



LUMS
A Not-for-Profit University

Learning *Without* Borders



**IMAGINE
YOUR
FUTURE**

**MS & PhD
PHYSICS**
Fall 2022

Syed Babar Ali School of Science and Engineering

CREATING IMPACT THROUGH RESEARCH

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.

6 Disciplines

Biology
Chemistry
Computer Science
Electrical Engineering
Mathematics
Physics

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

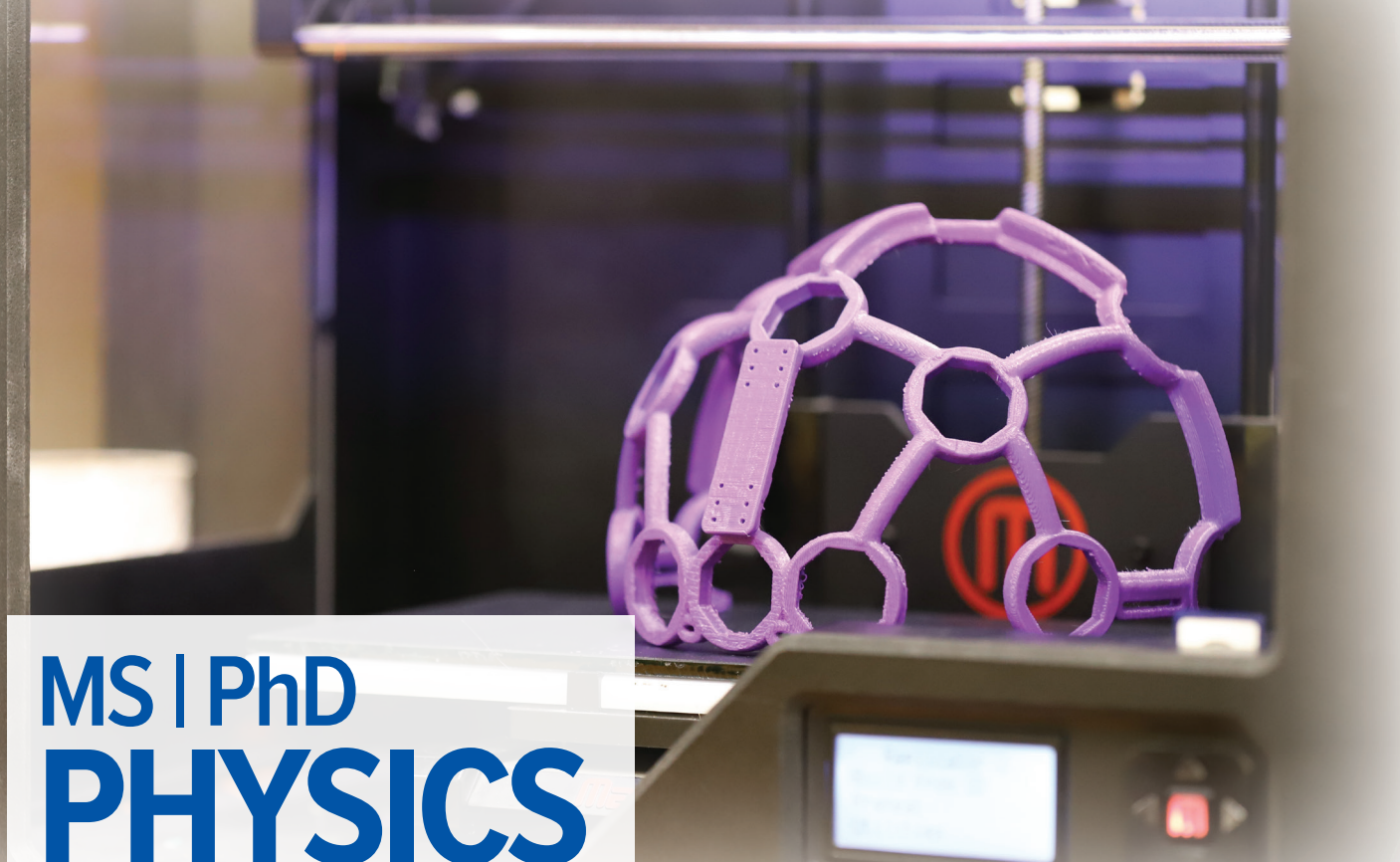
Research and teaching at LUMS truly offer its community 'Learning Without Borders' by breaking academic, geographic and socio-economic barriers to make education accessible to all. The University continues to be an intellectual hub, rich with varying perspectives and transformative ideas. With an environment 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 PHYSICS

How will you launch your new world?

The Department of Physics focuses on probing fundamental physical aspects of the universe and the underlying mathematics, as well as novel applications in diverse areas.

An important characteristic of the Department of Physics is embodied in encouraging students to get involved in research questions and exploratory experiments outside the formal classroom or laboratory coursework. Regular seminars and colloquia are led by faculty, students, as well as distinguished speakers from outside LUMS, and provide a chance to keep abreast of cutting edge and high impact research.

