

**IMAGINE  
YOUR  
FUTURE**

**MS & PhD  
ELECTRICAL  
ENGINEERING**  
Fall 2022

Syed Babar Ali School of Science and Engineering

# CREATING IMPACT THROUGH RESEARCH



## 6 Disciplines

Biology  
Chemistry  
Computer Science  
Electrical Engineering  
Mathematics  
Physics

The Syed Babar Ali School of Science and Engineering (SBASSE) at LUMS is taking strides in improving teaching and learning, while celebrating the novelty of research. SBASSE, through innovative and impactful contributions to science and technology, is nurturing future leaders with the potential to impact society.

SBASSE offers undergraduate, graduate and doctoral degrees in a wide range of disciplines. The MS programmes at SBASSE are rigorous and designed to impart specialised professional and research-oriented training to students. To graduate, students must accumulate a total of 30 credit hours either entirely from coursework, or by completing 24 credit hours from coursework and 6 from research work/thesis. Thus all SBASSE departments offer two options to choose from: MS-by-Coursework or MS-by-Thesis.

The SBASSE PhD programmes prepare students to think scientifically and conduct high-quality research independently. Major milestones that must be achieved for the successful completion of the PhD degree include the Coursework, Comprehensive (Qualifying) Examination, Thesis Proposal Defense, at least one peer-reviewed journal article and PhD Thesis Defense.

During the course of study, student learning takes place through lectures, tutorials, laboratories, problem-solving exercises, research projects and frequent interaction with experienced, world-class faculty members.

## WHY CHOOSE SBASSE

### QS World University Rankings by Subject

#251 Computer Science and Information Systems  
#351 Engineering – Electrical and Electronics  
#382 Engineering and Technology  
#501 Physics and Astronomy

### KEY INITIATIVES

#### THE ONLY 600 MHZ NMR SPECTROMETER IN THE REGION

SBASSE's 600 MHz nuclear magnetic resonance (NMR) spectrometer can be accessed for molecular analysis. Researchers can send their samples and obtain high resolution spectra, both in one and two dimensions.

#### WEB PORTAL TO ACCESS ONLINE COURSES

The School's website hosts a portal that provides access to diverse online courses produced by its faculty. The offered courses range from introductory to advanced levels.

#### MATLAB ACCESS FOR EVERYONE

A MATLAB license for everyone working at the School including faculty, staff, researchers and students provides complete access to all of its toolboxes.

#### HIGH VOLTAGE ENGINEERING LABORATORY

This lab has been established to become a nursery for important work in the field of high voltage and power systems.

#### CLOUD CLASSROOMS

SBASSE is combining virtual classrooms with real learning by introducing a blended learning solution. Roving cameras, instructor-controlled zoom,

full wall projection of participants for maximum immersiveness, ability to record and display multiple views are some of the technical capabilities.

#### CENTRAL LAB

The Lab aims at becoming the go-to place for high-end characterisation and analysis for academia and industry within the country. Student apprenticeships, restructuring of the Central Lab committee, efforts to add new equipment and a brochure to disseminate information about the Lab, all speak to this.

#### PLACEMENTS

SBASSE has top academic placements (Massachusetts Institute of Technology, Harvard University, University of Warwick, London School of Economics, University of Oxford, University of Cambridge etc.). Its graduates are hired by top local and international organisations (Engro Corporation, Nestle Pakistan, Systems Ltd., Microsoft, Google, Facebook etc.)

### LEARNING WITHOUT BORDERS

Research and teaching at LUMS truly offer its community 'Learning Without Borders' by breaking academic, geographic and socio-economic barriers to make education accessible to all. The University continues to be an intellectual hub, rich with varying perspectives and transformative ideas. With an environment brimming with inclusion, unity, and boundless knowledge, learning continues in and beyond the campus walls with the aim to develop innovators, leaders and change-makers who can contribute to the community and build strong borderless networks.

