

Energy Systems Engineering Department

U.S-Pakistan Centers for Advanced Studies in Energy

Rapid increase in energy demand and the recent energy crises have raised serious concerns about Pakistan's energy security and sustainable development in future. Pakistan is Alhamdulillah blessed with vast amount of energy resources. Energy Systems Engineering (ESE) is a highly interdisciplinary domain and the ESE is the largest department within the USPCAS-E with over 8+ faculty members.

At the graduate level, ESE offers two degrees, MS Engineering and the Doctor of Philosophy (PhD). ESE is a research-intensive department. Our faculty, research staff and students are engaged in cutting-edge research activities that span a diversity of areas. After completing the course work requirements, students can carry out advance research either in solar energy applications, advanced energy materials & systems, biofuel engineering, electrochemical devices, energy economics, modeling of energy systems/process, etc.

ESE interacts with the private and the public-sector organizations to train the manpower and address the challenges facing across the board. Faculty members at the ESE Department have also attracted many research grants from various organizations which along with our well-equipped facilities have raised our research profile in recent times.

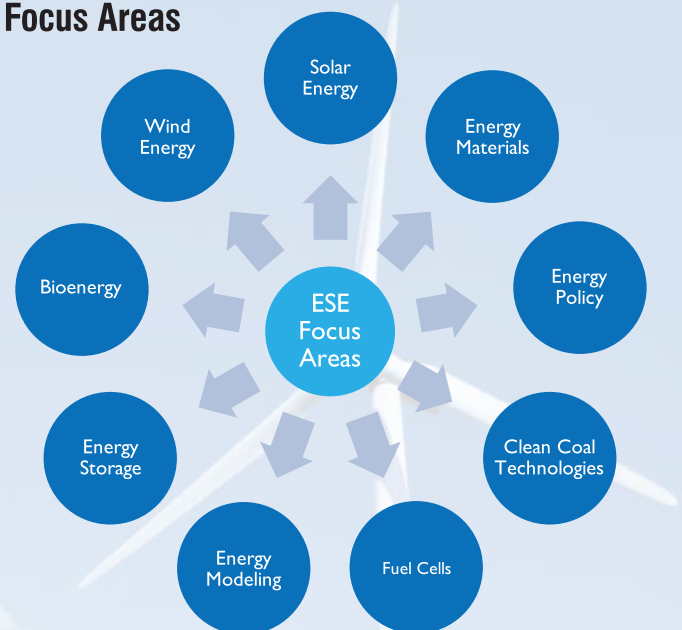
Eligibility and Admissions Criteria

Admission to the MS ESE:

- 16 years of schooling/ 4 years education after HSSC/A' Level in relevant discipline with minimum CGPA of 2 out of 4 or 55% marks.
- GAT (General) conducted by NTS with at least 50 accumulative score.
- B.E/BSc in Energy Systems, Environmental, Material, Chemical Engineering, chemistry, physics and electronics

Interview conducted by USPCAS-E, NUST

Focus Areas



Admission to the PhD program

MS/ M.Phil. in Chemistry, Physics, Electronics and Environmental/Energy Science

OR

MS in all HEC/PEC recognized Engineering disciplines

Admission of the PhD student for the program will be based on:

GRE (general) or GRE (Subject/Engineering) by ETS (New Jersey) or GRE-Subject type test organized by the USPCAS-E NUST (with min of 70% score)

Previous academic record of the applicant
Interview conducted by USPCAS-E, NUST

**Contact us today to
Learn more and apply**

Dr. Naseem Iqbal
Associate Professor/HOD
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Defining Futures

State of the art labs

- **Advance Energy Materials and Systems**

- o X-ray Diffractometer
- o Scanning Electron Microscopy with Energy Dispersive X-ray Spectroscopy (SEM-EDS)
- o Thermal Dilatometer
- o Atomic Force Microscope
- o FTIR
- o Thermogravimetric/Differential Thermal Analyzer (TG/DTA)
- o UV-Vis-NIR Spectrophotometer
- o Laser Particle Size Analyzer
- o Hall Effect Measurement System
- o DC & RF Magnetron Sputtering
- o Thermal Evaporation
- o Electron Beam Evaporation
- o Nanofiber Electrospinning System
- o Atmospheric Plasma Spraying
- o High Velocity Oxygen Fuel (HVOF) Spraying
- o Powder Flame Spraying
- o Arc Wire Spraying
- o Plasma Enhanced CVD
- o Spin and Dip Coaters
- o Controlled environment furnaces

