Ahmedabad University

# MTech

Master of Technology

# VLSI, Microelectronics and Semiconductors

Engineer your future with VLSI Design Microelectronics and Semiconductor Devices

www.ahduni.edu.in/seas


Ahmedabad University

# About Us

- Established in 2009
- Leading private, non-profit research university
- Liberal education focused on interdisciplinary learning, practice orientation, and research thinking
- Prepares critical thinkers who are analytically equipped, practically oriented, and contextually aware global citizens
- Six schools and nine centres bringing liberal arts, sciences, and the professions to engage together in knowledge creation for addressing complex challenges of the society
- Curriculum offering majors that merge the boundaries of disciplines to prepare students for the new economy

## School of Engineering and Applied Science

The School delivers undergraduate and graduate engineering programmes with extensive student-centric pedagogies to achieve excellent learning outcomes. Our project-based educational approach helps shape dynamic and proactive graduates with capabilities for lifelong learning, complex problem-solving, design and innovation, and adaptation of technology towards meeting the needs of society. We not only teach technology but actively guide and nurture its use in ways that may be unattainable with conventional approaches.

Amrut Mody School of Management ▪ Bagchi School of Public Health ▪ School of Arts and Sciences
School of Engineering and Applied Science ▪ Undergraduate College ▪ The Graduate School

Ahmedabad Design Lab ▪ Centre for Heritage Management ▪ Centre for Learning Futures ▪ Global Centre for Environment and Energy
▪ International Centre for Space and Cosmology ▪ Sahyog: Centre for Promoting Health ▪ The Climate Insitute
▪ Stepwell Centre for Asian Futures ▪ The Institute of Manufacturing and Economy

# Message from the Dean

Ahmedabad University is committed to providing an education that prepares students to think critically and creatively enabling them to emerge as independent thinkers and compassionate leaders. The School of Engineering and Applied Science has created curricula that help students grow intellectually, personally, and professionally so that they may thrive themselves and also help others thrive.

The School's infrastructure, comprising contemporary advanced facilities, well-equipped laboratories, and a large and well-stocked library, fosters a conducive environment for learning. Our students are also supported and mentored by faculty, who are active researchers and engage students in their academic pursuits. Additionally, the school promotes holistic development and participation among students through workshops, conferences, and other extracurricular events organised on campus. We deliver a sound engineering education and a nuanced approach for tackling real-world challenges.

**Professor Sunil Kale**

Dean
School of Engineering and Applied Science
PhD (Stanford University)

Why Study

# MTech in VLSI, Microelectronics and Semiconductors

at Ahmedabad University?

- **A comprehensive programme covering a broad range of topics under the subdomains: VLSI Design, Semiconductor-based devices, and fabrication/process technology for Integrated Circuits (ICs).**

  - Exposure to industry-standard Electronic Design Automation (EDA) tools for VLSI design.
    - Study various levels of VLSI design abstractions, design flows, design techniques, and pre-silicon verification.
    - Study design of high-performance digital VLSI sub-systems and general-purpose RISC and application-specific processor architectures.

  - Specialised knowledge of the modelling, designing, and simulation of micro and nano-scaled semiconductor-based IC devices using industry-standard TCAD tools.
    - Study application-specific semiconductor devices and their device-specific process technology steps.

  - Undertake elective courses under two tracks: (a) VLSI Design and Test and (b) Application-Specific Semiconductor Devices.

- **Aligns with the vision of Gujarat Semiconductor Policy, Government of Gujarat, and the India Semiconductor Mission (ISM), Ministry of Electronics & Information Technology (MEITY), Government of India (GoI), for creating a domestic semiconductor-based Electronic System Design and Manufacturing (ESDM) ecosystem.**

- **Aligns with semiconductor industry requirements and skills.**

Master of Technology in

# MTech in VLSI, Microelectronics and Semiconductors

The global semiconductor industry is growing rapidly with advancements in nano-scale IC fabrication/process technologies and new requirements for SoC (System-on-Chip) and ASIC (Application-Specific Integrated Circuit) chips for growing application areas driven by research in AR/VR (Augmented Reality/Virtual Reality), 5G, IoT (Internet of Things), Automation, Edge Computing, AI (Artificial Intelligence) and Machine Learning.