What will your new world invent?

The Physics faculty is actively engaged in research in the areas of Basic and Applied Physics. Both theoretical and experimental research is being conducted in the Department with active involvement of graduate students. Faculty members and their research areas are listed below:

SPIN AND PHOTON PHYSICS

Dr. Muhammad Sabieh Anwar

QUANTUM DYNAMICS

Dr. Adam Zaman Chaudhry

PLASMONICS AND NANOENGINEERED MATERIALS

Dr. Muhammad Faryad

SOLAR CELLS AND OPTOELECTRONICS

Dr. Ammar Ahmed Khan

QUANTUM OPTICS

Dr. Ata Ulhaq

QUANTUM FIELD THEORY

Dr. Tajdar Mufti

COSMOLOGY AND GENERAL RELATIVITY

Dr. Syed Moez Hassan

HIGH ENERGY PHENOMENOLOGY

Dr. Rizwan Khalid

CONDENSED MATTER THEORY

Dr. Rafi Ullah

LASER ENGINEERING AND TECHNOLOGY

Dr. Tayyab Imran

How will Physics help you realise your ambition?

The Department of Physics houses:

- Laboratories in Solid State Physics, Nanoscience, Optics and Photonics, Radiation Physics, and Measurement and Instrumentation
- Homegrown facilities in diverse areas of Physics, including synthesis of new materials, cryogenic and high temperature transport, electrical, thermal and magnetic property measurements, homebuilt atomic force microscopy and magnetic resonance devices
- A wide range of experimental facilities in optics like optical spectroscopy, optical and Kerr microscopy, sensitive imaging, light modulation, radiation detection, X-ray fluorescence, quantum optics, single photon detection, electrodeposition, electrospinning, sputter coating, and high-speed electronic test and measurement equipment
- Research groups headed by various faculty members aiming to explore various fields

Embrace the Physics experience

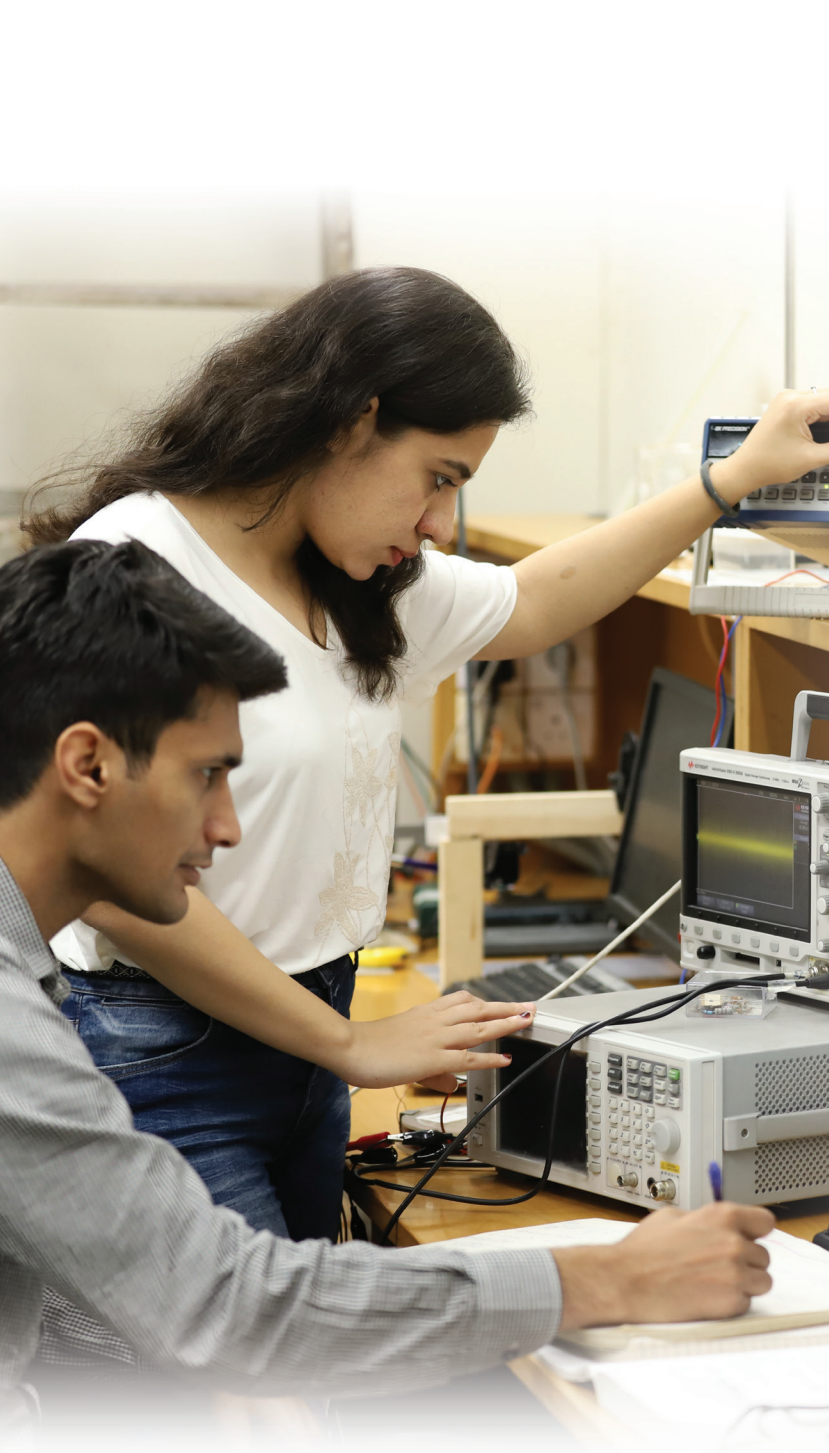
- Dr. Ata Ulhaq, Assistant Professor of Physics, has co-authored a paper revealing insights into the fundamental limitations of elementary quantum systems. This paper has been published in *Nature's NPJ Quantum Information* journal.
- Dean and Professor, Dr. Muhammad Sabieh Anwar, along with physics major, Abdullah Irfan (BS Physics, 2021) helped develop an experiment where a drop of liquid oxygen, and its tail of gaseous oxygen, is seen orbiting a magnet. The data from this experiment was recorded and analysed by students at the PhysLab.
- Assistant Professors at the Department of Physics, Dr. Ata Ulhaq, Dr. Ammar Khan, Dr. Adam Zaman, along with Dean and Professor, Dr. Muhammad Sabieh Anwar, lead the quantum revolution team. They have designed and built optical systems that integrate lasers, optics, microscopy and spectroscopy into a highly specialised optical setup. Some of these experiments use laser light to initialise and control qubits; a fundamental unit of quantum computing, with the promise of completely revolutionising computer technology, giving us unbreakable encryption protocols for security applications and incredible computing speeds that hold invaluable potential for the future of research in Pakistan and across the world.
- The PhysLab team published *Quantum Mechanics in the Single Photon Laboratory*. In this book, Dean and Professor, Dr. Muhammad Sabieh Anwar and students from University of Engineering and Technology, Lahore, describe their innovative experiments at the heart of quantum information processing.
- The International Commission for Optics and the Abdus Salam International Centre for Theoretical Physics declared Dr. Muhammad Faryad, Assistant Professor, Department of Physics, as winner of the 2019 Gallieno Denardo Award, for his contributions to Optics research and education.
- Junaid Saif Khan, MS Physics 2018, was selected for the 69th Lindau Nobel Laureate Meeting in Lindau, Germany.
- Physics PhD student, Aamir Hayat published his research on radiation in hyperbolic media in the prestigious journal, *Physical Review A*.



