Dept):

The projects in computer engineering usually involve writing software and firmware for embedded microcontrollers, designing analog sensors, designing mixed signal circuit boards, and designing operating systems. Computer engineers are also suited for robotics research, which relies heavily on .using digital systems to control and monitor electrical systems like motors, communications, and sensors

Project Sample from CPE Dept:

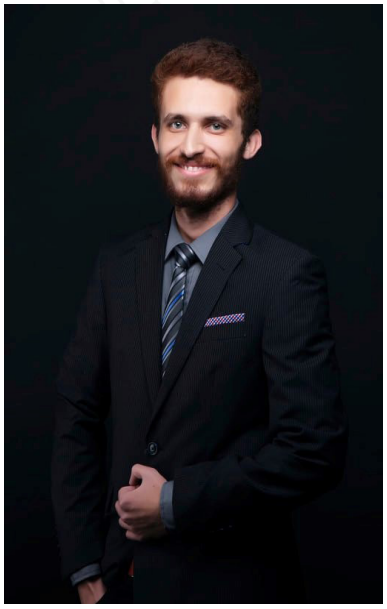
Title: Using LSTM Recurrent Neural Networks in Time-Series Weather Forecasting

Students: Ali Faisal Ali Al-Ramadan (2017980071) and Hisham Mwafaq Al-Eesa (2017880014)

Supervisor: Dr. Amin Jarrah

Ali Faisal Ali Al-Ramadan

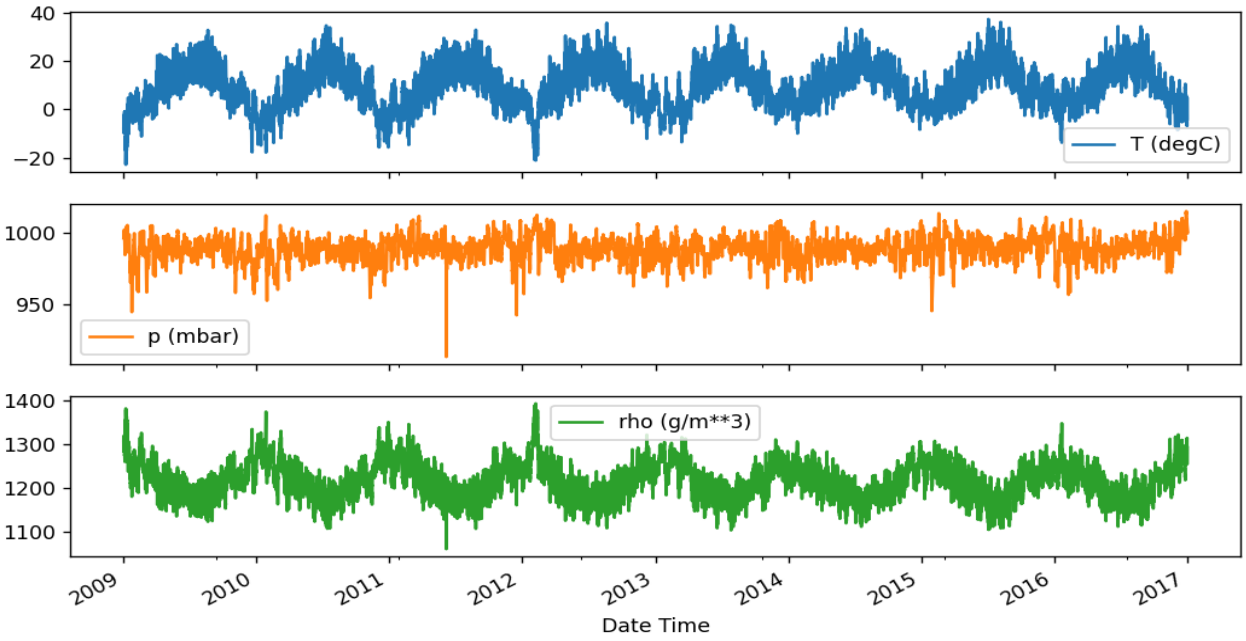
Hisham Mwafaq Al-Eesa

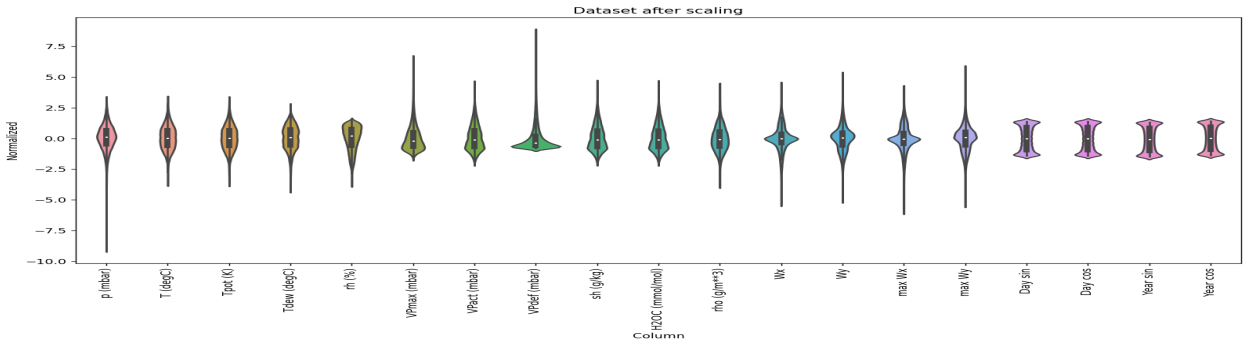


Time-series weather forecasting is the prediction of weather using science and technology for a given location and time based on historical time-stamped input data. The main purpose of weather forecasting is to inform people about the future weather conditions to allow them to plan and take the necessary decisions. Weather forecasting can save lives, especially in life-threating situations such as floods and tornados as it allows people to evacuate before they occur. The main purpose of this project is to create a model that can predict the weather conditions accurately. The two most important parameters in any weather forecasting model are the algorithm and the regional time-stamped training input data. These parameters are used to train .the model so that it can be used for future predictions

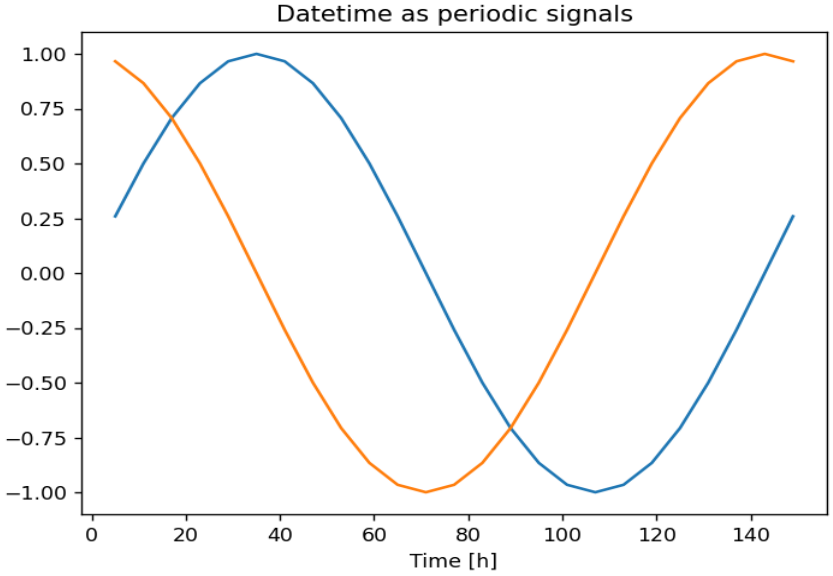
During training, a model's accuracy is measured using some error metrics that compare the actual labels with the predicted ones, and the training .is repeated if the accuracy needs to be improved Another set of input data, known as the validation data, is used to further improve the accuracy. Once trained, the model can then be used for predicting the weather using another set of data known as the test data. There are many models that are used for weather prediction such as the mathematical models, and neural network models. The model in our project is based on a specific type of neural networks known as the long short-term memory (LSTM) recurrent neural networks, and .it mainly tries to improve the accuracy of predictions

A sample of the inital dataset

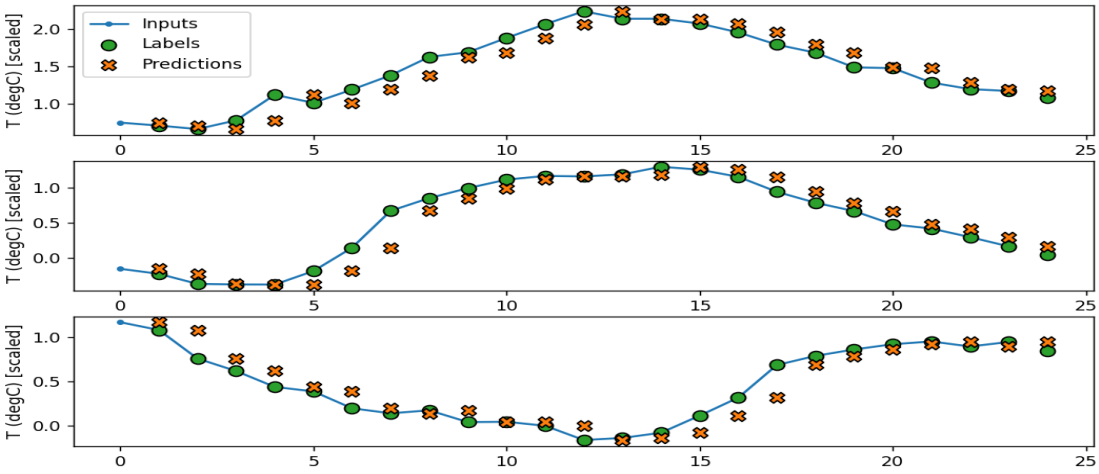




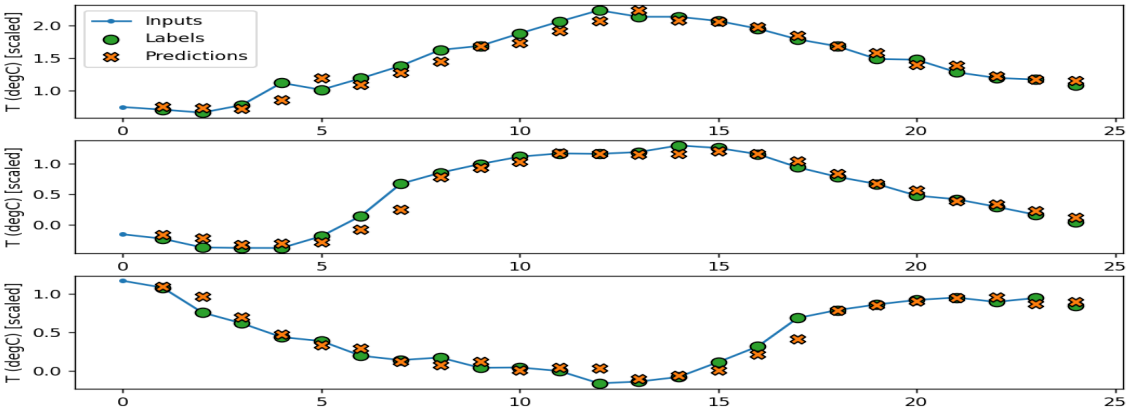
Datetime as periodic signals



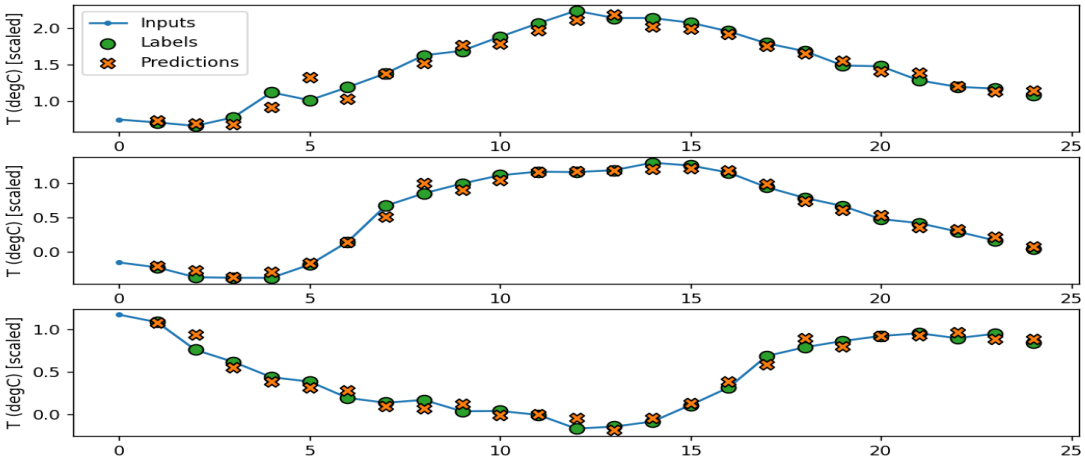
The predictions of the "Baseline" model



The predictions of the "Linear model"

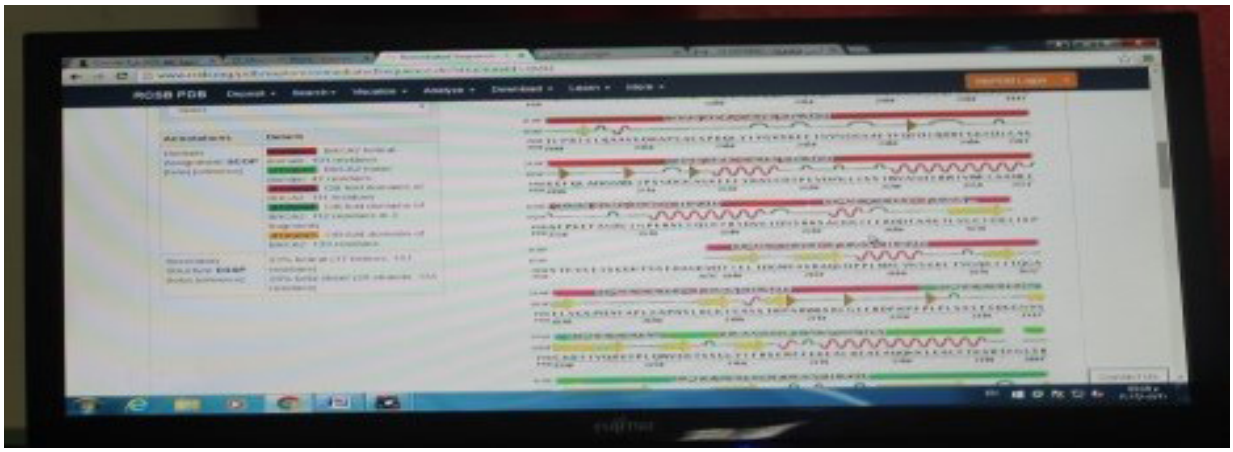


The predictions of the "LSTM model". This model has the highest accuracy in comparison to the other models.