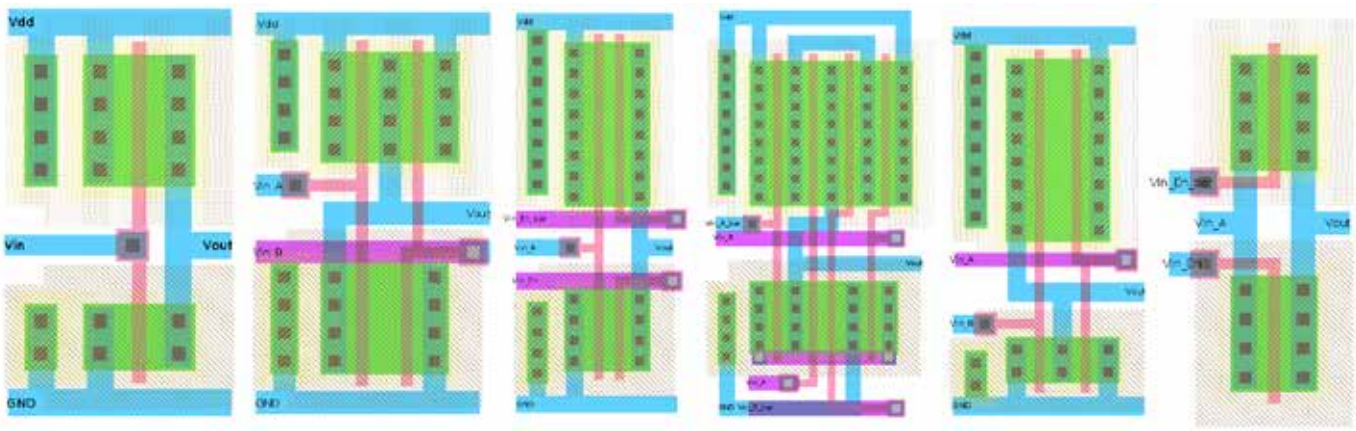
ESSCI (Electronics Sector Skills Council of India) and IESA (India Electronics and Semiconductor Association) report that India is home to around 70 VLSI Design services and 180 embedded software companies. Additionally, ESSCI projects an industry employment growth rate (CAGR) of 10.1 percent. Deloitte, one of the "Big Four" global professional services networks, estimated that the global semiconductor workforce will need to grow by more than one million by 2030, adding more than one lakh workers annually.

Gujarat itself has several prominent VLSI design service companies. In the past two decades, India has emerged as the hotspot for fabless VLSI design, and several semiconductor industries are planning to set up fabrication units in the Smart Industrial City of Dholera in Gujarat, thus highlighting the demand for VLSI design and semiconductor device engineers.

The new programme, MTech in MTech in VLSI, Microelectronics and Semiconductors, caters to this requirement of world-class engineers in India and globally who can shape the semiconductor industry's future.

## Programme Highlights

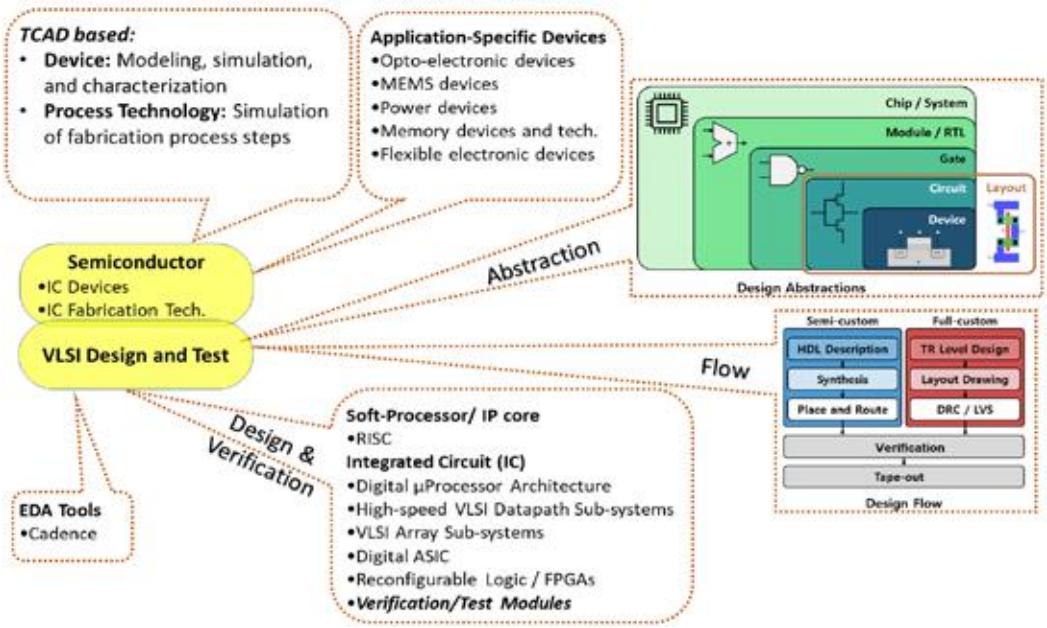
- Two-year, full-time
- Student-centric pedagogy
- Learning through projects
- Design-driven curriculum
- Problem-solving and application-specific approach
- Build skills and perspectives for life-long learning