- **Solar Energy**

- o Solar Heat Source Vapor Turbine
- o Solar Panel Laminator & Solar PV Testing Kits
- o Solar Cell I-V Curve Measurement System
- o Thermal Evaporation System for Metal& Organics
- o Three Phase Power Quality & Energy Analyzer
- o Energy Auditing Tool Kits
- o Solar desiccant Dehumidifier
- o TRNSYS , PV Sol and Meteonorm Software

- **Biofuels**

- o Supercritical Fluid Extractor
- o High Performance Liquid Chromatogram
- o Flash Point Tester
- o Real Time Polymerase Chain Reaction
- o Algae Online Monitor

- **Energy Storage and Conservation**

- o High Pressure Gas Sorption Analyzer
- o Electrochemical work station with RRDE
- o Coin Cell Battery Fabrication & Testing
- o PEM Fuel Cell Test Station
- o Hydrothermal Reactor
- o Battery Analyzer
- o Four probe device for conductivity measurement

- **Thermal Spray and Evaporation facility**

- o High Velocity Oxygen Fuel (HVOF) System
- o Atmospheric Plasma Spray System
- o Air Compressor System
- o Sand Blasting Machine
- o Super Sonic Arc Spray Equipment
- o Sub Sonic Powder Flame Spray Equipment
- o Sand Blaster Cabinet
- o Air Compressor System

- **Machine Shop**

- o Bench-top Radial Drill Press with complete standard accessories
- o Manual Utility Hydraulic Bench Press with complete standard accessories
- o Table Saw with complete standard accessories
- o Bench Tool Grinder with complete standard accessories
- o Impact Drill Machine with complete standard accessories
- o Metal Cut Off Saw
- o Arc Welding Plant with complete standard accessories
- o Lathe Machine with complete standard accessories



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| ESE PhD Faculty | Research Expertise |
|---|---|
| DR. NASEEM IQBAL Associate Professor/Head of Department Energy Systems Engineering Ph.D.: Vienna University of Technology, Austria | <ul style="list-style-type: none"> • Metal Organic Frameworks (MOF) • Fuel Cell, Li-ion Batteries and Supercapacitor • Carbon Capture and Hydrogen Storage • Industrial batteries |
| DR. ADEEL WAQAS Associate Professor Ph.D.: Asian Institute of Technology, Thailand | <ul style="list-style-type: none"> • PCSs integrated with buildings • Energy efficiency and conservation |
| DR. RABIA LIAQUAT Assistant Professor Ph.D.: Quaid Azam University Islamabad, Pakistan | <ul style="list-style-type: none"> • Strategies to enhance biogas production • Biomass gasification |
| DR. NADIA SHEHZAD Assistant Professor Ph.D.: Politecnico di Torino, Italy | <ul style="list-style-type: none"> • Fabrication of Perovskite and Dye-Sensitized Solar Cells (DSSCs) • Optimization and testing of DSSCs |
| DR. KAFAIT ULLAH Assistant Professor Ph.D.: University of Twente, Netherland | <ul style="list-style-type: none"> • Energy sector reforms • Energy-economy-society linkages |
| DR. MUHAMMAD HASSAN Assistant Professor Ph.D.: Nanjing Agricultural University, China | <ul style="list-style-type: none"> • Methane enhancement and pretreatment technologies • Energy recycling and management |
| DR. SEHAR SHAKIR Assistant Professor Ph.D.: University of Malaya, Malaysia | <ul style="list-style-type: none"> • 3rd generation solar cells • Advanced energy materials |
| DR. PERVAIZ AKHTAR TVF Sussex University | <ul style="list-style-type: none"> • Solid State Physics |
| DR. ZUHAIR S. KHAN, Professor, A/Principal & Dean Ph.D. (Kyoto, Japan), M.S. Engg. (Linkoping, Sweden) | <ul style="list-style-type: none"> • Adv. Energy Materials & Surface Engg. • Materials for Renewable & Alternative Energy Technologies |

| Lab Engineer/Technical-ESE | Education |
|--|--|
| Mr. NAVEED AHMED KHAN Lab Engineer | <ul style="list-style-type: none"> • BE Chemical Engineering |
| Mr. AREEJ AHMED KHAN MHP Engineer | <ul style="list-style-type: none"> • BE Electrical Engineering |
| Mr. AAMIR SATTI Process and Design Engineer | <ul style="list-style-type: none"> • Polymer Technology |
| Mr. ASGHAR ASLI Research Associate | <ul style="list-style-type: none"> • MS Energy System Engineering |
| Mr. QAMAR UDDIN Manufacturing & Machines Shop Technologist | <ul style="list-style-type: none"> • Technologist |