DR. MUHAMMAD SABIEH ANWAR

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

“The graduate programmes in science and engineering at SBASSE 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 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 and
- 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 of the PhD, which covers tuition, registration, admission fee and a monthly stipend for four (4) years.

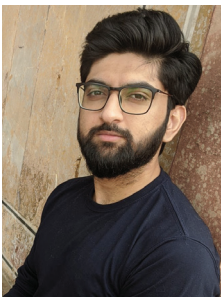
For details, please visit <https://financial-aid.lums.edu.pk/graduate-financial-aid>



DR. ADAM ZAMAN

Assistant Professor and Chair, Department of Physics

"The intellectual environment and academic freedom offered by the department are unmatched in the country. The faculty is composed of a group of extremely talented active scientists working on a variety of areas. As a graduate student, you will not just be working as an apprentice under these scientists; rather, you will be treated as a scholar out to make discoveries and uncover mysteries. It will be up to you to prove that you deserve this designation."



SHAYAN NADEEM

MS Physics 2021

"Coming to LUMS to pursue this path was undoubtedly the best decision I could have ever made. The Department of Physics at LUMS has an atmosphere conducive to learning, the faculty is very accommodating, and the student body is really helpful. I am incredibly grateful to all my professors, especially Dr. Tajdar Mufti, for their guidance and support. Under their guidance, I secured a PhD position at Baylor University, where I now hope to pursue my passion."

FOR FURTHER DETAILS, VISIT

MS PROGRAMME:

[HTTPS://LUMS.EDU.PK/PROGRAMMES/MS-PHYSICS](https://lums.edu.pk/programmes/ms-physics)

PHD PROGRAMME:

[HTTPS://LUMS.EDU.PK/PROGRAMMES/PHD-PHYSICS](https://lums.edu.pk/programmes/phd-physics)

PHD PROGRAMME (FOREIGN NATIONALS):

[HTTPS://LUMS.EDU.PK/PROGRAMMES/PHD-PHYSICS-FOREIGN-NATIONALS](https://lums.edu.pk/programmes/phd-physics-foreign-nationals)

DHA, LAHORE CANTT. 54792, LAHORE, PAKISTAN

Ph: +92-42 111- 11- LUMS (5867) Ext: 2177

Email: admissions@lums.edu.pk

Website: www.lums.edu.pk



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