### TOP QUALITY PUBLICATIONS

SBASSE faculty have produced around 300 articles, all published in international venues of prestigious ranking.

### RECOGNITION OF TOP RESEARCH THROUGH SYED BABAR ALI RESEARCH AWARDS (SBARA)

These Awards recognise PhD students. The winners, called the Syed Babar Ali Fellows, are selected for the novelty of their research work, and the potential for lasting impact to their disciplines and the society.

# MS | PhD ELECTRICAL ENGINEERING

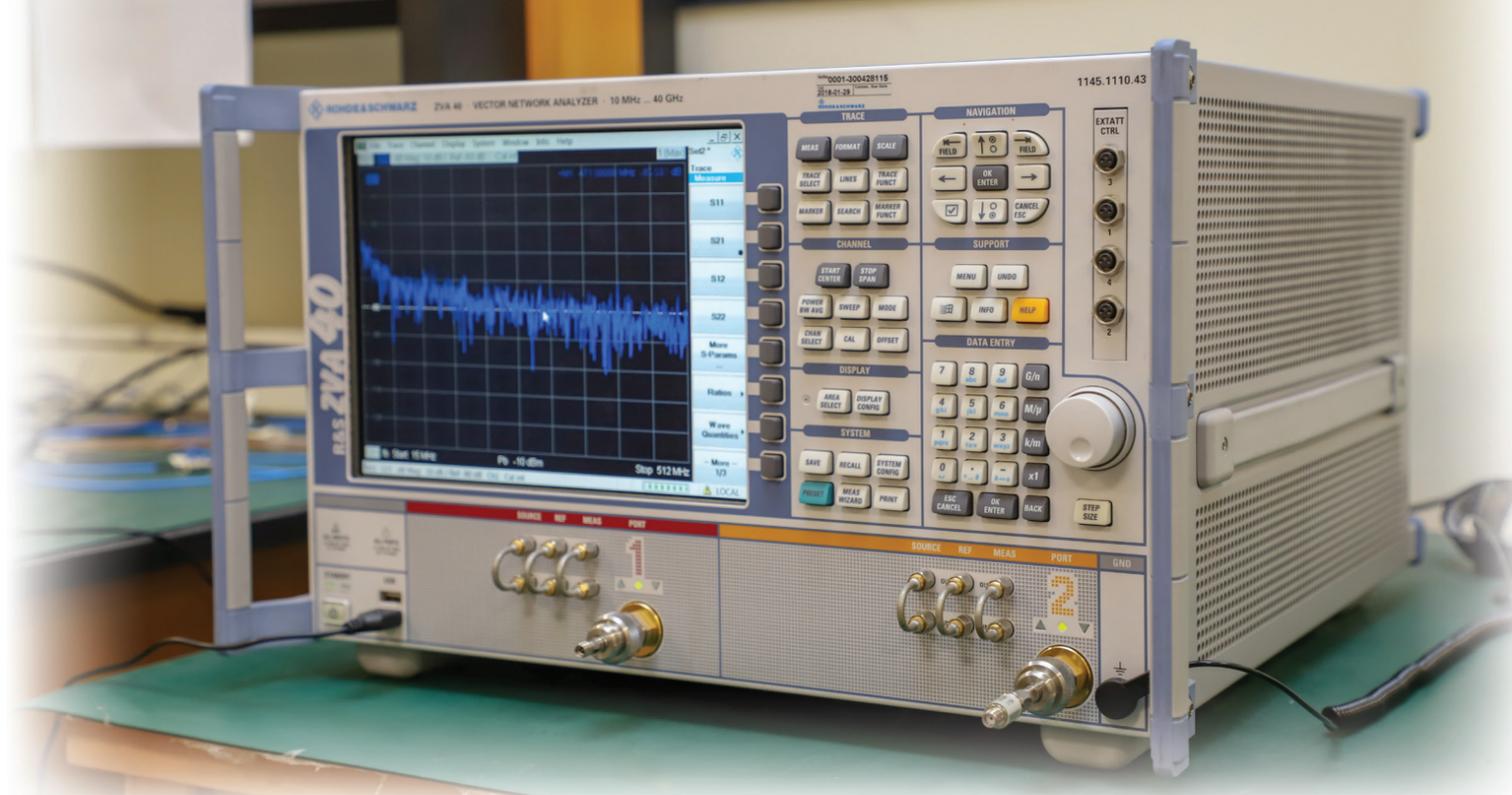
## How will you launch your new world?

