# Mahmoud Morsy Abdallah Abdelrahman

**Mechatronics Researcher Engineer | Embedded system Engineer**

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Git: https://github.com/morsy456 GrabCAD: Mahmoud Morsy Abdallah Abdulrahman | GrabCAD

## Summary:

Self-motivated adaptive Mechatronics Engineer, quick to learn and adept in C, C++, Arduino C, and MATLAB. Experienced in developing advanced Mechatronic systems, including a mind-controlled lower limb exoskeleton. Proficient in using SolidWorks and MATLAB Simscape for mechanical design and testing, as well as PCB design. Skilled in creating automation systems and IoT projects with Node MCU, Raspberry Pi, and Arduino. with hands-on experience in teaching and research. As a lead developer of *NeuroGait*, I secured funding from national agencies and achieved significant recognition in competitions and research forums. My passion for innovation and research drives me to contribute to advancing the field of robotics and enhance academic research through impactful discoveries. I aim to contribute to academic excellence by advancing robotics research and inspiring the next generation of engineers.

## Education:

- Bachelor's Degree in Mechatronics Engineering, Banha Faculty of Engineering 10/2019 -7/2024
  Accumlative Grade: **Very Good, GPA:3.1 (75.87%)**

**Graduation project: Lower limb exoskeletons with mind control, Grade: Excellent 96%** 11/2023 - 7/2024

- **Overview**: Developed a lower limb exoskeleton for rehabilitation that integrated mind control for tetraplegic users, ensuring smooth, balanced, and coordinated motion.
- **Tools**: SolidWorks, MATLAB, Simscape, AutoCAD, Cypcut, EasyEDA, Firebase, Emotiv 14-channel EEG.
- **Hardware**: Wheelchair motors, special bearings, motor drivers, power supply, batteries, custom PCBs, ESP-32 WROOM, Raspberry Pi 4 Model B, Arduino Mega, encoders, MPU6050.
- **Control Methods**: Manual control via remote control panel, mobile application with Wi-Fi, mind control using EEG sensors, Used PID control to ensure precise motor control and accurate position tracking.
- **Achievements**: Won **100,000 EGP** from ISF (Innovators Support Fund), **75,000 EGP** from ASRT, and **30000 EGP** from ITIDA, while selected at Nile University UGRF (top 580) and **2nd place** at **IEEE ESPC paper** contest all over Egypt.

## Experience:

**R&D Mechatronics Engineer Internship at Giga systems (with ability to be hired)** 12/2024-present

- Designing PCBs and underwater structures to securely hold sensors in a vertical orientation.
- Developing high-quality systems for water quality monitoring stations.
- Focused on ensuring precision, durability, and efficiency in monitoring solutions.

**Lab Enginner At Hertfordshire University by United Kingdom** (Part time, 2/2025 – present)

- **Teaching C Programming & Mechatronics Design**
- **Research Assistance**: Support faculty and students in testing, data collection, and experimental setups.
- **Technical Documentation**: Maintain records of lab activities, troubleshooting logs, and equipment status.

**Smart Technology (Embedded and Robotics Keynote Speaker)** (Part time, 11/2024 – present)

- Teach Robotic for kids and coordinate in international schools, while teaching in English and Arabic if needed.
- Teaching Embedded systems (C and AVR interface, Robotics and Arduino).

**Internship at Alsweidey Iskraemeco** 8/2023 – 9/2023

- **Specialty**: electric and water smart meters; owned by El-Sewedy Electric, a global leader in infrastructure solutions.
- **Safety Training**: Emphasis on safety protocols, disaster preparedness, and team roles in emergencies.
- **PCB Manufacturing**: Training on Surface Mount Technology (SMT) and Through-Hole Tech (THT) production lines.
- **Planning and Warehousing**: Coordination for timely delivery and efficient packaging and shipping.
- **Plastic Molding**: In-house production of plastic casings, ensuring control over manufacturing.

## Volunteering:

- **IEEE BUB (2021-2022):** Scientific member, taught audiences Arduino.
- **GDSC Banha (2021-2022):** Scientific member, taught audiences Embedded concepts, and DIO basics.
- **Collage Workshop (2022-2024):** Participate in Competitions and won **2nd place** in Ibdaa Festival 2023. **1st place** at the Helwan Maze Cars competition.

## Projects:

### 3D Scanner
February 2023

- **Aim:** Develop a system for capturing 3D scans of prototypes using Raspberry Pi and Arduino.
- **Responsibility:** Designed the 3D scanning system, integrated the hardware components, and calibrated the scanner for accuracy.
- **Achievements/Rewards:** Won 2nd place at the Ibdaa Festival 2023 with 50,000 EGP, enhancing my understanding of 3D scanning and sensor integration.