Biomedical and Information Systems Engineering Department (BME and BMIE Dept):

The projects done by the students in Biomedical and Information Systems Engineering Department target the application of engineering principles and design concepts to medicine and biology for healthcare purposes including diagnostic or therapeutic. Mainly, the students projects involve biomedical Instrumentation, Biomedical Signal Processing, Biomedical transducer, Medical Imaging, Medical Image Processing, Biomechanics, Biomaterials, Tissue Engineering, Bioinformatics, Medical informatics, Parallel computing, and Artificial Intelligence



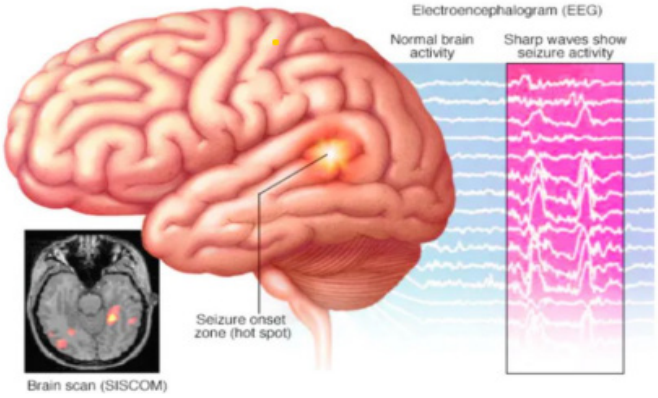
Project Sample from BME Dept:

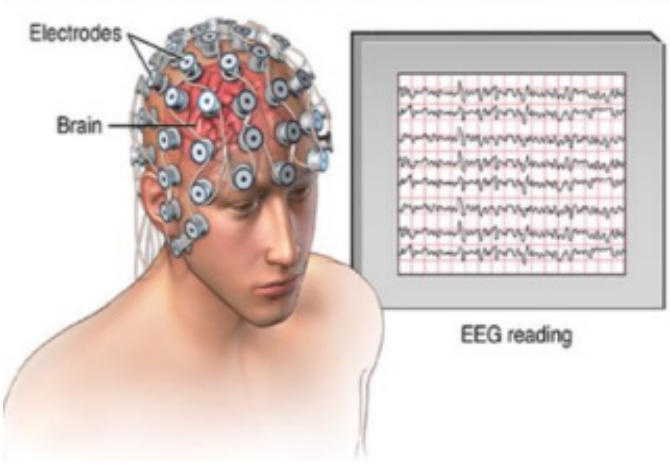
Title: Epileptic Seizure Recognition

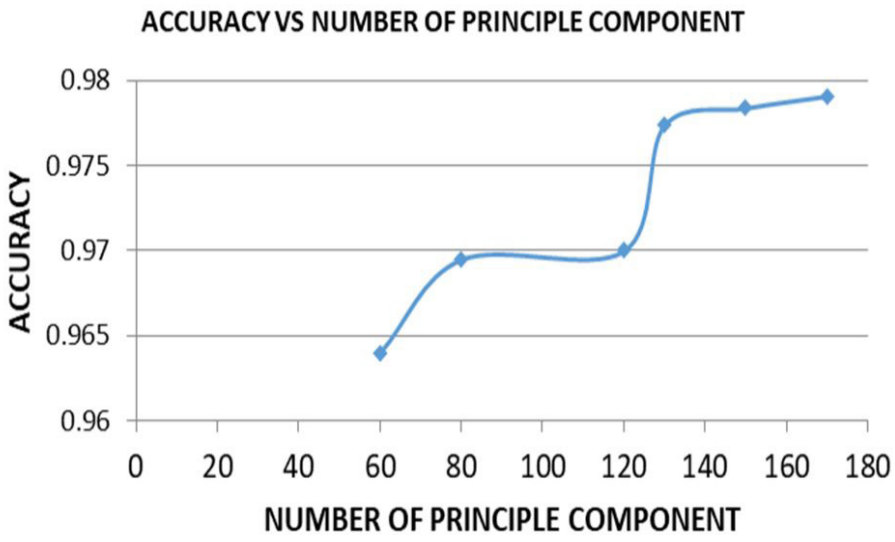
Students: Ruaa Al.Dmour, Manar Al.Dabaibeh, Thekra Al.Hawarneh and Sara Al.Asmi

Supervisor: Dr.Ahmad Al-Omari

Epilepsy is a central nervous system (neurological) disorder in which brain activity becomes abnormal, causing seizures or periods of unusual behavior, sensations and sometimes loss of awareness, it is a common neurological disorder that affects 65 million people around the world. This project presents an overview of how to diagnose epileptic seizure via advanced techniques of what is called artificial intelligence, including patient's features, suitable algorithms, and statistics, using python as a programming language to achieve the best result with high accuracy in the shortest possible time compared to other models that we applied. The reached accuracy was up to 97% neural network model for a huge data .consisting of 178 attributes and 11500 instances

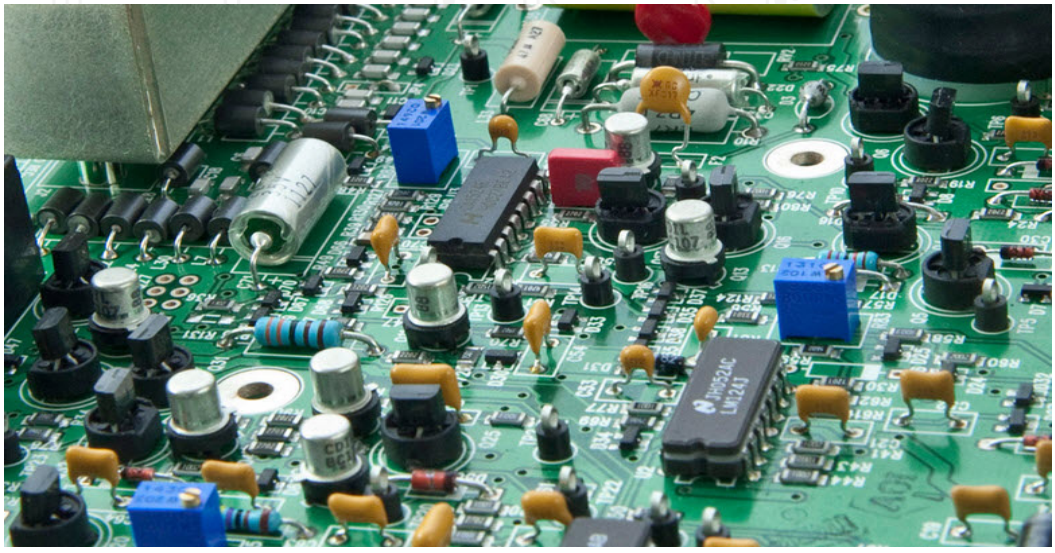






The Electronics Engineering Department (ELE Dept):

Special emphasis has been given to the department curriculum to stay up to date with the rapidly changing in the electronics engineering field. The classes in the department covers multidisciplinary topics including analog electronics, digital electronics, consumer electronics, Optical electronics, embedded systems and power electronics. The students in their final projects work to use the electronics engineering in different applications that can be clearly identified by their advantages in real world, these projects involve various fields including telecommunications, control systems, signal processing, systems engineering, computer engineering, instrumentation engineering, electric power control, robotics, internet of things, embedded systems, sensors and instrumentations



Project Sample from ELE Dept

Title: Contactless Optical Liquid Identifier

Students: Eyas M. Abu Mousa, Razan M. Talal Mushaljy

Supervisor: Dr.Yusra Obeidat

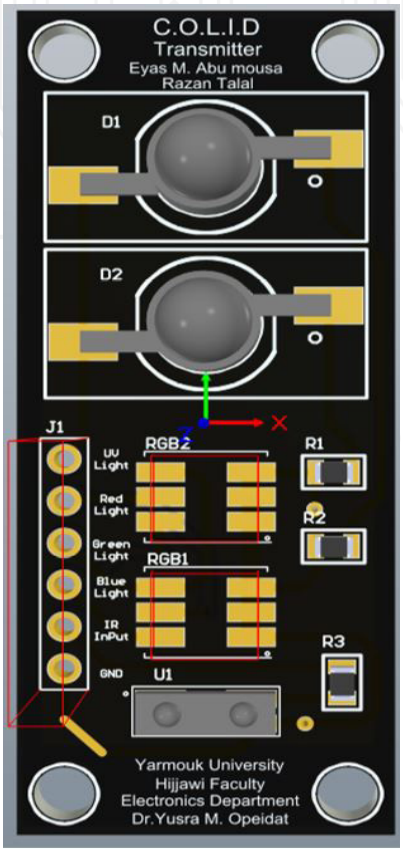
Eyas Abu Mousa

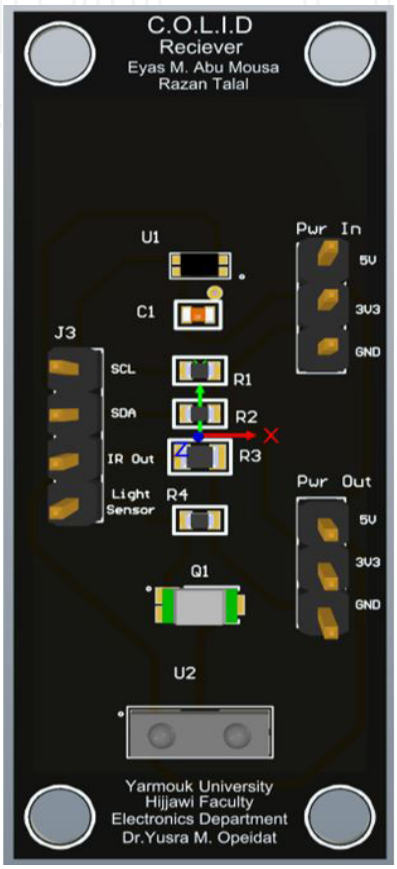
Razan Mushaljy

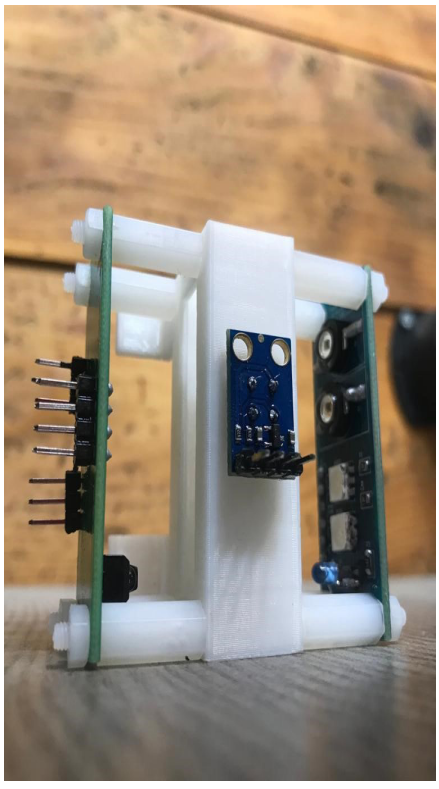
The main goal of the project was to develop a portable and optical based electronic device aimed for a contactless identification of a liquid specimen. A set of light emitting diodes (LEDs) that operates on different wavelength levels were used. A contrast reaction between every different wavelength and the specimen is used to give an identification for each liquid, as every solution reacts to each wavelength differently. The proposed system is designed for liquids analysis .and theoretically relies on Beer-lambert law

The system basically depends on sending radiation from a light emitting source, the emitted photons will penetrate through the sample, a part of it is going to be absorbed and the rest is going to be passed through to the other side of the sample container. The amount of light passed through the sample to the other side is measured by specific photodetectors. The absorption process that happens to the broad range wavelengths of light while passing through the sample is the main indicator to identity a specific sample. The transferred light readings depend on the amount of absorption which depends on the sample type, color, contents, and concentration

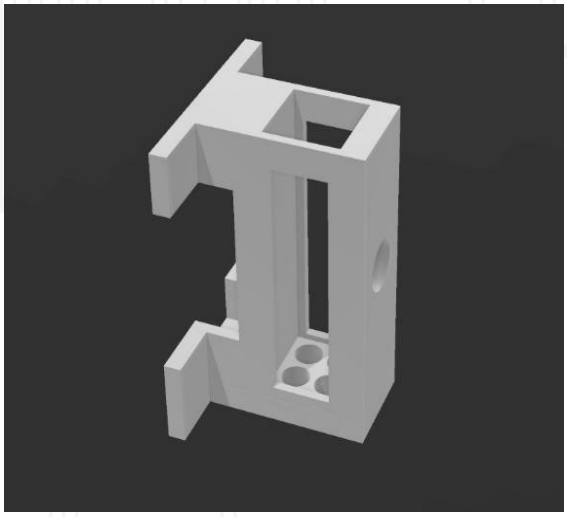
A) The designed optical system:



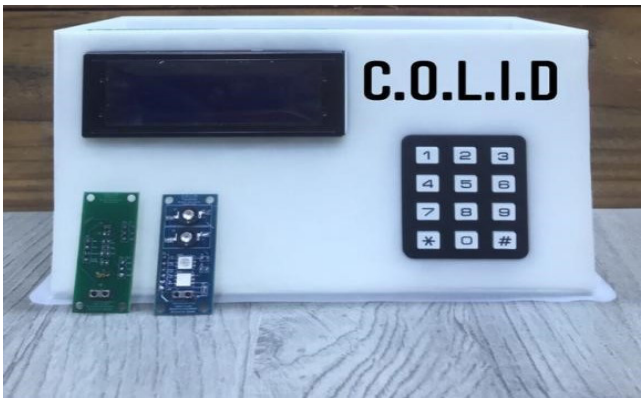


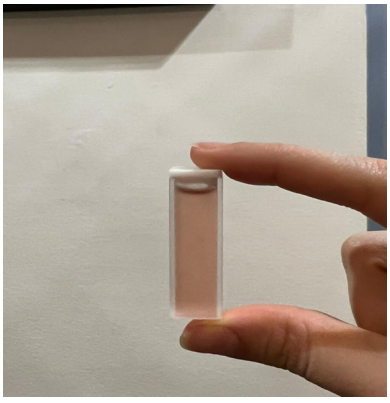


B) The Cuvette Holder:

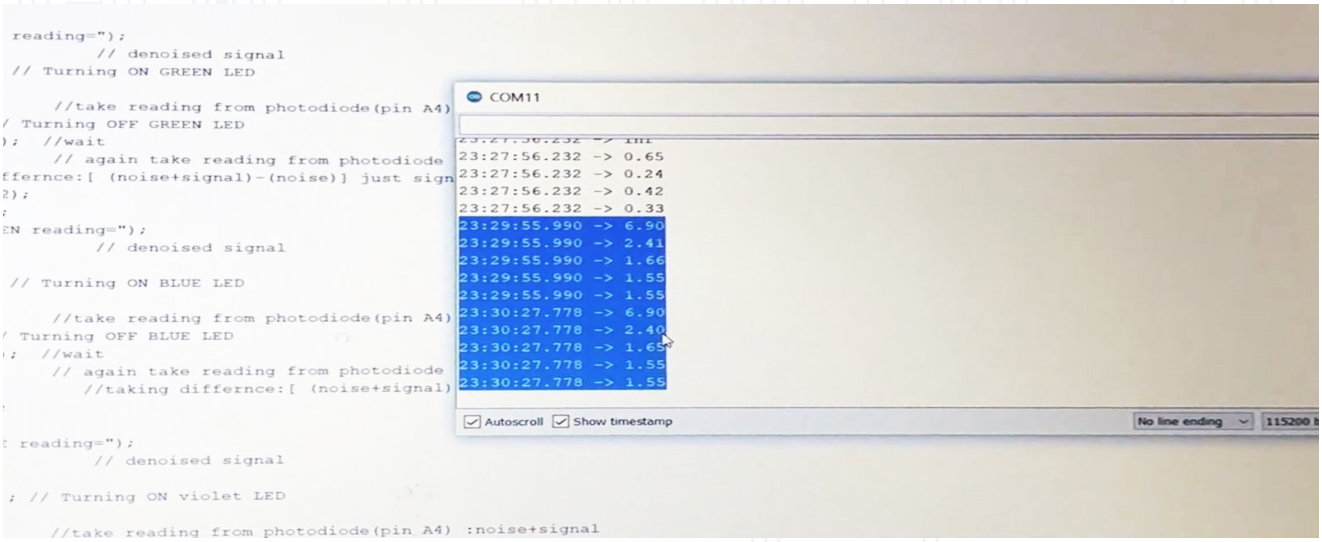


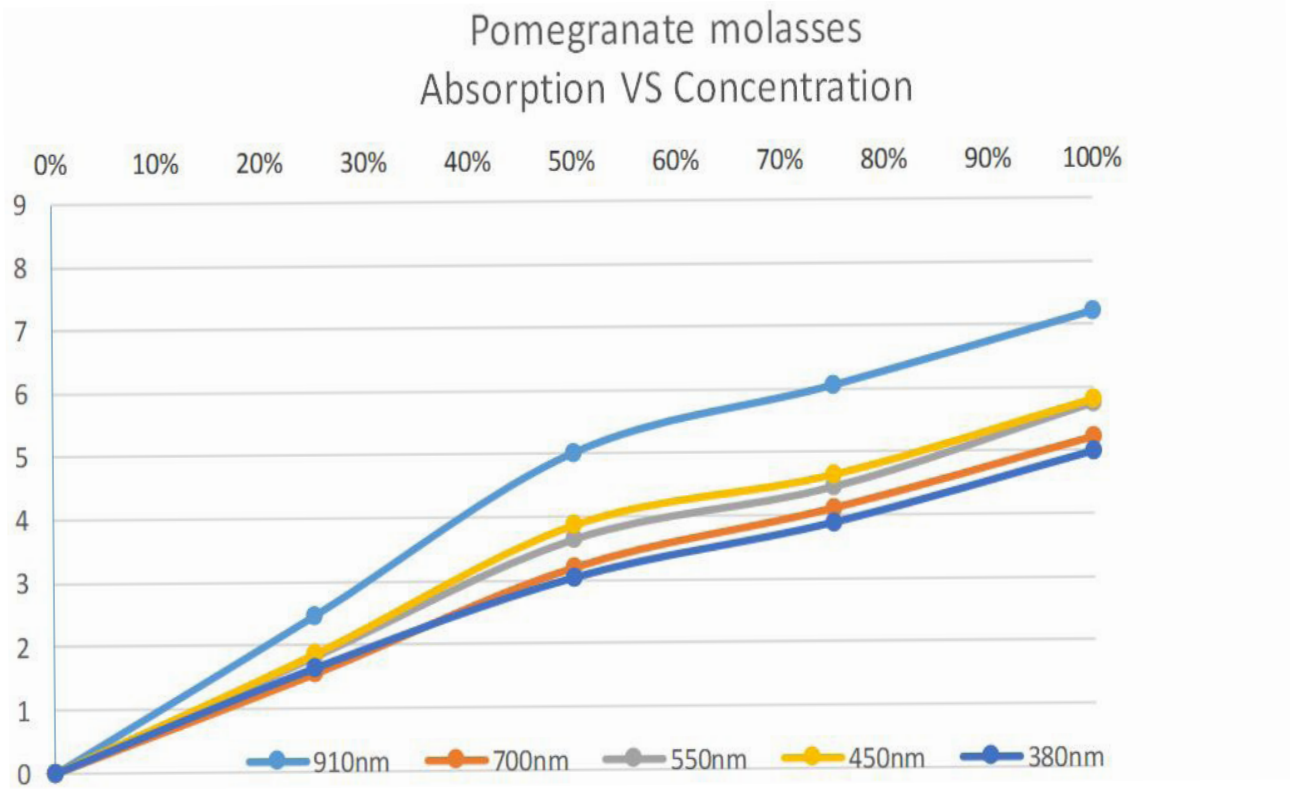
The final design can recognize up to thirty different materials in their liquid state and provides some other useful features that can enhance its operation. The user is able to choose and set the group of thirty liquids that the device can detect and identify according to specific needs and applications. The device can provide the user with some specific settings to start the measurements. The volume of a fluid is identified by a four mL sample inserted in the cuvette, then the user can start measuring the concentration of some common solvents like methanol, ethanol, etc. by displaying the amount of transferred light of different wavelengths through the sample





C) The Final Results





The Industrial Engineering Department (IE Dept):

The students projects covers the various fields of Supply Chain Management, reliability and maintainability, Renewable Energy, Microelectronics, Data Analysis and Processing, Quality Control and Reliability, Structural Health Monitoring, Modeling and Optimization, Automotive Technology, Design of Experiments. The students in their projects apply the knowledge of all areas related to industrial engineering such as: operations management, systems analysis, operations research, engineering economics, production and inventory control, project management and scheduling, quality, ergonomics, human performance and safety, and manufacturing systems and processes

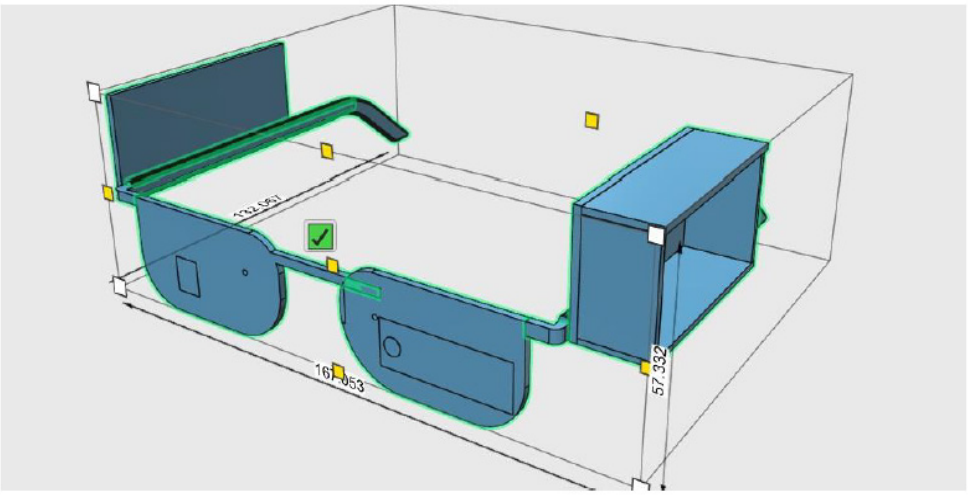
Project Sample from IE Dept:

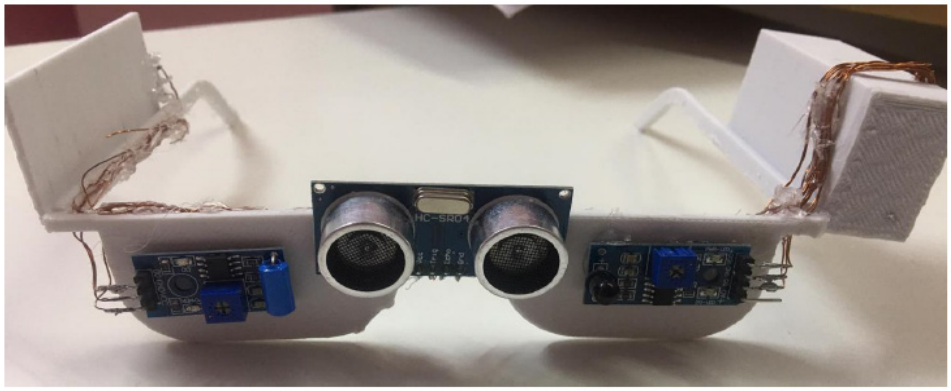
Title: A DMAIC Based Framework Towards The Design And Development Of Smart Glasses For Blind People in Jordan

Students: Majd Alkhotaba, Ola Alaraj, Shaimaa Alzboon, and Tasneem Khalaf

Supervisor: Dr. Dania Bani Hani

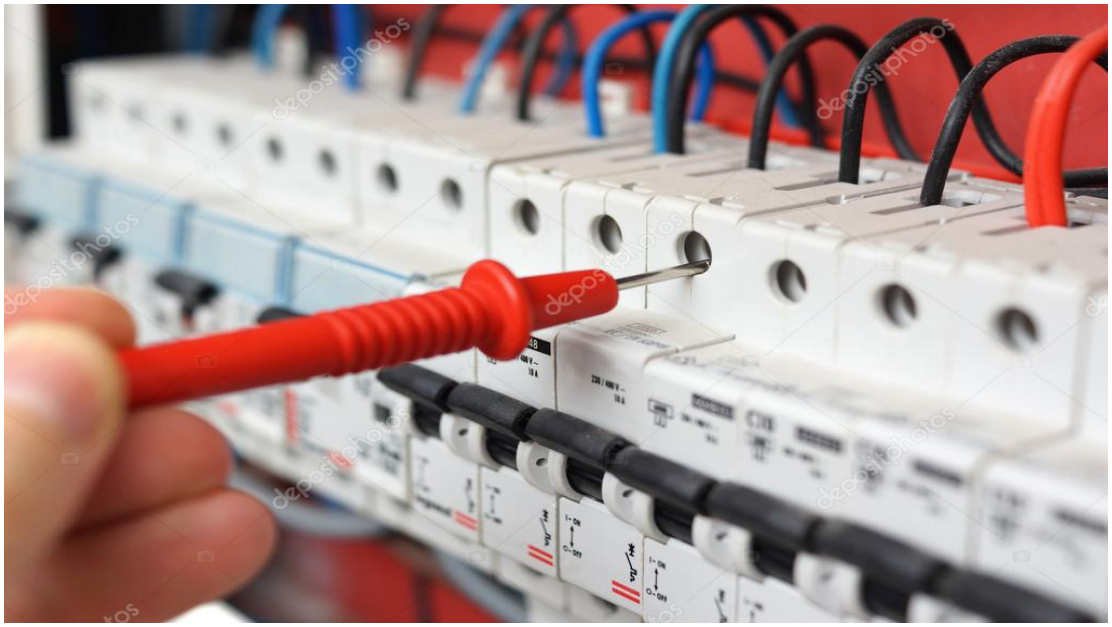
In their graduation project, students worked on developing a product to provide greater assistance to blind people by solving many of the problems that they might face in practicing their daily lives. In the project, students used a survey to understand the customers' needs under which they applied the Kano model to reflect the customer needs. Statistical analysis was also implemented to highlight the most important features to include. Students designed smart glasses to help the blind people and provide them with assistance. Students followed the DMAIC methodology towards the implementation of their project. Ultrasonic sensors, flame sensors, and vibration sensors were used to help the blind people avoid being in dangerous situations such as hitting high objects, trips and falls and being close to the dangers of fire. The smart glasses have a GPS system to help the parents/ family members get notified when their blind person is at danger. Students have gone through all phases of the design process starting by understanding the customer needs, running some statistical models, I"D printers, to having a product, manufacturing using performing a cost benefit analysis, testing the product and understanding the overall business model





The Electrical Power Engineering Department (EPE Dept):

The students projects cover electrical machines, power electronics, power systems, distribution systems, smart grids, renewable energies, electronics, communication, and high voltage engineering systems