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Courses offered in MS and PhD ESE Program at USPCASE-NUST

The MS ESE program requires a minimum of 24 credit hours (CH) of course work, plus 2 credit hours of research methodology and a 6 credit hour research project, which will be counted towards the thesis, for a total of 30 credit hours. The PhD ESE program requires a minimum of 18 credit hour (CH) course work and a 30 CH research project which will be counted towards the thesis.

| MS Energy Systems Engineering | Elective Courses Pool on Energy Policy and Management |
|--|---|
| Core Courses | ESE-813: Energy Economics and Policy |
| ESE-804 Applied Solar Energy | ESE-831: Energy Policy Analysis and Planning |
| ESE-809 Modeling of Energy System | ESE-816: Development and Evaluation of Energy Projects |
| ESE-820 Energy and Environment | ESE-819: Environmental Impact Assessment |
| ESE-821 Energy Resources and Technologies | ECO-932 Development Policy and Planning |
| ESE-899 Thesis | CE-824 Water Resources, Economics, Planning and Management |
| Elective Courses | PhD Energy Systems Engineering |
| ESE-810 Computer Applications in Energy Systems | Core Courses |
| ESE-801 Biofuel Engineering | ESE-901 Recent Trends in Energy Systems Engineering |
| ESE-803 Photovoltaic Devices | ESE-902 Socio-Economic Aspects of Energy Systems |
| ESE-800 Clean Coal Technologies | ESE-999 Dissertation |
| ESE-811 Solar Energy | Elective Courses |
| ESE-814 Fuel Cells | ESE-903 Contemporary Materials for Advanced Energy |
| ESE-815 Thin Films | ESE-904 Advanced Energy Materials: Synthesis & Characterization |
| ESE-817 Wind Energy | ESE-905 Advanced Heat and Mass Transfer |
| ESE-818 Power Distribution Systems | ESE-906 Biomass/Coal Gasification |
| ESE-823 Thermal Hydraulics | ESE-907 Photocatalysis-Advancement and Applications |
| ESE-824 Nuclear Energy Engineering | ESE-908 Nuclear Thermal Hydraulics |
| ESE-826 Industrial Catalysis for Energy Systems | ESE-909 Smart Grid Architecture |
| ESE-827 Energy from Biomass: Thermochemical Processes | ESE-910 Smart Power Systems |
| ESE-828 Energy Storage Systems | ESE-911 Carbon Capture and Utilization |
| ESE-829 Functional Nanomaterials for Renewable Energy | RM-899 Research Methodology |
| ESE-830 Next-generation Photovoltaics | CHE-848 Gasification Processes |
| ESE-832 Energy and Climate Change | EME-803 Combustion and Propulsion |
| ESE-833 Industrial Energy Management | EME-901 Advanced Engineering Mathematics |
| ESE-834 Sustainable Buildings | EME-981 Advanced Fuel Technology |
| CSE-801 Computational Fluid Dynamics | NSE-842 Nano Materials for Energy Applications |
| EEE-801 Clean Energy Generation, Integration and Storage | NSE-931 Advanced Synthesis and Fabrication Techniques |
| EEE-811 Electric Power Quality | MSE-901 Advanced Characterization of Materials |
| EEE-812 Advanced Power System Protection | ME-935 Renewable Energy |
| EEE-814 Advanced Power Electronics | ME-936 Solar Technologies |
| TEE-801 Advanced Thermodynamics | CSE-931 Advanced Numerical Methods |
| TEE-803 Conventional and Renewable Energy Power Plants | PHY-924 Experimental Techniques of Physics |
| TEE-814 Environmental Issues of Fossil Fuel Power Plants | PHY-921 Plasma Physics |
| TEE-815 Advanced Heat and Mass Transfer | |
| TEE-816 Fuels and Combustion | |
| TEE-820 Process Intensification | |



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