### Self-balance RC car
May 2023

- **Aim:** Build an RC car capable of balancing itself using sensors and control algorithms application on Research paper.
- **Responsibility:** Programmed the car's stability using PID control and integrated sensors like the MPU6050 for feedback.
- **Achievements/Rewards:** Successfully demonstrated real-time self-balancing, strengthening my skills in robotics and control systems, and applying research paper work on real world with great results.

### Firefighter car
October 2022

- **Overview**: Developed an RC car that can autonomously detect and respond to fires.
- **Tools**: Arduino, SOLIDWORKS.
- **Hardware**: KY-026 IR Flame sensors, ultrasonic sensor, pump prober, Bluetooth module.
- **Control Methods**: RC (Bluetooth remote control), automatic fire detection and response.

### Production line (ITI graduation project)
August 2021

- **Overview**: Automate production line operations for enhanced productivity.
- **Tools**: Microcontroller programming, rectifier PCB design.
- **Hardware**: Keypad, 2*16 LCD display, motor, workplace lights, voltage regulator.
- **Impact**: Improved productivity and efficiency, safe and reliable operation.

### Smart Home IoT
September 2021

- **Aim:** Design and implement an IoT-based system to automate home lighting, windows, fans, and smoke detection.
- **Responsibility:** Programmed the system using NodeMCU and integrated sensors for motion detection and smoke detection.
- **Achievements/Rewards:** best team won, and first team to finish the project in 5 days.

## Languages:

- **English:** Fluent in professional communication.
- **Arabic**: Native speaker.

## Courses:

- **IMT Parallel Education** (C – AVR Interface – RTOS- ARM- PCB- E-Linux -IOT). 2/2023 - 6/2024
- **ITI Embedded System Diploma** 7/2021 - 9/2021
- **Smart Technology Robotics** 1/2022 - 3/2022
- **Innova Egypt Entrepreneur Training with winning the best project and application** 8/2023 – 9/2023

## Achievement & Awards

1) Secured **100,000 EGP** from **ISF**, **75,000 EGP** from **ASRT, and 30,000 EGP** from **ITIDA** for the graduation project.
2) Won **2nd place** in Banha University's **First Research Conference.**
3) Won **2nd place** in the **IEEE ESPC Paper Contest** and advanced to the **IEEE Region 8 finals.**
4) Won **2nd place** in Egypt's **Ibdaa Festival 2023**, awarded **50,000 EGP** for the 3D Scanner project.
5) **1st place** in **Helwan University's Maze Car Competition 2023**.
6) **Best Project Award** in Innova Egypt Entrepreneur Training & **Best Marketing Team.**

## Technical Skills

- **Programming**: Proficient in C, C++, and Arduino C; Basic knowledge of Python and MATLAB.
- **PCB Design**: Skilled in designing PCBs using EasyEDA and Proteus 8 Professional.
- **Mechanical Design**: Expertise in SolidWorks, Fusion 360, and Cypcut for 3D modeling and simulation.
- **Tools and Software**: SolidWorks, MATLAB, Eclipse, Proteus, EasyEDA, Fusion 360, and Cypcut.
- **Communication Protocols**: UART, SPI, I2C.
- **Automation and IoT**: Experienced with NodeMCU, Raspberry Pi, Bluetooth modules, and Wi-Fi modules.

# Motivation Letter

**Dear Selection Committee,**

I am excited to apply for the **Embedded Systems and Mechanical** roles at **Project MARCH**. As a **Mechatronics Engineer**, I have a strong background in **robotics, control systems, and embedded programming**, and I am eager to contribute to advancing exoskeleton technology.

My journey in **assistive robotics** started during my **bachelor's degree at Banha University**, where I worked on a **mind-controlled lower-limb exoskeleton** for paraplegic patients. This project allowed me to develop **embedded systems, motor control, and mechanical design** skills. I worked with **brushed DC motors, encoders, and PID control**, ensuring smooth motion. I also designed **custom PCBs using EasyEDA**, programmed motor control algorithms in **C and C++**, and simulated mechanical systems in **SolidWorks and MATLAB Simscape**.

Beyond practical work, I am also passionate about research. My paper on **motion control for exoskeletons** won **2nd place in the IEEE Egyptian Student Paper Contest (ESPC)** and advanced to the **IEEE Region 8 finals**. This achievement reflects my ability to **analyze problems, develop innovative solutions, and contribute to cutting-edge research in robotics**.

At **Project MARCH**, I hope to refine my **embedded software skills, mechanical design expertise, and real-world system integration experience**. I am particularly excited about working in a **collaborative, multidisciplinary team**, where I can apply my technical knowledge while learning from others.

I would love the opportunity to be part of **Project MARCH** and contribute to the development of next-generation exoskeleton technology. Thank you for considering my application, and I look forward to hearing from you.

You can find all the data you need about my project here in these links

- Code & PCBs: https://github.com/morsy456
- 3D Model: https://grabcad.com/library/neurogait-1
- Project video: https://www.youtube.com/shorts/99T1hJ8DPWU

**Best regards,**