# Programme Overview

**Programme Structure** **Duration: 2 years** **Semesters: 4 semesters**

| Category | | Credits |
|---|---|---|
| **Semester 1** | Electronic Materials and Properties<br>VLSI Sub-system Design<br>Introduction to IC Fabrication Technology<br>Three electives | 19 |
| **Semester 2** | Fundamentals of IC Devices<br>Technical Communication<br>Digital CMOS VLSI Design<br>Design Verification<br>Two electives | 19 |
| **Summer School** | Emerging Topics in Microelectronics and Semiconductors | 2 |
| **Semester 3** | Major Project - I (One year off-campus industry project OR one year on-campus thesis)<br>Graduate Research Seminar I | 20 |
| **Semester 4** | Major Project - II (One year off-campus industry project OR one year on-campus thesis)<br>Graduate Research Seminar II | 20 |
| | **TOTAL** | **80** |



# Curriculum Structure

## Domain Core Courses

Recognising the capabilities of fresh UG graduates and industry requirements, we have built a programme that provides knowledge (green), and design skills (blue) to upgrade students to become industry-ready. The core courses of the programme are given below:

- **Electronic Materials and Properties**
- **VLSI Sub-system Design**
- **Introduction to IC Fabrication Technology**
- **Fundamentals of IC Devices**
- **Digital CMOS VLSI Design**
- **Design Verification**

## Domain Elective Courses

Students will have the option to select electives* from a wide variety of topics aligning with their areas of interest. These are a mix of advanced knowledge, application oriented, and design skill-building courses beyond the domain core courses.

### Track: VLSI Design and Test

- High-Speed Computer Architecture
- Edge Computing using Microcontrollers
- Artificial Intelligence
- Internet of Things
- Low-Power VLSI Circuits and Architectures
- ASIC Design (or SoC Design)
- VLSI Physical Design
- VLSI Testing
- Microwave Circuits and Systems
- Design using Reconfigurable Hardware (FPGAs)

### Track: Application-Specific Semiconductor Devices

- Electrical, Optical and Magnetic Materials and Devices
- Organic Optoelectronic Devices
- Flexible Electronic Devices
- CMOS MEMS Devices and Fabrication
- Power Semiconductor Devices
- Semiconductor Memory Devices and Technology
- Emerging Nano-scale IC Devices and Structures

*Disclaimer: Elective courses offered to students would be subject to the availability of faculty or external experts.