The Electrical Engineering graduate programmes provide students a strong foundation and specialisation in contemporary areas of Electrical Engineering, including Communication Systems, Computer Networks, Embedded Systems, Nanoelectronics, VLSI Design Signal Processing, Control Systems, Robotics, Renewable Energy Systems and Optoelectronics. The research conducted by the faculty can be broadly classified into three broad themes—Data (AI Hardware and Theoretical Foundations); Life (Biomedical Devices and Point-of-Care Healthcare); and Sustainability (Systems View of the Water-Energy-Food Nexus).

## What will your new world invent?

The Electrical Engineering department has gradually grown to 22, full-time PhD faculty members who teach and direct research. The following table maps different labs/clusters, and faculty on the themes discussed above:

Themes	Labs/Clusters	Associated Faculty
Data (AI Hardware and Theoretical Foundations)	Electronics and Embedded Systems Lab	Dr. Muhammad Adeel Pasha, Dr. Muhammad Jahangir Ikram, Dr. Shahid Masud, Dr. Muhammad Awais Bin Altaf & Dr. Wala Salem Mustafa Sadeh
	Smart Data, Systems, and Applications Signal Image and Video (SIV) Lab	Dr. Zubair Khalid, Dr. Muhammad Tahir, Dr. Momin Ayub Uppal & Dr. Nadeem Ahmed Khan
	Advanced Communications (AdCom) Research Lab	Dr. Ijaz Haider Naqvi, Dr. Naveed Ul Hassan & Dr. Momin Ayub Uppal
	Cyber Physical Networks (CyPhyNet) Lab	Dr. Abubakr Muhammad & Dr. Hassan Jaleel
	Clinical and Translational Imaging Lab	Dr. Hassan Mohy-ud-Din
	Networks and Communications Lab	Dr. Zartash Uzmi & Dr. Tariq Jadoon
Life (Biomedical Devices and Point-of-Care Healthcare)	Semiconductor and Nanoelectronics Devices Lab	Dr. Nauman Zafar Butt
	Electronics and Embedded Systems Lab	Dr. Muhammad Awais Bin Altaf & Dr. Wala Salem Mustafa Sadeh
	Clinical and Translational Imaging Lab Signal Image and Video (SIV) Lab	Dr. Hassan Mohy-ud-Din & Dr. Nadeem Ahmed Khan
	Bio-Agri Photonics Lab	Dr. Muhammad Imran Cheema
	RAMCASP Research Lab	Dr. Wasif Tanveer Khan
Sustainability (Systems View of the Water-Energy-Food Nexus)	Semiconductor and Nanoelectronics Devices Lab	Dr. Nauman Zafar Butt & Dr. Abubakr Muhammad
	Centre for Water Informatics and Technology (WIT) and CyPhyNet Lab	Dr. Abubakr Muhammad & Dr. Hassan Jaleel
	Energy and Power Systems Lab	Dr. Hassan Abbas Khan & Prof. Nauman Ahmad Zaffar
	Centre for Water Informatics and Technology (WIT)	Dr. Abubakr Muhammad
	Energy and Power Systems Lab	Dr. Hassan Abbas Khan & Prof. Nauman Ahmad Zaffar
	RAMCASP Research Lab	Dr. Wasif Tanveer Khan
	Advanced Communications (AdCom) Research Lab	Dr. Naveed Ul Hassan & Dr. Ijaz Haider Naqvi