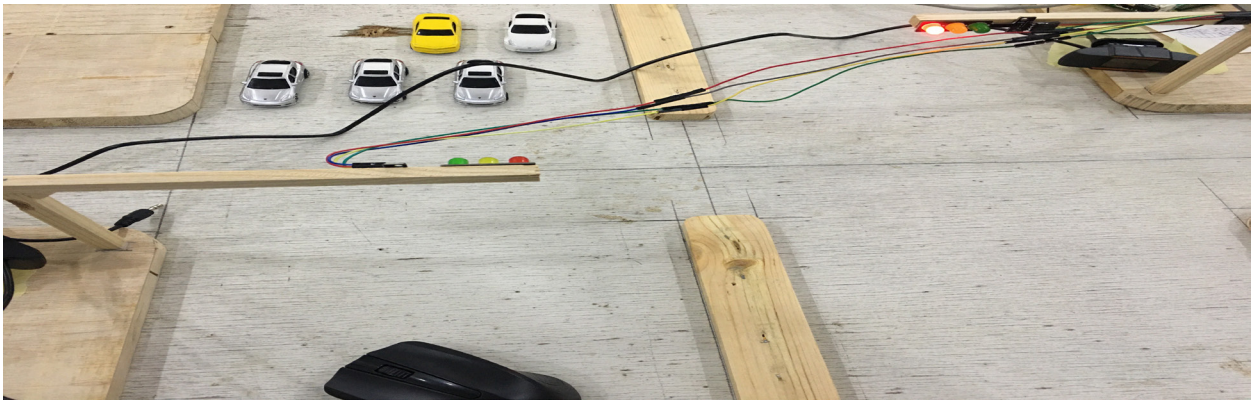
Project Sample from EPE Dept

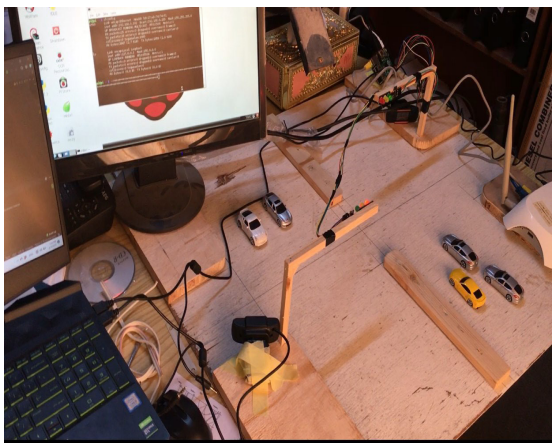
Title: A New Approach for Smart Traffic Lights

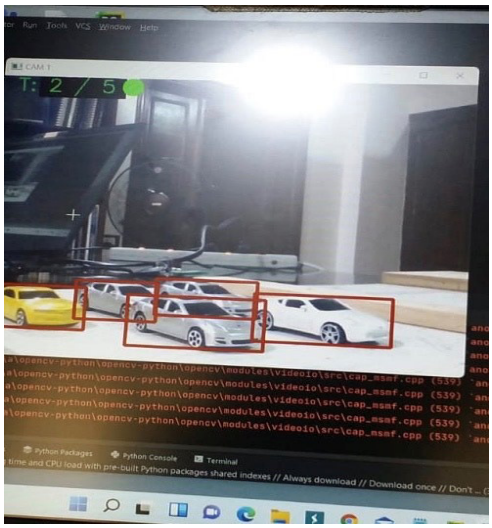
Students: Issam Alhazaimh , Osama Bani Sakher, Gaith Malkawi

Supervisor: Prof. Mohammad Al-zoubi

Despite the remarkable developments achieved in traffic light systems in the last three decades, the uncontrolled increase of vehicles still constitutes a problem for a smooth flow of traffic. Although Jordan cities are not considered very crowded ones in international measure, the traffic congestion problem is increasing day after day. The aim of the current project is to introduce new ideas, concerning control of traffic light system, to solve one of the major problems of traffic congestion. In this project, a self-adaptive system will be modified and adjusted according to the density of vehicles in the road. The approach will use computer vision technologies for real-time calculation of traffic density by detecting the number of vehicles waiting the signal and set the green light time accordingly. A simple traffic light model was constructed and applied to simulate a real functioning of proposed system. Additionally, this system will use live video fed from CCTV, Open CV libraries, Tensor Flow and YOLO algorithm. Finally, this proposed system has been tested to prove its reliability by avoiding the problems associated with older approaches, such as the wasted time spent by the green lights with no vehicles coming in

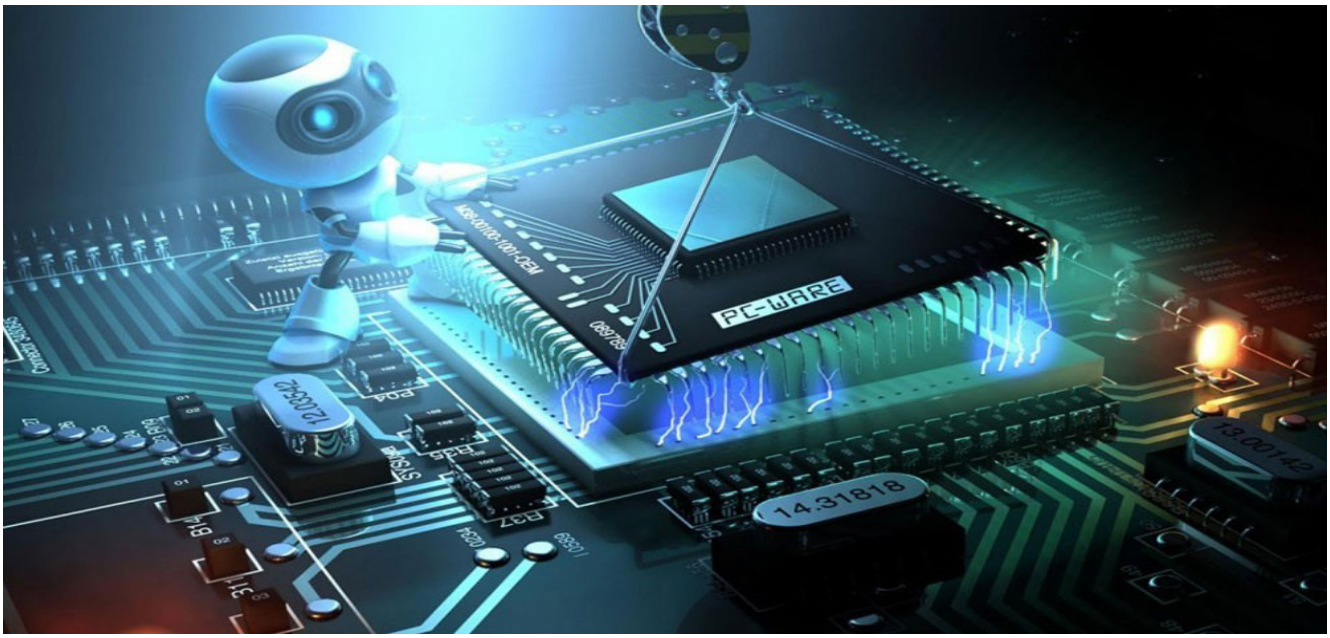






The Communication Engineering Department (CME Dept):

The students projects include designing wireless and mobile communications systems,electronics , and data communication, sensor, instrumentation, internet of things



Project Sample from CME Dept:

Title: "How to make Yarmouk library (Al-Hussein bin Talal library) is smarter using passive High Frequency RFID"

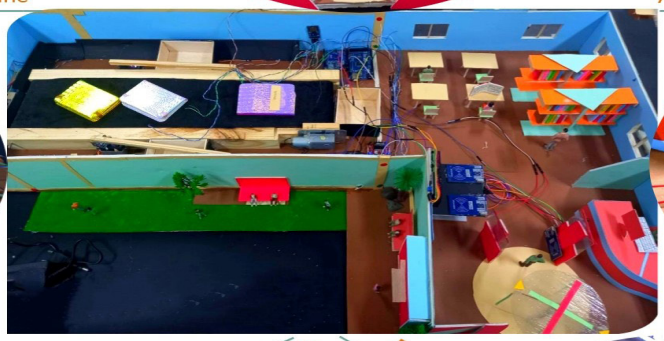
Students: Alaa Al-Naji, Toqa Qublan

Supervisor: Dr.Hazim Shakhatreh

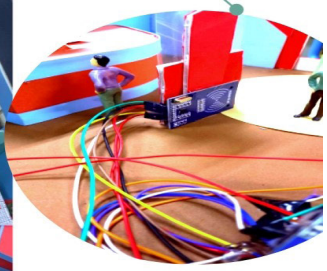
The research project titled "How to make Yarmouk library (Al-Hussein bin Talal library) is smarter using passive High Frequency RFID" is a bone-fide record of research work done by Ala'a AL-Naji and Toqa Qblan under the Guidance of Dr.Hazim Shakhatreh in Telecommunications department, college of Hijjawi Faculty for Engineering Technology/ Yarmouk University. This project talk about the future of Al-Hussein bin Talal library which considered as one of the largest libraries in the Middle East, it is a destination and refuge for many students, faculty member and other for services of its provides, it is a haven for information sources sources 600,000 in its various forms which contain a volume of books and university theses, 515,000 including digital 2000 miniature of films and 14,000 approximately miniatures, in addition to an automated speech system for blind people to facilitate the research process of them. The current library management system (LMS) operate a barcode technology for circulation processes i.e. borrowing and returning books, but there is another technology that has outperformed the barcode technology and is used by most library around the world, which is RFID (Radio Frequency Identification) technology, it is a wireless communication technology used radio waves in tracking process based on three main components; RFID reader, RFID tag and a data processing subsystem. The major drive forces behind the rapid deployment RFID technology is a commercial revolution which means that RFID increase the quality of services and improving the efficiency of operation. With RFID technology it is expected that the library visitors can .carry out various activities very quickly, effectively and safely The purpose of this research is to make a Yarmouk University library utilizes RFID technology for the book management process using passive (tags has no batteries) MHz, so we made a case 13.56 RFID with high frequency study consist of five main stages before implementing this technology, and Ala'a designed a prototype of smart library system based on Arduino IDE consist of four sub-systems; the first one is self-checkout system, the second is applying a security system via anti-theft gate based on HF-RFID, the third one is automated book return system from outside the library and the last one is the sorting machine connected with third system to sort the books returned from outside the library in the suitable bins according to the books location on any floor, in this prototype we used three books (EM,WAVE, Antenna) the inside of these books consist of RFID tag label which it can read by RFID reader and three RFID card for student's have names (Ala'a, Toqa, Sara) to make a circulation process, as a result of our design; the four sub-systems linked to each other in order to exchange and update data between them via using EEPROM memory the time and effort was saved, accuracy, efficiency and safety were increased for 3D rending both library users and employees. We used a Lumion program to imagine the future of Al-Hussein bin Talal library after the design and construction were completed, the system was tested under various working circumstance, such as obstruction .between RFID tag and reader, RFID card angle of interrogation The presented project will help in solving the difficulties of traditional management system for Al-Hussein bin Talal library such as the difficulties in time took in circulation processes and less secure system. We learned from this research journey how the library stored data, what is the type of data and what are the bases the library used to classify books on shelves and how the university student ID number is linked to the book that was borrowed. We would to thank our supervision Dr.Hazim Shakhatreh, we wish to express our sincere gratitude and grateful admiration to him for his overseeing guidance, interest and suggestion which was very helpful for the preparation and completion of this work, we would like to express our very deep respect to the director of the Al-Hussein bin Talal library Dr.Omar AL-Ghoul, the assistant director Dr.Imad Yamin, and field visits to the director of the University of Science and technology's library eng.Ra'ad Al-Zoubi through numerous interviews with him

Prototype of Design

Sorting machine



Anti-theft gate

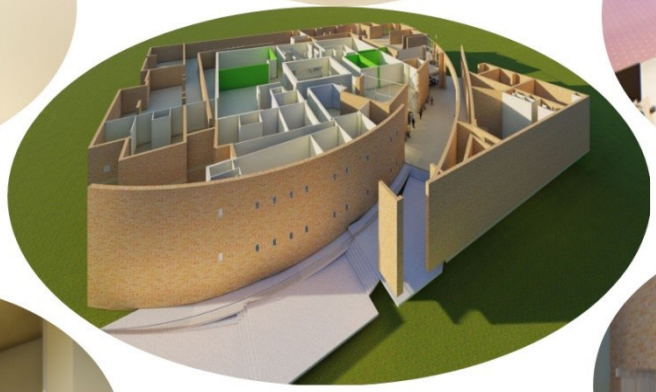


Self-check station

Drop Books

Made with VISME

Future of YU library



Made with VISME

The Architectural Engineering Department (Arch Dept):

The students projects cover technological aspects and multi-disciplinary approach to planning, design, construction and operation of buildings, such as analysis and integrated design of environmental systems (energy conservation, HVAC, plumbing, lighting, fire protection, acoustics, vertical and horizontal transportation, electrical power systems), structural systems, behavior and properties of building components and materials, and construction management

Project Sample from Arch Dept

Title: Graduation Project -Jordanian Academy of Artificial Intelligence

Students: Abdulsalam Alkilani , Omar Meqdadi , Mohammad Smadi

Supervisor: Dr. Muna Alibrahim

The project's vision is to establish the beginning of the technological industrial revolution in Jordan and work to integrate industry, nature and humanity connected together. Teaching students in the technological and artificial field, providing the appropriate space for practicing specialized practical experiments and operations in this field and displaying them in the exhibitions designated for them within the project

Project Sample from Arch Dept

Title: (Toward Low Carbon City- Irbid's sustainable initiative)

Students: Shadi Nabil Rayyashi, Baha'a Metani,Ayat Ahmed,Noor Ma'ayah

Supervisor: Arch Samia Ayyoub

It's a redesign of a street and neighborhood in Irbid in the northern of Jordan, to be zero carbon and walkable, and to help the local economy of the city and address the importance of creating a sustainable urban ecosystem, the zero carbon city is an initiative to effect change and create a city that lasts for future generations by utilizing the urban corridor to be greener and sustainable

The Civil Engineering Department (CE Dept):