# Curriculum Structure

## Graduate Research Seminar

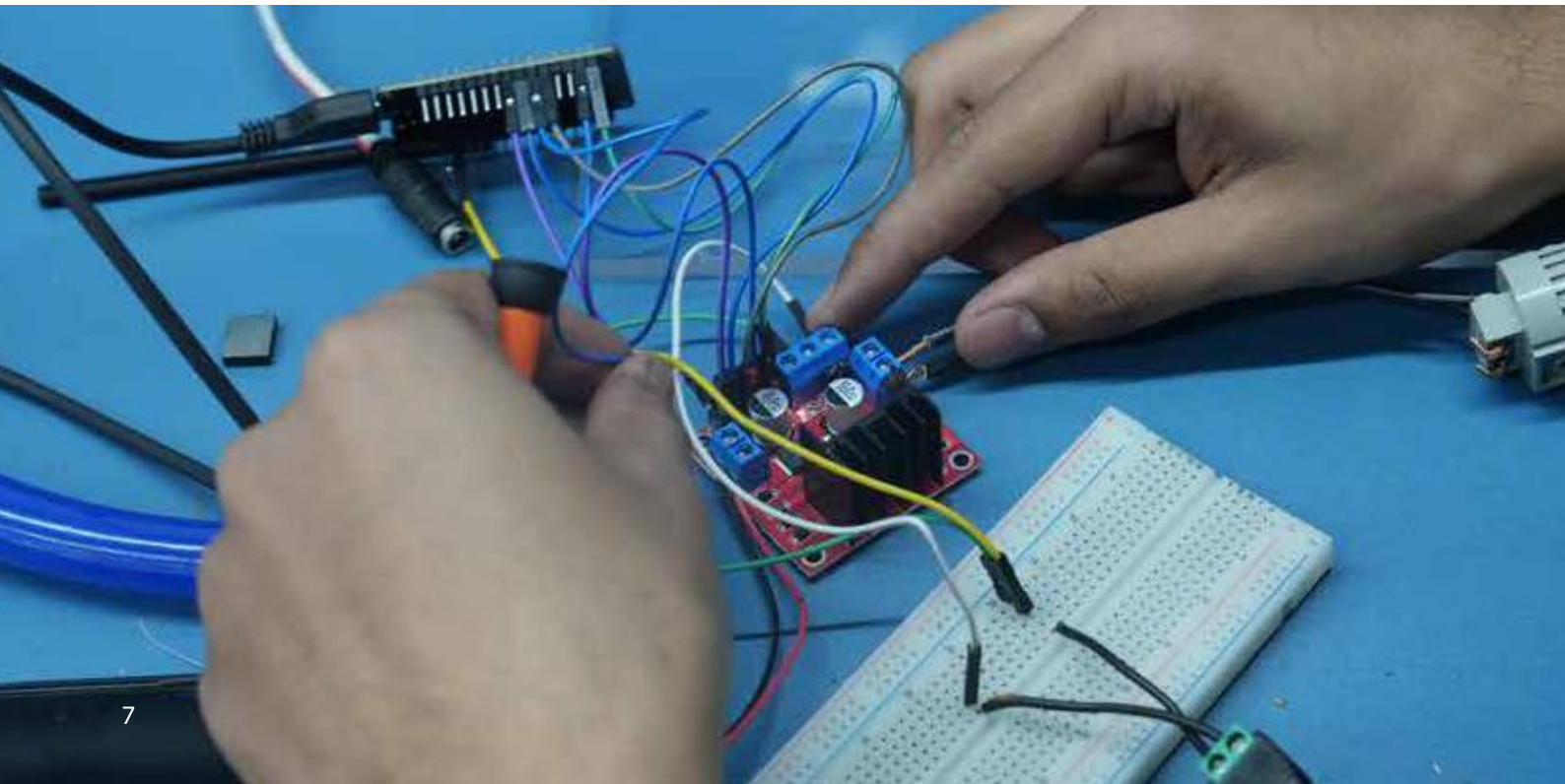
The Graduate Research Seminar (GRS) - I and II will allow the students to independently explore and experiment on varied/advanced topics in the VLSI design and semiconductor device and process technology sub-domains. They will undertake a literature survey, modelling, and experimentation and summarise the survey/findings as a research paper and a presentation, giving them experience and practice in research writing and professional communication. The GRS will run parallel to the major project and be distinct from the major project.

## Major Project

The one-year MTech Major Project is a mandatory component that students can complete either by opting for an off-campus industry project** or completing an on-campus thesis.

- Off-campus Industry Project: Students will train/work in the industry to bridge academic research with real-world applications.
- On-campus Thesis: Students will undertake the typical methodical steps for academic research, including literature survey, modelling and experimentation, design/implementation/development, simulation/measurements, testing/analysis/comparison, using EDA/TCAD tools, and prototyping boards, under the mentorship of a faculty supervisor.