## How will Electrical Engineering help you realise your ambition?

The Electrical Engineering department is internationally reputed, providing a research environment supported by international collaborations, and comprises highly skilled faculty. Currently, research programmes are being pursued in the following fields:

- Signals, Communications and Intelligent Systems
- Photonics and Semiconductor Devices
- Electronics and Embedded Systems
- Electrical Power and Energy Systems

## Embrace the Electrical Engineering experience

- The Electrical Engineering department provides an excellent opportunity for graduate research; together faculty and students have published 305 journal papers from 2018-2021, the highest number across LUMS.
- PhD students from the department won 3 out of 4 prestigious Syed Babar Ali Research Awards.
- Dr. Muhammad Awais Bin Altaf and his PhD student, Abdul Rehman Aslam have recently published their research in *IEEE Transactions on Biomedical Circuits and Systems*, a leading journal in the field. Mr. Aslam has also been selected for the IEEE Circuits and Systems Society Pre-Doctoral Award.
- Powering agricultural farms through solar energy requires creative designs in both the solar cells as well as how solar cells will be integrated into a solar system that can power agri-farms. EE PhD graduate, Hassan Imran has produced an amazing body of work that helps achieve both of these tasks. He has published articles

- along with several conference proceedings in the world's leading journals on this topic; *these journals are IEEE Transactions on Electron Devices, IEEE Journal of Photovoltaics and Solar Energy and Renewable Energy.*
- Dr. Zubair Khalid has been elected to the editorial board of *IEEE Signal Processing Letters* as an Associate Editor.
- Dr. Wasif Tanveer Khan's patent application has been approved by the US Patent Office (US Patent Number 10541464). This will enable the integration of antennas in embedded wafer level packages with higher efficiency.
- Dr. Naveed Ul Hassan's PhD student joined Stanford University as a post-doctoral researcher.
- Students under the supervision of Dr. Momin Ayub Uppal got into MIT for the second year running.
- Dr. Ijaz Naqvi's PhD students are pursuing fellowships at the National Institute of Standards and Technology lab in Maryland, USA.



**DR. MUHAMMAD SABIEH ANWAR**

Dean and Professor, Syed Babar Ali School of Science and Engineering

"The graduate programmes in science and engineering at SBASSE, LUMS are poised to make an impact. Our deepest impact as an institution would truly be made by the research that emanates from our graduate education and the research that it propels. We are committed to providing a collegial, rigorous and progressive research milieu that triggers the thirst for knowing more and seeking the truth, and in the process, creating tools, gadgets, machines and ideas that address the human condition and global issues. We promise that our graduate programmes will make you ride through the two extremes of the microcosm and the macrocosm, the ideal and the practical, the abstract and the tangible. Welcome to the Syed Babar Ali School of Science and Engineering!"



## YOUR JOURNEY BEGINS HERE!

### Admission Criteria for Local and International Students

Admission is purely merit-based and rests on the following criteria:

#### MS Programme

- Academic Record
- Performance in Admission Tests
- Application Review
- Submission of complete online application, application processing fee and supporting documents by the stipulated deadline
- Interview Performance (If needed)
- Letter of Recommendation

#### PhD Programme

- Academic Record
- Performance in Admission Tests
- Application Review
- Research Statement
- Submission of complete online application, application processing fee and supporting documents by the stipulated deadline
- Letters of Recommendation
- Interview Performance (If shortlisted)

**Note:** This is the minimum criteria that applicants need to fulfil in order to be eligible to apply. Fulfilment of this criteria does not guarantee admission to LUMS.

For further details, please visit  
<https://lums.edu.pk/graduate>

### Admission Criteria for Phd Programme for Foreign Nationals

SBASSE's PhD application for foreign nationals caters to applicants who currently reside outside Pakistan and have a foreign nationality.