The students projects cover various fields of civil engineering such as Structural Engineering, Construction Materials Sciences, Transportation Engineering, Pavement Engineering, Geotechnical Engineering, Water Resources Engineering, Environmental and Waste Water Treatment Engineering, and Construction Project Management and Engineering

Project Sample from CE Dept:

Title: Bullet-Proof Concrete

Students: Ali A. Tawalbeh

Supervisor: Dr. Ahmed Salama

Bullet-proof concrete is a concrete mix designed to absorb the bullets' impact and stop them without penetration, ricocheting or returning, even for a very narrow firing angle. The actual resistance of these mixed assemblies to high-velocity projectiles such as bullets varies considerably depending on the details of the assembly and the type and energy of the projectile. This project focuses on studying composite concrete mixes' resistance under an impact of the AK-47 bullet with an estimated projectile speed of 715 m/s and energy of 2019 J

Two sets of samples (nine samples) are fabricated and tested from mortar with 1 cm steel fibres or 1 cm carbon fibres, respectively. Tensile and compression tests are applied for the first set of samples to investigate the effect of steel and carbon fibres on the strength of the specimens. Two ratios (1% and 2%) of fibres per mortar mass are also experienced before assessing the bullet resistance. Three different composite sandwich configurations for the second set of samples are tested with a rear impact test. An Armox-® 500 T plate is applied in front of mortar panels for two configurations

Results show that the addition of carbon and steel fibers to concrete panels enhances the impact resistance of concrete by keeping the panels coherent and preventing them from breaking into fragments, reducing crater diameters and detached mass. The three proposed configurations of sandwiches .panels stopped the full perforation of the bullet

The List of Projects Participated in the Scientific Day of the Deanship of Scientific Research and Graduate Studies Held on March 29th, 2022:

Electronics Engineering Department

Project Title: Inertial Motion Capture
Students: Mahmoud Fayad, Mohammad Jawabreh
Supervisor: Inst. Ma'amoun Tantawi

Project Title: A Smart and Automatic Irrigation System
Students: Islam Obeidat, Dana Abd-Alqader, Wesam Bani-Saeed, Maram Gharaibeh
Supervisor: Dr. Yusra Obeidat

Project Title: A Smart Car Parking System Powered based on Footstep Power Generation
Students: Ibrahim Serhan, Malaa Mansour
Supervisor: Dr. Yusra Obeidat

Project Title: Indoor and Outdoor Security Systems to Prevent the Spread of Covid-19
Students: Toqa Abu-AlDahab, Rana Daoud
Supervisor: Dr. Yusra Obeidat

Project Title: Contactless Optical Liquid Identifier COLID
Students: Eyas Abu-Mousa, Razan Mushalji
Supervisor: Dr. Yusra Obeidat

Project Title: A Smart Home Security System
Students: Sewar Al-Harbeed, Raya Elian, Aya Bataineh, Mohammad Shlol
Supervisor: Dr. Yusra Obeidat

Project Title: Third Eye for the Blinds
Students: Talal Qaryoti, Homam Talal, Al-Hareth Al-Sharea, Abd-AlRahman Reehan
Supervisor: Prof. Adnan Al-Smadi

Project Title: Acetone Sensing in Liquid and Gas Phases Using Cyclic Voltammetry
Researcher: Dr. Yusra Obeidat

Project Title: A System for Blood Glucose Monitoring and Smart Insulin Prediction
Researcher: Dr. Yusra Obeidat

Biomedical and Informatic Engineering Department

Project Title: A 3D Printed Prosthetic Forearm Controlled by EMG using Arduino and Servo motor
Students: Huda Ibrahim, Sarah Za'rour, Yasmeen Al-Hamshari
Supervisor: Dr. Atekah Khader

Project Title: Hand Self-rehabilitation Device. **Awarded as the first place project**
Students: Israa Al-Satri, Bayan Darawsheh, Aya Al-Sharea
Supervisor: Inst. Sami Mashaqbeh

Project Title: Nonivasive Blood Pressure Measurements using Optical Technique
Students: Marwa Ababneh
Supervisor: Dr. Qasem Qananweh

Project Title: Telemetry of Respiration Monitor
Students: Sarah Husienat, Salsabel Al-Dhoun, Sewar Abu-Alhana
Supervisor: Prof. Awad Al-Zaben

Project Title: Low cost performance patient monitor for low income countries
Students: Rasha Al-Alami, Naheelah Radefi, Nada Zhour
Supervisor: Prof. Awad Al-Zaben

Communication Engineering Department

Project Title: How to make Yarmouk library is smarter using passive high frequency RFID
Students: Tuqa Qublan, Alaa Al-Naji
Supervisor: Dr. Hazim Shakhatreh

Project Title: Traffic Signal Pre-emption for Emergency Vehicles
Students: Hala Al-Zboun, Rahaf Nawafleh, Duaa Shakhatrh, Ola Ammaw
Supervisor: Dr. Khaled Hayajneh

Project Title: Telemonitoring system for patient with insomnia
Students: Noor Nsair, Salsabeel Al-Huseinat, Sarah Al-Momani
Supervisor: Dr. Sharief Abd-Alrazeq

Project Title: Smart Rover Robot
Students: Nizar Al-Jebawi, Mohammad Ma'bad, Mohammad Zahrawi
Supervisor: Dr. Asem Al-Zou'bi

Project Title: Wireless Charging of Electric Vehicles Using Solar Energy. **Awarded as the first place project**
Students: Alen Ammari, Samar Malkawi, Fatemah Al-Yousef, Amal AL-Raba'a
Supervisor: Dr. Sharief Abd-Alrazeq

Project Title: IoT Based Smart Pills Dispenser
Students: Aya Ta'ani, Rahmah Gharaibeh
Supervisor: Dr. Sharief Abd-Alrazeq

Industrial Engineering Department

Project Title: Wireless sensor network using Internet of Things
Students: Shahd bataineh, Mayadah Younes
Supervisor: Dr. Sharief Abd-Alrazeq

Project Title: A DMAIC based approach towards the design of a garbage cart
Students: Saed Ismeek, Khaled Al-Shbol, Mohammad Momani
Supervisor: Dr. Dania Bani-Hani

Project Title: Gas Cylinder Holder
Students: Ruaa Derbas
Supervisor: Dr. Gazi Maqableh

Project Title: A Developed System for Solar Energy Storage in Molten Salts
Students: Jood Sulaiman
Supervisor: Dr. Gazi Maqableh

Project Title: Smart ladder Project
Students: Dalia Sawafteh, Sarah Al-Jareeri
Supervisor: Dr. Gazi Maqableh

Project Title: Solar Panel Table
Students: Islam Gharaibeh
Supervisor: Dr. Gazi Maqableh

Project Title: Movable and Adjustable Drill Press Stand
Students: Rania Al-Najjar
Supervisor: Dr. Gazi Maqableh

Project Title: Spirulina System Household Agriculture
Students: Ahmad Azzam
Supervisor: Dr. Gazi Maqableh

Civil Engineering Department

Project Title: Use of Jordanian Olive Waste Ash as A Raw Material for Geopolymer Concrete
Researcher: Dr. Faris Matalkah

3

Key Publications

The faculty members at Hijjawi are interested in conducting scientific research that keeps pace with modern science and technology in all fields. Their scientific research activity also contributed to raising the scientific and academic level of Yarmouk University and its evolution to the best levels which leads it to compete with local and international universities.

Communication Engineering Department

Dr. Hazim Shakhatreh is currently cooperating with the Remote Sensing Unit in Northern Border University, Saudi Arabia in a research project entitled "A Novel Mining Approach using Ground Penetrating Radar Tomography Mounted on Intelligent Unmanned Aerial Vehicles". The primary focus of this research project is on enhancing the performance of the sensing technologies that are employed within automated phosphate mining horizon control. These technologies play a fundamental role in increasing the productivity and safety of mines. Having, automated horizon control remains a challenge within the mining industry. One significant problem that hinders the ongoing development of effective horizon control concerns the absence of instruments that can accurately determine the phosphate-strata geological structure on a real-time basis. To develop effective practical methods of solving this problem, this research project examines the application of radar technology within a production open-cut phosphate mine. It examines the application of ground-penetrating radar tomography (GPRT) for determining and differentiating between subsurface geological strata boundaries. The mining context, experimental design, data collection approach, and validation methods are provided as a means of testing the efficacy and challenges associated with using GPRT for the horizon sensing application. The GPRT suffers from sidelobe masking the sensing angle which may corrupt the collected data by the radar. UAVs optimize the scanning angle/level to maximize the accuracy and scanning data. Sensing the strata-geological structure for mining determinations in a remote area and harsh environment needs further equipment that can reach such an area. Using UAVs will reduce the cost of reaching these environments and increase the capability for accurate measurement data. In this research project, we will utilize UAV- based GPRT to optimize the sensing process through determining the informative angle and level UAV look. We will use the Dyadic Green function to process the scattering field to obtain a 3D sensing image of the phosphate-strata geological structure.

Dr. Hazim Shakhatreh

Dr. Hazim Shakhatreh received the B.S. and M.S. degrees (Hons.) in wireless communication engineering from Yarmouk University, Jordan, in 2008 and 2012, respectively, and the Ph.D. degree from the ECE Department, New Jersey Institute of Technology, in 2018. He is currently an Assistant Professor with the Department of Telecommunications Engineering, Hijjawi Faculty for Engineering Technology, Yarmouk University. His research interests include wireless communications and emerging technologies with a focus on unmanned aerial vehicle networks.

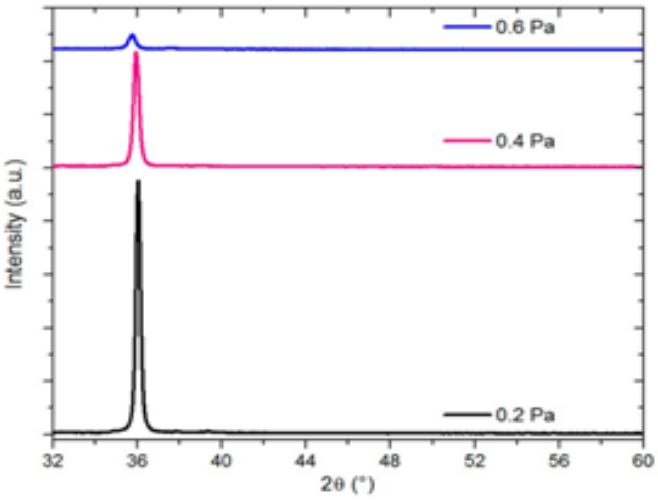
Electronics Engineering Department

Prof. Abdallah Ababneh

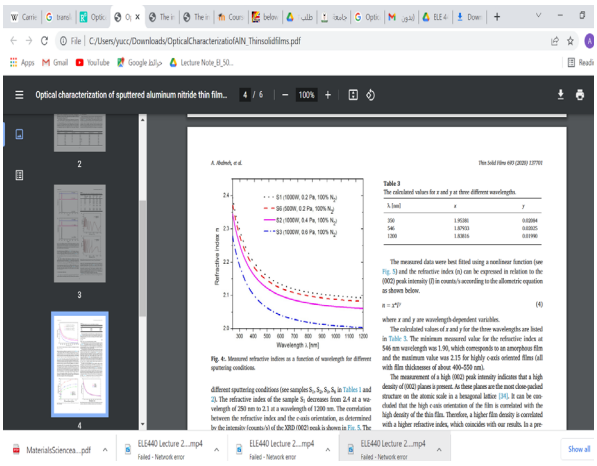
Prof. Abdallah Ababneh received his Dipl.-Ing. (B. Sc. + M.Sc.) and Ph.D. degrees in electrical engineering from Saarland University/ Germany in 2002 and 2009, respectively. He is currently Professor at the Department of Electronics Engineering at Yarmouk University. His research interests include MEMS, characterization of thin films, piezoelectric thin films and microresonators.

Prof. Ababneh research areas in cooperation with Saarland University in Germany and Castilla La Mancha University in Spain include the following topics:

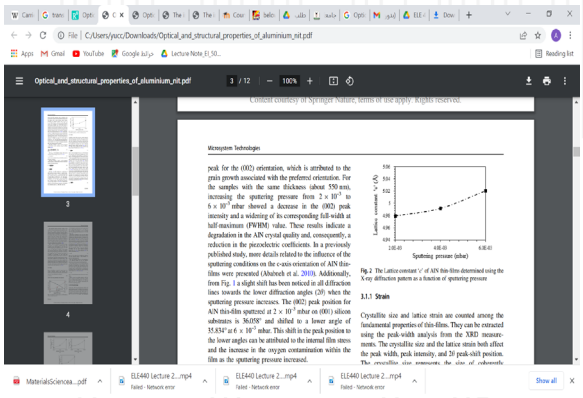
1. Optical, electrical and morphological characterization of piezoelectric Aluminium Nitride (AlN) and platinum (Pt) thin films. Some properties are shown in the figures below:



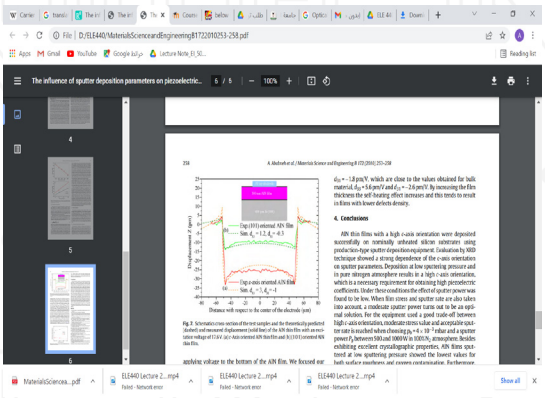
X-ray diffraction patterns of AlN thin films sputtered on a silicon substrate with a film thickness of about 500 nm at different back pressures and plasma power with 100% N2 atmosphere.



Measured refractive indices of AlN thin films as a function of wavelength for different sputtering conditions.