**Disclaimer: Subject to availability from industry and CDC.

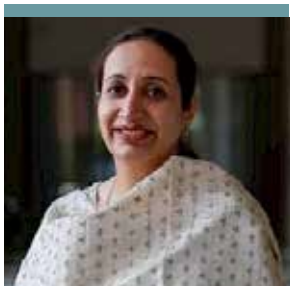


# Faculty

## Shweta Agarwala

PhD (National University of Singapore)

**Research Interests:** Green Electronics, Flexible and Printed Electronics, Sustainable and Biodegradable Materials, Healthcare Devices



## Harmeet Kaur

PhD (Academy of Scientific and Innovative Research)

**Research Interests:** Optoelectronics, Photovoltaics, Optical Sensors, and Luminescent Nanomaterials

## Anurag Lakhlani

MS (The University of Texas, Arlington)

**Research Interests:** VLSI Technology And Design, Semiconductor Device Characterization and Modelling, Embedded System Design, Internet Of Things, Human Computer Interaction, Neuromorphic Circuits

## Mayuribala Mangrulkar

PhD (Skoltech, Moscow, Russia)

**Research Interests:** Perovskite Solar Cells, Flexible and Printed Solar Cells, Next-Generation Photovoltaic Technologies, Optoelectronic Devices Beyond PV, Thin-Films, Surface Treatment, Coatings, Material Stability Studies, Advanced Semiconducting Materials, Nanocomposites

## Sanket Patel

PhD (Dhirubhai Ambani Institute of Information and Communication Technology, Gandhinagar)

**Research Interests:** Antenna, RF, Microwave, Circuits, Sensors, Sensor Instruments & Applications, Applied Physics, Non-destructive Material Characterization, Metamaterials, Frequency Selective Surfaces, Microwave Absorbers made of Composites

## Aditya Tiwari

PhD (BITS-Pilani)

**Research Interests:** Gas Sensing, Molecular Adsorption, Sensor Design, Nanomaterials, Energy Storage, Material Simulation, Material Design and Engineering

## Mazad Zaveri

PhD (Portland State University)

**Research Interests:** Digital CMOS VLSI Circuits and Sub-systems, Verilog HDL based Implementation of Arithmetic-Logic Sub-systems, Neuromorphic Architectures

# Career Prospects

The programme prepares students for careers in VLSI design, semiconductor devices, and process technology sectors of the semiconductor industry and research labs. Some roles that students could explore are:

- Semiconductor Device Engineer
- RTL Design Engineer
- Design Verification Engineer
- FPGA Design Engineer
- SoC Design Engineer
- Physical Design Engineer
- ASIC Verification Engineer

Career Pathways: Besides pursuing professional roles, the programme prepares students to pursue PhD programmes or start their own ventures.

Industry Centric Project / Academic Research: Students work on a year-long project or research real-world industry problems, building their potential and value in the semiconductor ecosystem. This often leads to direct industry absorption or provides students with in-depth insights to pursue roles in similar organisations. The faculty and the University's Career Development Centre offer complete support throughout the student's academic journey.

Startup ecosystem: Ahmedabad University's incubation centre, VentureStudio, offers comprehensive support to students interested in building enterprises, including workspace, patenting assistance, technical mentoring, and access to funding from government and private entities.

Research: For students with a penchant for research in VLSI design and semiconductor devices, the University gives a strong foundation for PhD admissions at Ahmedabad University or at leading universities worldwide of their choice.

# Career Development Centre

The Career Development Centre (CDC) at Ahmedabad University prepares students for successful careers by offering access to significant resources. It enables them to explore, discover, develop, and pursue personal and professional goals, while facilitating their connection to the corporate world in alignment with those goals. MTech students can tap such active connections to attain summer internships at the end of their first year. The CDC also facilitates final placement of students and prepares them for successful careers by augmenting their technical and technological skill sets.

The CDC is thus committed to working with students across various levels of career development, ranging from interest to assessments, networking opportunities to job searching strategies, and all other requirements.

## Role of the CDC

The objective of the CDC is to:

- Help build a solid and active University-industry interface;
- Enhance students' career readiness through coaching, counselling, instruction, innovative programming, and aligning with prevalent industry trends;
- Organise various forums for students and faculty to engage with the industry, such as guest lectures, career masterclasses, workshops, seminars, conferences, and projects;
- Provide experiential learning opportunities to students through internships;
- Assist students in achieving their career goals by connecting them with recruiters; and
- Promote a sense of responsibility among students for lifelong career development efforts through exploration, education, and experience.