All other applicants (i.e. those who have dual nationality, are Pakistani nationals, or are overseas Pakistanis) are required to apply through the regular admission application.

Admission is purely merit-based and rests on the following criteria:

- Academic Background
- Research Background
- Online Test and Interview (If shortlisted)

In order to study at LUMS, foreign nationals must obtain a 'Study Visa' from the Pakistani Embassy/Consulate working in their country. The Pakistani Embassy/Consulate will only issue a Study Visa for students' stay at LUMS upon receipt of Higher Education Commission (HEC), Pakistan's 'No Objection Certificate' and clearance from the Ministry of Interior, Pakistan.

For the issuance of Visa, students must submit relevant documents to the LUMS Admissions Office through postal mail/courier service by the stipulated deadline.

For details, please visit  
<https://international.lums.edu.pk>

## FINANCIAL SUPPORT FOR LOCAL AND INTERNATIONAL STUDENTS

Admission to all LUMS programmes is purely on merit and independent of students' ability to pay the related tuition fees. Once a student has been admitted to a programme, there are several mechanisms in place to provide financial support based on need and merit. All awards are reassessed each academic year based on performance, need, available resources and prevailing University policies. LUMS is committed to providing as much financial assistance as possible within the limits of its available resources. Nevertheless, the University may not be able to meet all requests for financial assistance, and it is strongly recommended that applicants secure as much of their own funding as possible. Several funding opportunities are available to deserving MS and PhD students. These include:

- Merit Scholarships
- Partial tuition fee waivers for MS Basic Sciences students
- LUMS Interest-free Loan that covers partial to full tuition fee expense (only for local applicants)
- External Scholarships (support and eligibility for these scholarships vary depending on the donor)
- Options to work as Research or Teaching Assistants (subject to availability)
- Full funding for four years of the PhD, which covers tuition, registration, admission fee and a monthly stipend for four (4) years.

For details, please visit  
<https://financial-aid.lums.edu.pk/graduate-financial-aid>



### DR. ABUBAKR MUHAMMAD

Associate Professor and Chair, Department of Electrical Engineering

"The Department of Electrical Engineering is the largest and most complex operation at SBASSE comprising the biggest group of faculty, numerous labs and facilities, a large body of hard-working students and dedicated staff members. Electrical Engineering is the engine that drives the information and intelligence revolutions; it is the inspiration for synthetic biology and neuroscience; it is the instrument of scientific discovery in Physics and Chemistry; it is the user and generator of the deepest results in Mathematics. Our faculty and students build advanced communication systems, design hardware for intelligent systems, conceive renewable energy solutions, study biomedical devices and invent smart systems for the manufacturing industry and agriculture."



### ADEEM ASLAM

PhD Electrical Engineering 2021

"Joining SBASSE was one of the best decisions of my professional life. It has a highly qualified and experienced faculty, friendly and helpful support staff, state-of-the-art facilities and a conducive environment for inter-disciplinary research. The School presents a wonderful opportunity to learn the art of conducting high-quality and impactful research, making LUMS one of the best institutions in Pakistan to pursue your graduate studies."

**FOR FURTHER DETAILS, VISIT**

**MS PROGRAMME:**

**[HTTPS://LUMS.EDU.PK/PROGRAMMES/MS-ELECTRICAL-ENGINEERING](https://lums.edu.pk/programmes/ms-electrical-engineering)**

**PHD PROGRAMME:**

**[HTTPS://LUMS.EDU.PK/PROGRAMMES/PHD-ELECTRICAL-ENGINEERING](https://lums.edu.pk/programmes/phd-electrical-engineering)**

**PHD PROGRAMME (FOREIGN NATIONALS):**

**[HTTPS://LUMS.EDU.PK/PROGRAMMES/PHD-ELECTRICAL-ENGINEERING-FOREIGN-NATIONALS](https://lums.edu.pk/programmes/phd-electrical-engineering-foreign-nationals)**

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**#LearningWithoutBorders**