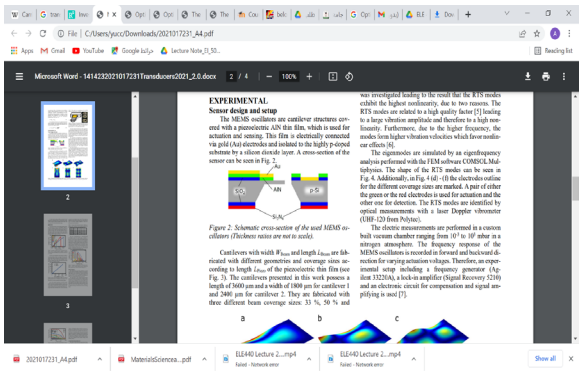


The Lattice constant 'c' of AlN thin-films determined using the X-ray diffraction pattern as a function of sputtering pressure.

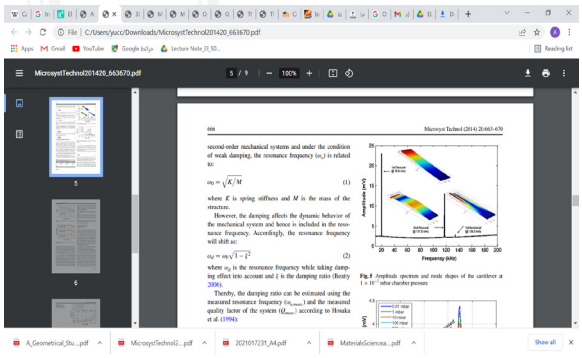


Schematics cross-section of the test samples and the theoretically predicted (dashed) and measured displacement (solid line) of the AlN thin film with an excitation voltage.

2. Optimization and micro fabrication of AlN piezoelectric resonators. A schematic cross-section of MEMS resonators and mode shapes of such device are shown below.

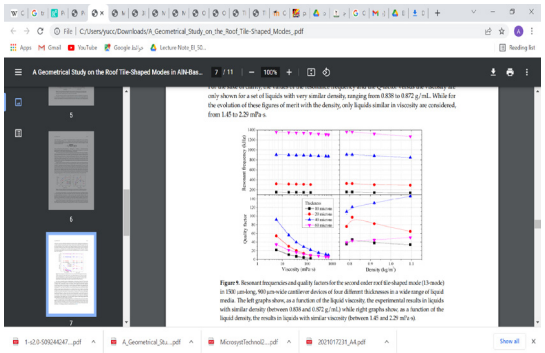


Schematic cross-section of MEMS resonators.

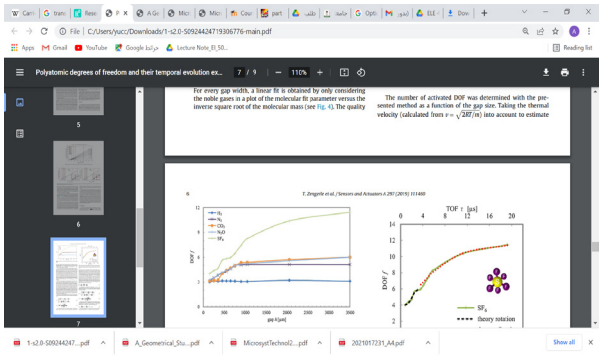


Amplitude spectrum and mode shapes of the cantilever.

3. The third part of his research activities deals with practical applications of micro-resonators in our life; for example, the detection of gas and liquid properties as shown in the figures below.



Quality factors as a function of the liquid viscosity for the second order roof tile-shaped mode in 1500 µm-long, 900 µm-wide cantilever devices of four different thicknesses in a wide range of liquid media.



Determined the degrees of freedom (DOF) for all polyatomic gases in dependence of the adjusted gap width.

For more information, please do not hesitate to contact prof. Ababneh at the E-mail: a.ababneh@yu.edu.jo

Electrical Power Engineering Department

Hussein M. K. Al-Masri received the B.Sc. and M.S. degrees in electrical power engineering from Yarmouk University, Irbid, Jordan, in 2010 and 2012, respectively, and the Ph.D. degree in electrical engineering from Texas A&M University, College Station, TX, USA, in 2016. He was a Lab Manager and Researcher at the Sustainable Energy and Vehicle Engineering Program, Power Electronics and Motor Drives Laboratory, Texas A&M University. He is currently an Associate Professor with the Electrical Power Engineering Department, Yarmouk University. Dr. Al-Masri received the 2016 Outstanding Graduate Teaching Fellowship from the Department of Electrical Engineering at Texas A&M University. Dr. Hussein has been promoted to an Associate Professor at Yarmouk University based on the Fast Track and he received distinguished comments for his research work from the external reviewers.

Throughout his academic career, Dr. Hussein loved the academic environment and working with knowledgable staff, it is great pleasure to update academic knowledge every day.

His research interests include renewable energy retrofitting systems, power electronics and photovoltaic applications, and the applications of artificial intelligence techniques to solve power system problems.

Dr. Hussein mentioned that the green energy is a promising choice to reduce the temperature of the earth and to get an affordable and clean energy resource. He is working hard to be part of the team helping humanity occupying this planet to restore normal environment. He does prefer renewable energy resources as integral part of a large-scale power system.

Recently, he has published many research articles that are adapting various renewable energy resources in Jordan. For instance, the paper of "Output power computation and sizing of a photovoltaic array by advanced modeling" has been published in the Sustainable Energy Technologies and Assessments Elsevier journal, whose impact factor is 5.353. In this

Dr. Hussein M. K. Al-Masri

paper, an on-grid solar photovoltaic (PV) system has been investigated in terms of power systems reliability in Marsaa' Area, Amman, Jordan. The mathematical modeling of the solar PV system has been tested nine times by considering nine PV models. The Ant Lion optimization algorithm was used to find the optimal value of the reliability indices. It has been shown that the TD solar model has the lowest output power, but it is more realistic because it considers all circuit losses (i.e. diffusion, recombination, internal series, and leakage losses). In sum, the TD solar model helps get realistic reliable results by finding the true size of the solar renewable energy system. Finally, sensitivity analysis, on the measured data, is tested to validate the robustness of the system.

This study and other research studies in (https://scholar.google.com/citations?hl=en&user=bTHChgcAAAAJ&view_op=list_works) and other similar studies of other researchers will have a positive impact for non-oil producing countries by orienting their energy solutions toward green energy.

Computer Engineering Department

Dr. Al-khassaweneh has more than 60 publications in peer-reviewed journals and conferences. Below is a summary of two recent papers:

1- Community Detection [1]: Community detection in network-type data provides a powerful tool in analyzing and understanding real-world systems. In fact, community detection approaches aim to reduce the network's dimensionality and partition it into a set of disjoint clusters or communities. However, real networks are usually corrupted with noise or outliers which affect the detected community structure quality. In this paper, a new robust community detection algorithm that is capable of recovering a clean or a smoothed version of the corrupted graph and detecting the correct community structure is introduced. The proposed approach combines robust principal component analysis (RPCA) and symmetric nonnegative matrix factorization (SymNMF) in a single optimization problem. The proposed problem is solved under the framework of alternating direction methods of multipliers (ADMM). In particular, the corrupted adjacency matrix is decomposed into a low-rank and sparse components using RPCA and the community structure is detected by applying SymNMF to the extracted low-rank component. Extensive experiments that have been conducted on real and simulated binary and weighted networks show that the proposed approach significantly outperforms existing algorithms in detecting the correct community structure even in grossly corrupted networks.

Without going into the mathematical details of the proposed algorithm, figure 1 shows the results of applying the proposed algorithm real data. The dataset used is the Primary School Network dataset which comprises weighted network of face-to-face proximity between students and teachers in a primary school. The school consists of 10 grades and 10 teachers. In the constructed network, the nodes represent the individuals and the edges represent the face-to-face interactions. Each node

Dr. Mahmood Al-khassaweneh

has two attributes: class name which represents the school class and the grade of the associated individual. Edges weights represent the duration measured in seconds. Duration is the total time for the face-to-face time proximity over the study period and recorded every 20 seconds. The proposed algorithm is applied to the primary school data set to detect the community structure. The number of clusters is set to 10 which refers to the number of grades in the school. The black frames represent the ground truth of the different grades in the school and the teachers are presented by the red frame. Whereas the colored rectangles represent the clusters detected by the proposed algorithm. As it can be seen in the figure, the detected clusters refer almost to the different grades including their teachers.

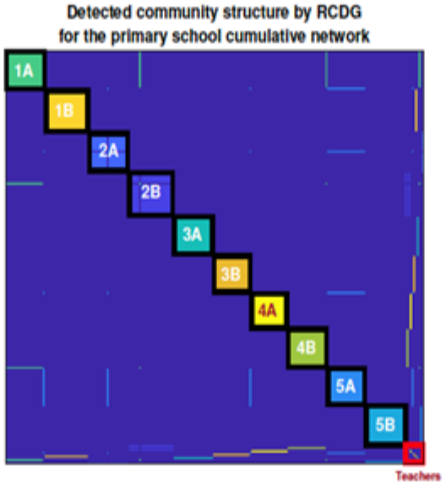


Fig1. The detected community structure for the primary school network by the proposed algorithm.

2- An Implementation of the HDBSCAN* Clustering Algorithm [2]: Cluster analysis is the task of arranging a set of similar data points into groups. It is an unsupervised machine learning task that can discover patterns or identify related groups from a dataset. There are many different algorithms proposed for cluster analysis. The K-Means algorithm is commonly used for clustering since it is fast and easy to understand. But there are some potential problems with this algorithm. First, the number of clusters, or partitions, need to be provided as input to the algorithm. The number of clusters that may be present in a new dataset is, however, not always known. Another problem is that K-means is more of a partitioning algorithm than a clustering algorithm, since it partitions all the data into groups by minimizing distances between data points. These problems are also exist in other clustering algorithms. For example, the affinity propagation and spectral clustering algorithms also partition all the data into groups, so even outliers or noisy data points are included in the clusters. Another well-known algorithm is agglomerative clustering, which like K-Means, requires the number of clusters to be provided as input to the algorithm when a threshold parameter is not used.

The HDBSCAN* clustering algorithm is a density-based algorithm. Unlike K-Means, it doesn't require that every data point is assigned to a cluster, since it identifies dense clusters. Points not assigned to a cluster are considered as outliers, or noise. An algorithm that can effectively find distinct groups in a dataset and identify outliers is a valuable technique. There is an established Python implementation of the HDBSCAN* algorithm which is included as a scikit-learn compatible project. It is well known that Python is a very popular language for data mining and machine learning tasks such as clustering. Java, on the other hand, is not as popular for these types of tasks, even though there are numerous Java enterprise applications running in production currently. Machine learning libraries offer the benefit of providing a consistent API to variety of learning algorithms and utilities. Tribuo is a recent open-sourced Java machine learning library. Tribuo is proven to be robust and performant, but currently it only supports the K-Means clustering algorithm. Therefore, it is valuable to build an implementation of the HDBSCAN* algorithm in the Tribuo library. This work offers a new and optimized implementation of the HDBSCAN* algorithm in Java.

The proposed implementation leverages Tribuo's infrastructure to provide a train/predict interface consistent with the library's other learning algorithms and features. This gives the ability to train models which discover clusters and identify outliers. This work introduces a novel prediction technique which uses a trained model to make predictions for unseen data points natively in Java. Functionality such as this provides the foundation for applications such as a streaming clustering service. Furthermore, the methodology presented in this work illustrates a generic development process which can be reused for the implementation of an existing learning algorithm in an existing machine learning library. The proposed algorithm (Tribuo Hdbscan) and the python hdbscan were applied on different datasets: credit card usage, 50,000 Gaussians and 100,000 Gaussians. Fig2. Shows the model prediction times. As sown, Tribuo Hdbscan is able to make predictions much faster than the Python module hdbscan.

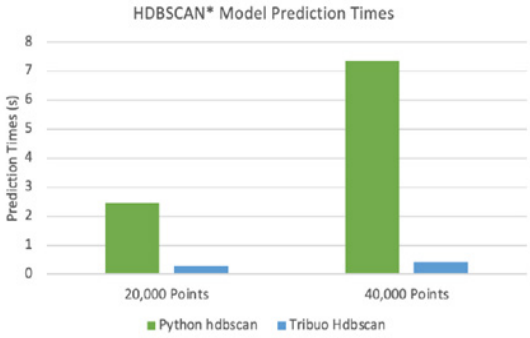


Fig2. A clustered column chart comparing the model prediction times for the two datasets

References:

[1] Al-Sharoa, Esraa M., Ababneh Bara'M, and Mahmood A. Alkhassaweneh. "Robust Community Detection in Graphs." IEEE Access 9 (2021): 118757-118770.

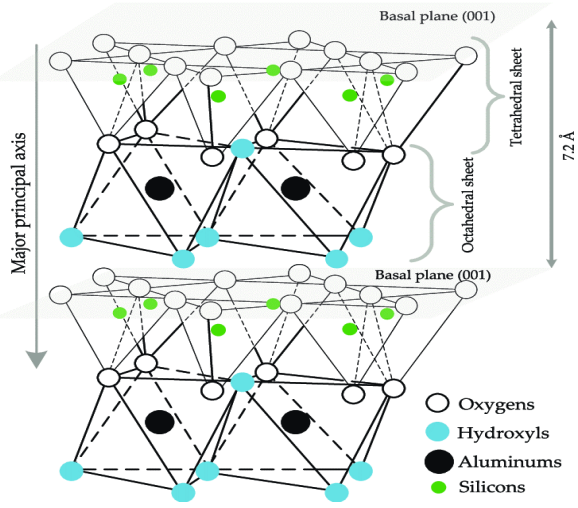
[2] Stewart, Geoffrey, and Mahmood Al-Khassaweneh. "An Implementation of the HDBSCAN* Clustering Algorithm." Applied Sciences 12, no. 5 (2022): 2405.

