



**COLLEGE OF ENGINEERING  
AND COMPUTER SCIENCE**  
FLORIDA ATLANTIC UNIVERSITY

Announces the Ph.D. Dissertation Defense of

## **Sheikh Muhammad Asher Iqbal**

for the degree of Doctor of Philosophy (Ph.D.)

### **“Development of a Wearable Device for Monitoring of Parameters Related to Heart Failure”**

**October 26, 2023, 9 a.m.-11 a.m.**  
**EE 96, Room # 405**  
**777 Glades Road**  
**Boca Raton, FL**

**DEPARTMENT:**

Department of Electrical Engineering and Computer Science

**ADVISOR:**

Waseem Asghar, Ph.D.

**PH.D. SUPERVISORY COMMITTEE:**

Waseem Asghar, Ph.D., Chair

Mary Ann Leavitt, Ph.D.

Imadeldin Mahgoub, Ph.D.

Bassem Alhalabi, Ph.D.

Mirjana Pavlovic, Ph.D.

**ABSTRACT OF DISSERTATION**

Development of a Wearable Device for Monitoring of Parameters Related to Heart Failure

Heart failure is a chronic cardiovascular disease that is caused due to the lack of blood supply from heart. This lack of blood supply leads to accumulation of the fluid in the thoracic region. Traditionally, implantable cardioverter defibrillators (ICDs) are used to treat HF and to monitor its parameters. Healthcare wearable devices (HWDs) are healthcare devices that can be worn or attached to the skin. HWD are non-invasive and low-cost means of providing healthcare at the point-of-care (POC). Herein, this dissertation discusses the development of a HWD for the monitoring of the parameters of heart failure (HF). These parameters include thoracic impedance, electrocardiogram (ECG), heart rate, oxygen saturation in blood and activity status of the subject. These are similar parameters as monitored using ICD. The dissertation will discuss the development, design, and results of the HWD.

**BIOGRAPHICAL SKETCH**

B.S., Lahore University of Management Sciences, Lahore, Punjab, Pakistan, 2018

M.S., Florida Atlantic University, Boca Raton, FL, USA, 2022

Ph.D., Florida Atlantic University, Boca Raton, Florida, 2023

**CONCERNING PERIOD OF PREPARATION**

**& QUALIFYING EXAMINATION**

**Time in Preparation:** 2020 - 2023

**Qualifying Examination Passed:** Semester Spring 2020

**Published Papers:**

1. Iqbal, S.M.A., Mahgoub, I., Du, E. et al. Development of a wearable belt with integrated sensors for measuring multiple physiological parameters related to heart failure. *Sci Rep* 12, 20264 (2022). <https://doi.org/10.1038/s41598-022-23680-1>
2. Iqbal, S.M.A., Mahgoub, I., Du, E. et al. Advances in healthcare wearable devices. *npj Flex Electron* 5, 9 (2021). <https://doi.org/10.1038/s41528-021-00107-x>
3. Iqbal, S.M.A., Butt, N.Z. Design and analysis of microfluidic cell counter using spice simulation. *SN Appl. Sci.* 1, 1290 (2019). <https://doi.org/10.1007/s42452-019-1327-1>
4. Iqbal, S. M. A., & Asghar, W. (2023). Smartphone Integration with Point-of-Care Devices for Disease Diagnostics. 317–335. [https://doi.org/10.1142/9789811226113\\_0012](https://doi.org/10.1142/9789811226113_0012)
5. MD Alamgir Kabir, Rajib Ahmed, Sheikh Muhammad Asher Iqbal, Rasheduzzaman Chowdhury, Ramasamy Paulmurugan, Utkan Demirci & Waseem Asghar (2021) Diagnosis for COVID-19: current status and future prospects, *Expert Review of Molecular Diagnostics*, 21:3, 269-288, DOI: [10.1080/14737159.2021.1894930](https://doi.org/10.1080/14737159.2021.1894930)
6. Aghayev, K., Iqbal, S. M. A., Asghar, W., Shahmurzada, B., & Vrionis, F. D. (2021). Advances in CSF shunt devices and their assessment for the treatment of hydrocephalus. *https://Doi.Org/10.1080/17434440.2021.1962289*, 18(9), 865–873. <https://doi.org/10.1080/17434440.2021.1962289>
7. Kabir, M. A., Ahmed, R., Chowdhury, R., Iqbal, S. M. A., Paulmurugan, R., Demirci, U., & Asghar, W. (2021). Management of COVID-19: current status and future prospects. *Microbes and Infection*, 23(4–5), 104832. <https://doi.org/10.1016/J.MICINF.2021.104832>
8. Ulus, C., Wang, Z., Iqbal, S. M. A., Khan, K. M. S., & Zhu, X. (2022). Transfer Naïve Bayes Learning using Augmentation and Stacking for SMS Spam Detection. *Proceedings - 13th IEEE International Conference on Knowledge Graph, ICKG 2022*, 275–282. <https://doi.org/10.1109/ICKG55886.2022.00042>

**Paper Under Review:**

1. Iqbal, S.M.A., Leavitt, M., Mahgoub, I., et al. A wearable telehealth system for the monitoring of parameters related to heart failure. Under Review