

Thermal Energy Engineering Department

U.S-Pakistan Centers for Advanced Studies in Energy

Mission Statement

Roughly 65% of Pakistan's energy mix is based on fossil fuel based thermal power plants. A variety of fuels comprising of high speed diesel, furnace oil, heavy fuel oil, coal and natural gas are used in the power plants. Thermal resources are also heavily used in the industry and transport sector along with domestic application. In order to enhance the energy efficiency of thermal systems, various technological breakthroughs are imperative. Cutting edge applied research is required not only in fossil fuel based power plants but also in areas such as advanced materials, waste heat recovery, turbomachinery, combustion, and thermal hydraulics.

Thermal Energy Engineering department is primarily focused on thermal energy technologies and systems, and covers advanced aspects of thermal energy system modelling, power plant engineering, heat- and mass transfer, and experimental work with focus on different components and energy system aspects. The semesters are particularly focussed on thermal energy and process engineering along with in-depth understanding of the technologies and scientific disciplines involved in energy conversion, utilization and transport. The education is multidisciplinary and covers the integration of general engineering disciplines such as thermal system design and optimization, fluid dynamics, thermodynamics and thermal hydraulics.

Eligibility Criteria

MS -TEE

- Sixteen years of schooling or 4 years (minimum 124 credit hours) education after HSSC/A' Level in relevant discipline with minimum CGPA of 2.0 out of 4.0 OR 55% marks (percentage will only be considered if CGPA is not mentioned on the transcript).
- GAT (General) conducted by NTS with at least 50 accumulative score or GRE (General) conducted by ETS, USA, with following minimum score separately in each section:
- Interview at USPCAS-E

PhD-TEE

- MS/M.Phil. in Energy System Engineering (Thesis in Thermal Engineering), Thermal Energy Engineering, Mechanical Engineering, Chemical Engineering, Nuclear Engineering, Physics, Aerospace Engineering, Thermal Power Engineering and Process Engineering.
- 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 and interview at USPCAS-E

Interview conducted by USPCAS-E, NUST

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

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Department of Thermal Energy Engineering

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National University of Sciences and Technology Islamabad Pakistan



Defining Futures

Research Focus



TEE Faculty

TEE Faculty	Research Expertise
DR. ADEEL JAVED Assistant Professor and HoD TU Delft, Netherlands	<ul style="list-style-type: none"> Gas Turbine Performance Turbomachinery Aero-Thermodynamics Wind Energy
DR. MAJID ALI Assistant Professor Harbin Engineering University, China	<ul style="list-style-type: none"> Nuclear Thermal Hydraulics Thermal Energy Storage Computational Fluid Dynamics
DR. M BILAL SAJID, CEM Assistant Professor KAUST, Saudi Arabia	<ul style="list-style-type: none"> Fuels and Combustion Industrial Energy Management Green Buildings
DR. ENGR. M. ZUBAIR Assistant Professor TU Delft, Netherlands	<ul style="list-style-type: none"> Process and Equipment Design Biomass Gasification Hybrid CHP Systems
DR. MARIAM MAHMOOD Assistant Professor University of Genoa, Italy	<ul style="list-style-type: none"> Thermal Energy Storage Solar Thermal Power Systems
DR. ASIF HUSSAIN Assistant Professor UTM, Malaysia	<ul style="list-style-type: none"> Reforming Technologies Fuels and Combustion
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. High Temperature & Corrosion Tolerant Materials for Turbine Engines
HASSAN NAZIR (Chemical Engineer)	<ul style="list-style-type: none"> Thermal Energy Engineering Lab
ALI ABDULLAH (Chemical Engineer)	<ul style="list-style-type: none"> Biofuel Lab
HAIDER IJAZ (Chemical Engineer)	<ul style="list-style-type: none"> Fossil Fuel Lab/Combined Lab



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MS Thermal Energy Engineering

The 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. Degree completion by course work option is available after meeting due requirements.