Civil Engineering Department

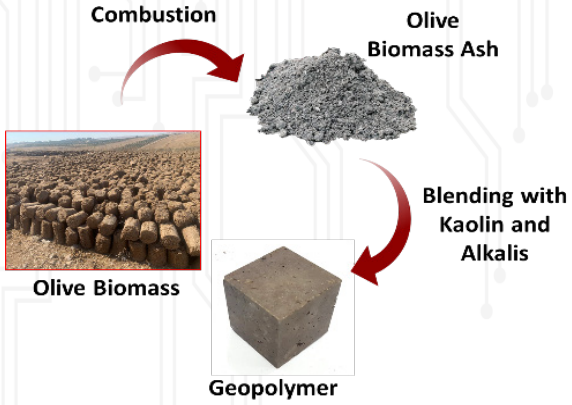
I am an Associate Professor of Civil Engineering at Yarmouk University. I received a Ph.D. in Civil Engineering from Michigan State University (United States), an MSc, and a BSc in Civil Engineering from Jordan University of Science and Technology. My research interests include the development of sustainable, energy-efficient, and low-cost cementitious materials. So far, I have published a total of 43 research papers in reputable journals in the field of civil engineering and materials science. Since I joint Yarmouk University in January 2018, I have received 9 funded projects from internal and external funding agents with a total budget of $202,000. Most of the projects concern the development of alternative and environmental-friendly construction materials.

Dr. Faris Matalkah

Several projects were focused on the development of geopolymeric cement using Jordanian kaolin were demonstrated recently. The competitive merits of the new cement were assessed against Portland cement considering the raw materials contributions to carbon footprint, cost, and energy content. The carbon footprint of the new hydraulic cement was found to be 70% less than that of Portland cement. The cost and energy content of the kaolin-based hydraulic cement was 45% and 70%, respectively, less than those of Portland cement. These significant advantages are complemented with noticeable initial benefits, which combine to produce positive prospects for the commercial prospects of hydraulic cement.

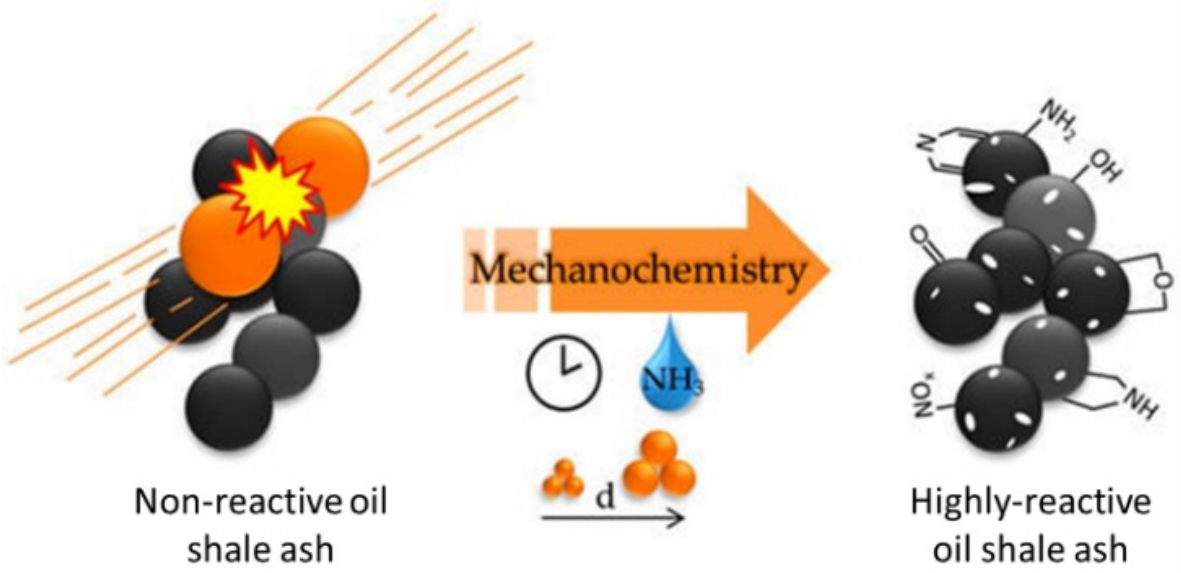


Another project investigates the potential use of Jordanian olive biomass ash for the development of a new sustainable and environmental-friendly binder. Refined binder chemistry was developed where the alkali and silica contents of the olive biomass ash (OBA) are supplemented by calcined kaolin (CK) as alumina-rich constituents targeting balanced chemistry to produce olive biomass ash-based geopolymer concrete. The results showed that optimum formulation was achieved when 40 wt.% OBA and 60 wt.% CK were blended yielding geopolymer concrete with 28-day compressive strength exceeding 35 MPa.



The most recent project is titled "Mechanochemical Activation and Surface Functionalization of Jordanian Oil Shale Ash as a Sustainable Approach Toward High-Volume Use in Concrete Applications". This project is funded by the Scientific Research Fund and Innovation (SRFI) with a total find of $108, 323. The project is intended to introduce a new approach to reduce the impact (cost and environmental effect) of disposal products of oil shale fuel (specific: oil shale ash, OSA) in a highly effective and efficient way. The main thrust of the proposed project is to promote the use of oil shale fuel by developing high-value markets for its combustion residue (OSA) as a replacement option for Portland cement in sustainable concrete.

The proposed idea explores the mechanochemical activation and surface functionalization approach of the ash toward use in high-percentage in concrete Mixtures. The mechanochemical activation approach will be conducted by inducing a structural disorder via applying intensive mechanical energy in the presence of several activators (acids and bases). Moreover, the functionalization with different synthesized ligands will be conducted in an approach to enhance the binding of the functionalized ash with the cement paste components.



The proposed approach utilizes the chemical and mineralogical characteristics of the oil shale ash to produce a low-cost and environmentally friendly cement composite with improved mechanical properties and durability characteristics.

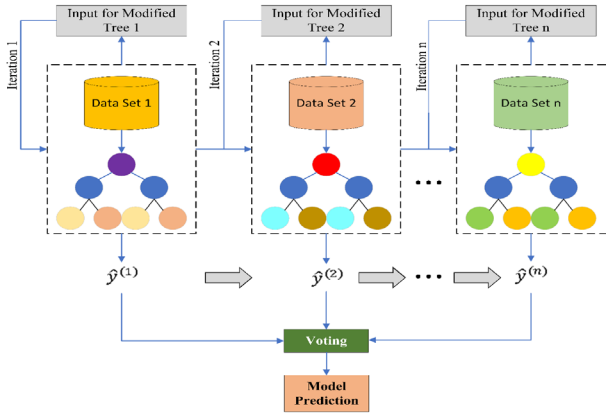
Facilitating Use of Jordanian Resources: Oil shale is distributed in 23 known deposits in Jordan with an estimated quantity of 4070- billion tons. Jordan has recently started to operate a fired oil shale-based power plant for electricity generation. The ash resulting from this industry has limited market value since its reactivity is relatively low. The proposed project aims to raise the potential use of the "low quality" oil shale ash in concrete applications.

Minimizing Environmental Pollution: Firing of solid fossil fuels such as coal, lignite, and oil shale release massive quantities of greenhouse gases, and produce large volumes of solid residues that are considered global environmental threats. Those challenges arise from the by-product -referred to as ash when using oil shale for energy production. Land disposal of such ash in ponds may result in groundwater pollution. Inappropriate management of such quantities may lead to an increase in environmental pollution, hence raising a global concern regarding public health and environmental sustainability. This project proposes the exploitation of oil shale ash in the concrete industry, subsequently, reducing the potential environmental risks.

As a faculty member in the Department of Civil Engineering at Hijjawi Faculty for Engineering Technology in Yarmouk University, my life is dedicated to serving the university, the local community, and humanity by producing applied research that contributes to finding practical and environmentally friendly solutions to contemporary problems facing the world around us. From the first moment I set foot in Jordan at the end of 2019 after a strenuous journey to obtain my master's and doctorate degrees in construction engineering and management from the University of Central Florida in the USA, I had to set my sights on a lofty goal to serve humanity by adapting the technological means and research capabilities provided by Yarmouk University to produce world-class scientific research published in the most prestigious international peer-reviewed journals. I have also been motivated to review research articles for elite international journals (e.g., Technological Forecasting & Social Change (I.F. 8.6) and Renewable Energy (I.F. 8)). In addition, I have been invited as a speaker at international conferences (e.g., the 2022 International Conference on Machine Learning and Knowledge Engineering (MLKE2022), the International Meet & Expo on Robot Intelligence Technology and Applications (ROBOTMEET2022), and International Conference on Software Engineering (ISCSEE2023)).

Dr. Ali M. Shehadeh

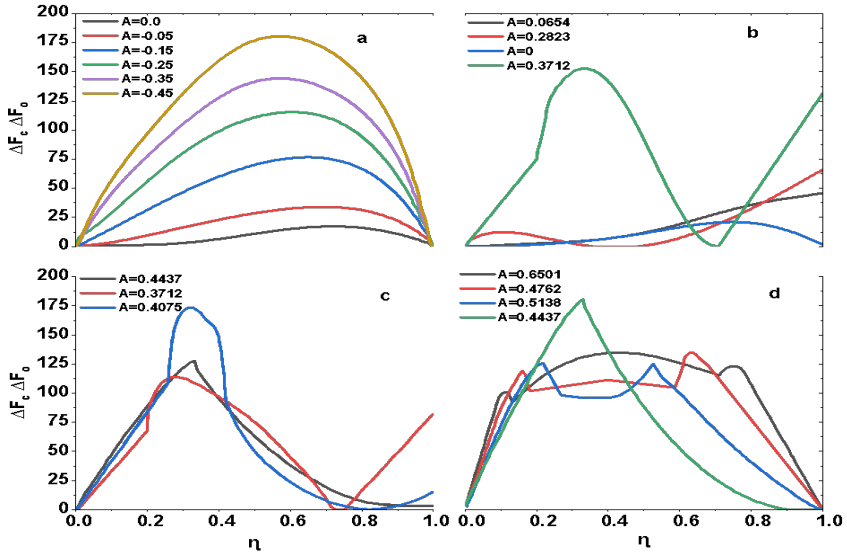
The journey began with publishing a paper about applying the latest algorithms in machine learning and deep learning to find accurate forecasts for the prices of heavy machinery used in giant construction projects. This scientific paper, published in the Journal of Automation in Construction (I.F. 7.7), positively impacts engineering and construction project management, as it got many citations quickly.



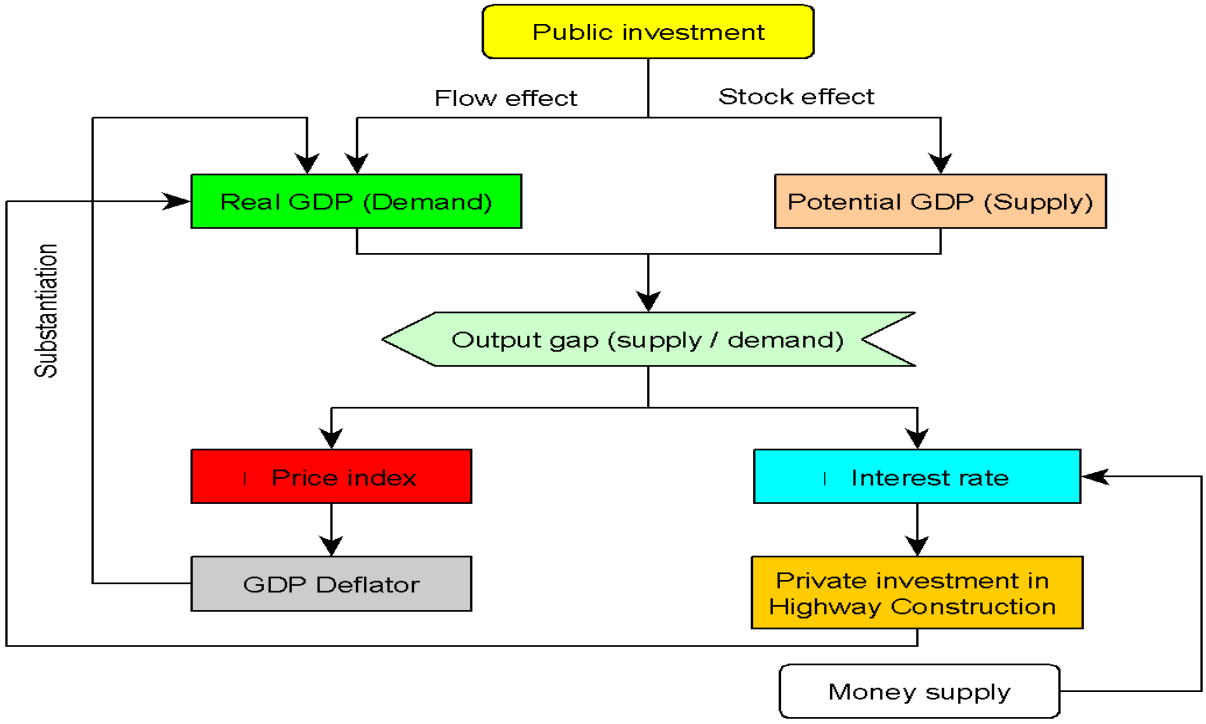
To develop a Salvage Value forecast model, a management decision support model was designed to create a comprehensive perception for stakeholders regarding the prices of heavy machinery used in construction projects. This research was published in the Engineering, Construction and Architectural Management (I.F. 3.5) journal, issued by Emerald Publishing located in the UK. Then, research efforts were directed to develop an integrated model for asset management for highway facilities based on risk assessment, to ensure the sustainability of vital facilities and to enhance their resistance to resisting potential dangers, and to publish this research in the International Journal of Construction Management (Scopus Q1).

After the COVID-19 pandemic worldwide spread, researchers had to find innovative solutions to face the repercussions of this global pandemic, especially on construction companies' project implementation and maintenance operations capabilities. At the same time, construction companies worldwide are entrusted with establishing hospitals, isolation, and vaccination centres as quickly as possible to enhance the resilience of societies in resisting the pandemic and saving the lives of millions of people. Accordingly, a Gaussian mixture evaluation model has been developed to assess the ability of construction companies to play their vital role in these difficult circumstances and provide them with the necessary support to perform their duties optimally. The research article was published in the International Journal of Management Science and Engineering Management (Scopus Q1), issued by the Taylor & Francis Publishing located in the UK.

The rapid changes in our world necessitate the permanent development of construction contract systems to ensure access to the best legal formulas that protect the rights of the contracting parties and ensure their commitment to perform the duties optimally entrusted to them. In this regard, a multi-criteria selection model and framework for the design-build contract was developed to ensure an efficient, robust, and consistent selection model along with a flexible framework that allows bidders to be screened based on the preferred values identified by the owner and the criteria of the DEA base model. The research article was published in the International Journal of Management Science and Engineering Management (Scopus Q1), issued by the Taylor & Francis Publishing located in the UK. In the same vein, the target cost contracting system was also analyzed, where an optimization model was designed to analyze the risks associated with this contractual system to determine the optimal Gain-Pain share ratio to ensure the best results for all contracting parties. The developed mathematical optimization model has been published in the Journal of Construction Engineering and Management (I.F. 3.9), published by the American Society of Civil Engineers (ASCE) in the USA.



Given the importance of government support in bypassing the liquidity trap, it was necessary to develop an integrated model of the investment savings-liquidity preference money supply (IS-LM) curve and the dynamic stochastic general equilibrium (DSGE) analysis to investigate the balance of supply and demand during deflation status in addition to the associated spending adjustment mechanism, where the deep parameters were obtained using Bayesian estimation via the Markov chain Monte Carlo technique (MCMC). This research article has been published in the Journal of Management in Engineering (I.F. 6.8), published by the American Society of Civil Engineers (ASCE) in the USA.



Finally, given the importance of the multi-objective optimization technique in construction engineering and management, a model for selecting heavy machinery in construction projects has been developed to ensure optimal time and cost objective functions focusing on earthmoving activities. This research article has been published in the Alexandria Engineering Journal (I.F. 3.7), which Elsevier publishes.

The unparalleled motivation provided by Yarmouk University and Hijjawi Faculty for Engineering Technology to researchers among the faculty members represents the main engine that leads scientific research operations and guides it in the best direction to serve the local community and humanity in general. Here, I would like to express my heartfelt thanks to the university and college administration for their efforts, paving the way to produce this scientific production in 2021 and their continuous support to push for more influential scientific research achievements in 2022.

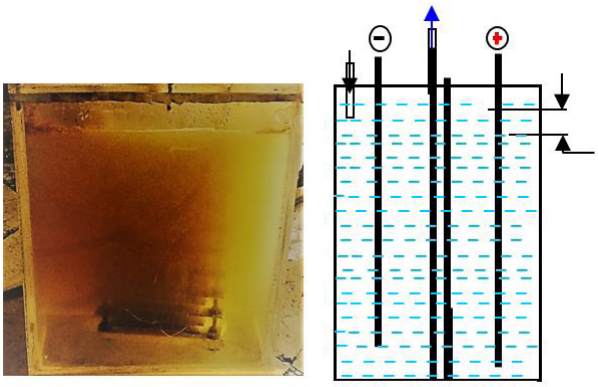
Mechanical Engineering Department

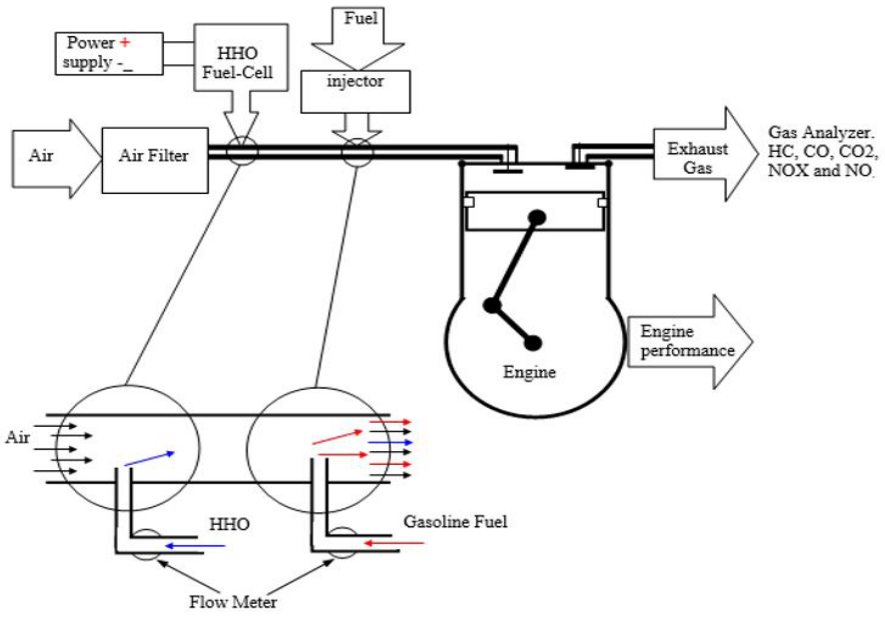
Prof. Ammar Al-Rousan has built an impressive record of success. As detailed below, Dr. AlRousan's original research has addressed topics like Energy extracted from underground rock area and the optimization and design of novel HHO fuel cells, the integration of HHO fuel cells into existing combustion engines

One of Dr. AlRousan's research endeavors has addressed the need for new types of clean fuel that reduce emissions and pollutants from non-hybrid vehicles. He investigated innovative optimizations for the design of HHO fuel cells to be used on internal combustion engines and reduce the reliance on fossil fuels. He found that the optimal design for an HHO fuel cell. His research thus provided critical data on the development of HHO fuel cells to support current and future diesel engine designs to reduce their environmental impact a reduction in pollutant emissions to about 50% when a mixture of HHO, air, and fuel was used. Moreover, the carbon monoxide concentration has been reduced to about 20%. As well as achieving a reduction in fuel consumption between 20% and 30%.

Prof. Ammar Al-Rousan

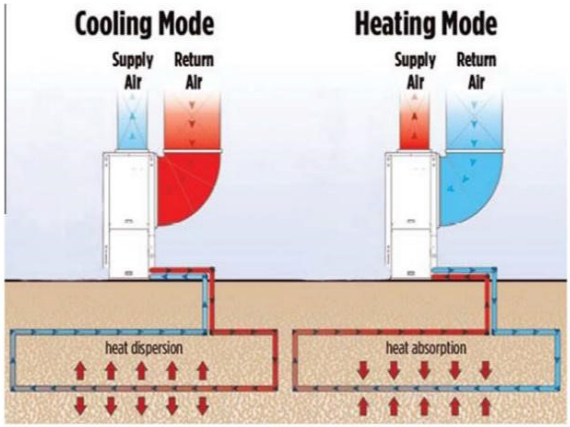
In addition, the effect of Potassium hydroxide (KOH) concentration in electrolyte solution of HHO fuel cell on internal combustion engine performance parameters and emissions has been investigated by Dr.AlRousan A 1 L/min Blend of HHO is fed to the engine as a secondary fuel and a constant electrical load and variable engine speeds test were carried out to quantify the foremost concentration of KOH in the fuel cell electrolyte that has a constructive impact on both engine performance parameters and emissions.

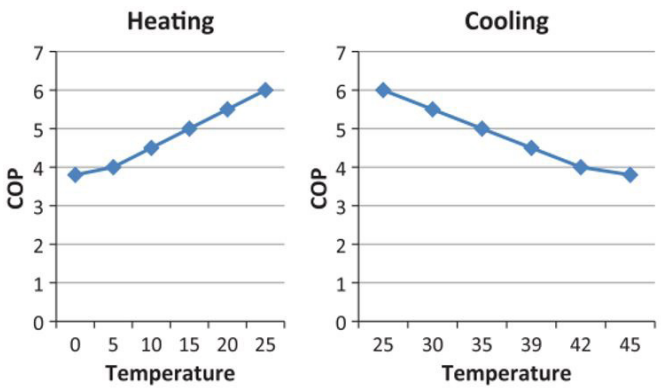


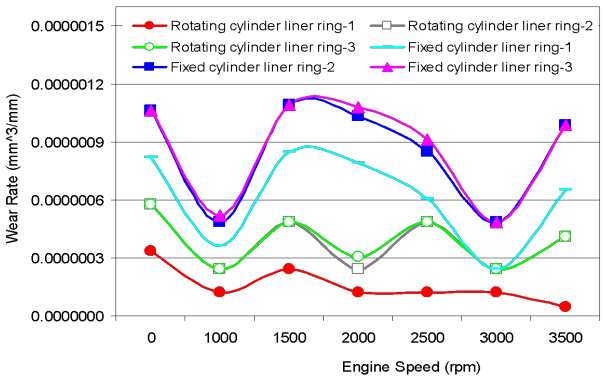


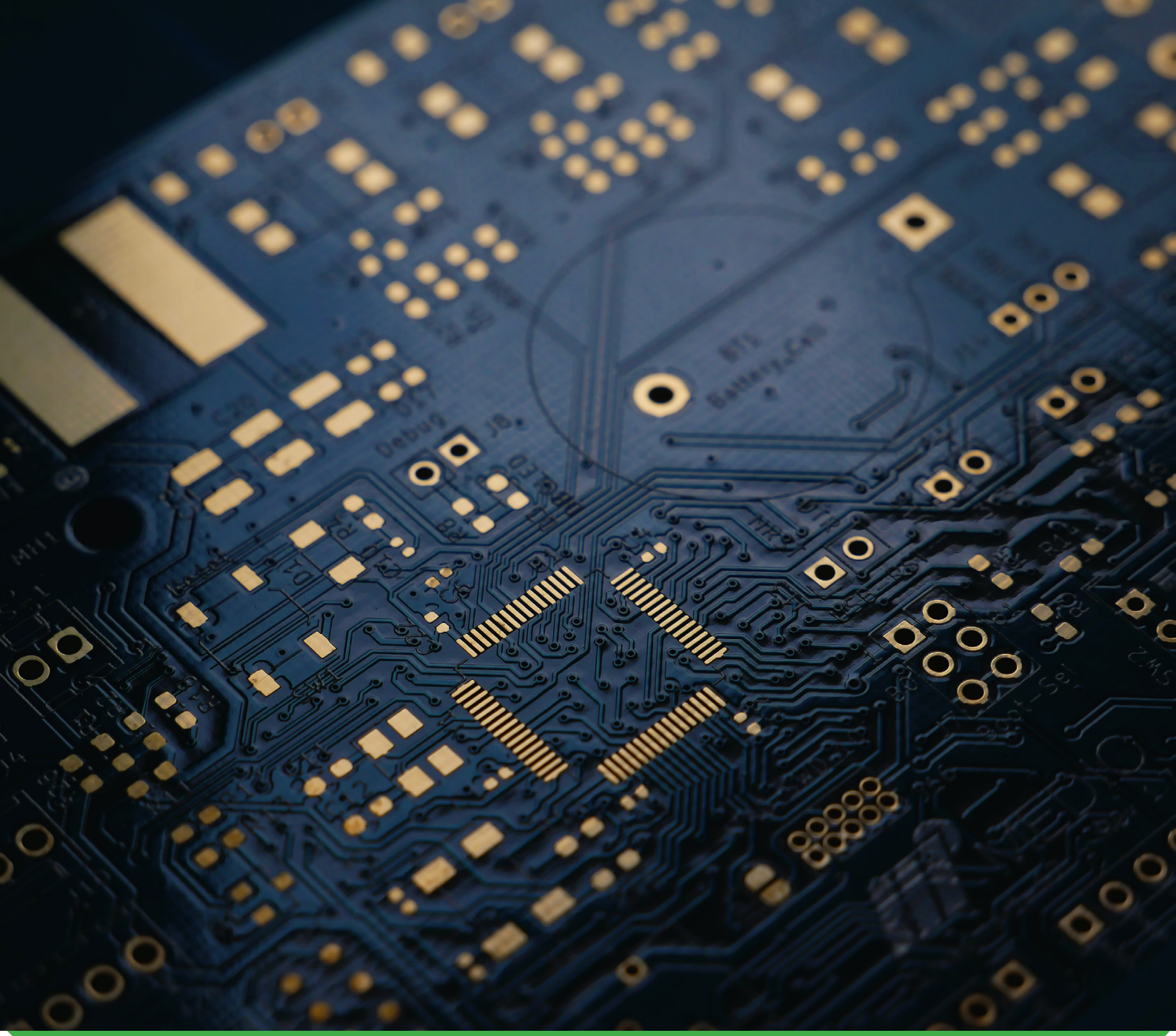
Earth Energy Systems (EESs) utilize the thermal energy that is stored in rocks and ground water under the earth's surface to provide homes, commercial buildings, and industrial facilities with heating, cooling, and hot water. Solar energy is absorbed by the earth's surface which stores up to 50% of the sun's energy that radiates on it. Consequently, the earth and groundwater's temperature is relatively constant compared to that of the surface air. The earth's temperature is generally warmer than the surface temperature during the colder months of the year, while it is generally cooler than the surface temperature during the hot months of the year. In this study, energy was extracted from the underground rocks by using the geothermal horizontal closed loop system. Two-meter holes were drilled into the earth's surface; copper pipes were inserted for liquid to pass through them into the heat exchange system. Then, the liquid was circulated back into the ground. Several temperature differences were measured and reported in the cold and hot months. The experimental results showed that thermal energy stored in rocks can be used to provide homes with heating, cooling, and hot water with low capital cost and zero environmental emissions.

In another of his research endeavors, Dr. AlRousan investigated different methods useful for reducing the impact of wear on engine performance and operational life in internal combustion engines. He first analyzed the wear rate in engines resulting from oil-mixtures, finding that a mixture with carbon allowed for better insight into engine wear. Further, he found that the wear rate in engine components is reducible by more than 50% depending on oil mixture if the cylinder bore and crankshaft-bearing are inverted. Following this, he investigated the rotation of the cylinder for six-hour intervals, finding that the greatest decrease in engine wear occurred when the cylinder liner was at rotation angles of 120 ° and 240°. Finally, Dr. AlRousan examined the effect of sulfur on engine wear rate and found that it was essential for sulfur and dust to be reduced in piston-rings and the cylinder of engines for both engine performance and environmental reasons. His research thus provided highly insightful data on engine wear and recommendations for improving engine operational life.









Edited and Designed by: Dr. Yusra M Obeidat, Assistant Dean for Students and Graduates Affairs

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