S. No	Code	Title	CH
Core Courses			
1	TEE-801	Advanced Thermodynamics	3
2	TEE-802	Design and Modelling of Thermal Energy Systems	3
3	TEE-815	Advanced Heat and Mass Transfer	3
4	TEE-816	Fuels and Combustion	3
5	TEE-899	Thesis	6
Elective Courses			
1	TEE-803	Conventional and Renewable Energy Power Plants	3
2	TEE-810	Advanced Process Energy Analysis and Optimization	3
3	TEE-812	Advanced Fluid Dynamics	3
4	TEE-813	Turbomachinery	3
5	TEE-814	Environmental Issues of Fossil Fuel Power Plants	3
6	TEE-817	Computational Fluid Dynamics for Thermal Energy Systems	3
7	TEE-818	Advanced Heating, Ventilation and Air-Conditioning Systems	3
8	TEE-820	Process Intensification	3
9	TEE-821	Advanced Thermal Energy Storage Systems	3
10	TEE-822	Gas Turbine Performance	3
11	TEE-823	Solar Thermal Power Systems	3
12	ESE-800	Clean Coal Technology	3
13	ESE-811	Solar Thermal Technology	3
14	ESE-814	Fuel Cells	3
15	ESE-816	Economic Evaluation of Energy Projects	3
16	ESE-822	Geothermal Energy	3
17	ESE-823	Thermal Hydraulics	3
18	ESE-824	Nuclear Energy Engineering	3
19	ESE-827	Energy from Biomass Thermochemical Processes	3
20	ESE-831	Energy Policy Analysis and Planning	3
21	ESE-832	Energy and Climate Change	3
22	ESE-833	Industrial Energy Management	3
23	ESE-834	Sustainable Buildings	3
24	CSE-801	Computational Fluid Dynamics	3
25	ME-831	Computational Fluid Dynamics - I	3
26	ECO-932	Development Policy and Planning	3
27	CE-824	Water Resources, Economics, Planning and Management	3



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PhD Thermal Energy Engineering

The main program requires a minimum of 18 credit hour (CH) course work and a 30 CH research project which will be counted towards the thesis.

S. No	Code	Title	CH
Mandatory Courses			
1	TEE-901	Emerging Trends in Thermal Technologies	3
2	TEE-902	Sustainability in Thermal Energy Systems	3
3	TEE-899	Dissertation	30
Additional Required Course			
4	RM-899	Research Methodology	2
Elective Courses			
5	TEE-903	Phase Change Thermal Processes	3
6	TEE-904	Laser Diagnostics for Thermal Engineering Applications	3
7	TEE-906	Advanced Combustion Kinetics	3
8	TEE-907	Technologies for Enhanced Heat Transfer	3
9	TEE-908	Advance Turbo-machinery Application	3
10	ESE-904	Synthesis and Analytical Characterization of Advanced Energy Materials	3
11	ESE-905	Analytical and Numerical Techniques in Heat Transfer	3
12	ESE-906	Biomass Gasification	3
13	ESE-908	Nuclear Thermal Hydraulics	3
14	ESE-913	CO2 Capture, Utilization and Sequestration	3
15	MATH-901	Advanced Engineering Mathematics	3
16	ME-931	Internal Combustion Engine Technology	3
17	ME-884	Convection Heat Transfer	3
18	CSE-803	Data analysis and Statistics	3

Laboratories and Facilities

Thermal Energy Lab

Fossil Fuel Lab

Combined/Emerging Technology Lab

Wind Power Lab

High Performance Computing Lab

- Gas Chromatograph Mass Spectrometer
- Ultrasonicator
- Partial Image Velocimetry (PIV) system
- Fuel Atomization Verification System
- Bomb Calorimeter
- Thermal Imaging Camera
- High Speed Camera
- CHN-S Elemental Analyzer
- 18x18" Open-Circuit Wind Tunnel
- Wind Masts
- Wind LiDAR
- 24-Core Xeon based Workstations
- ANSYS, WindPRO, CHEMKIN, TRNSYS etc.
- Fischer-Tropsch Synthesis Facility
- 500 kW Grid-Tied PV Solar System



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