## How Can the CDC Help You?

The CDC offers support to students in the following areas:

- Career counselling, guidance and planning
- Career assessment and testing
- Career development workshops and interactions with industry leaders
- Industry engagement (guest lectures, seminars, and research projects, among other things)
- Placement and internship assistance
- Campus-to-corporate training, including:
  - o Professional grooming sessions;
  - o Personality development workshops;
  - o Communication proficiency interventions;
  - o Resume writing workshops;
  - o Mock group discussions and personal interviews;
  - o Quantitative, analytical and logical practice tests; and
  - o Aptitude practice tests.

# Campus Infrastructure

The Ahmedabad University campus offers a modern, sustainable, and fully networked environment designed to enrich the learning experience. The state-of-the-art infrastructure at the University includes modern and technically equipped classrooms, laboratories, a central library, and other learning resources. It provides comprehensive facilities for student well-being, including accommodation, sports facilities, cafes, spaces for recreation, and a wellness centre.

The award-winning University Centre is a vibrant hub for exchange of ideas, informal meetings, and social events. The eco-friendly campus, characterised by a rich biodiversity, has implemented sustainability strategies to enhance resilience against extreme heat, reduce water runoff, and augment green spaces for the entire community.

# Student Housing

The Ahmedabad University student residencies offer high-quality, comfortable, and secure living accommodations. Committed to fostering a sense of community, the residencies celebrate diversity in ideas, lifestyles, and cultural practices, providing a true home-away-from-home experience.

Located within a one-kilometer radius of Ahmedabad University's Central Campus, the residencies offer air-conditioned accommodations on a sharing basis, subject to availability. Shared dining halls, gymnasiums, and recreational spaces are available for residents' convenience. The University also provides transportation to and from the campus. All residencies are under 24/7 security surveillance, with wardens, security guards, CCTV cameras, and on-call medical services ensuring residents' safety and wellbeing.

# Life at Ahmedabad

At Ahmedabad University, learning extends beyond the classroom. Vibrant student clubs, cultural events, and a robust support system create a strong community. On campus, students receive the support and resources they need to succeed.

Located in the heart of Ahmedabad, India's first UNESCO World Heritage City, the University offers a unique blend of academic excellence and cultural experiences. The city's vibrant mix of tradition and modernity provides an inspiring backdrop for holistic education and exploration. The city brims with opportunities for students who can participate in inter-college competitions, music and performance festivals and explore ancient monuments, vibrant markets, and more.

# Accreditations and Awards

- Recognised by University Grants Commission to award degrees under Section 22 of the UGC Act, 1956, in 2010.
- Recognised by the Government of Gujarat as a Centre of Excellence.
- Accredited with an 'A' grade by the National Assessment and Accreditation Council (NAAC).
- Awarded a 5-star rating, one of the highest awarded in the Gujarat State Institutional Rating Framework (GSIRF) for 2021-22 by the Knowledge Consortium of Gujarat (KCG), Department of Education, Government of Gujarat.
- Recognised by the UGC under Section 12(B) of the UGC Act, becoming one of the few private research universities to have been awarded this recognition for select research universities.
- Recognised as a Highly Commended University for Teaching and Learning Strategy of the Year in the Times Higher Education (THE) Awards Asia 2023.
- Awarded the Association to Advance Collegiate Schools of Business (AACSB) Innovations That Inspire Award 2023 for its Foundation Programme.
- Awarded Platinum Rating by the Indian Green Building Council for achieving the Green Building Standards at our University Centre.
- Awarded the Royal Institute of British Architects (RIBA) International Award for Excellence 2024 for our University Centre.

# Admissions

## Eligibility

A graduate with BE / BTech in Computer Science and Engineering / Computer Science / Information Technology / Electrical Engineering / Electronics and Communication / Instrumentation and Control / Electronics/Information and Communication Technology / or equivalent from a recognised university

The GATE score is optional. Students without a GATE score will have to undergo an on-campus written test

All students (with or without the GATE score) will have to appear in a personal interview

Graduates of other engineering branches will also be considered subject to prior preparation, evaluation, and personal interview

## Selection Process

Eligible candidates can submit an online application form with a payment of INR 1200 as application fees (non-refundable)

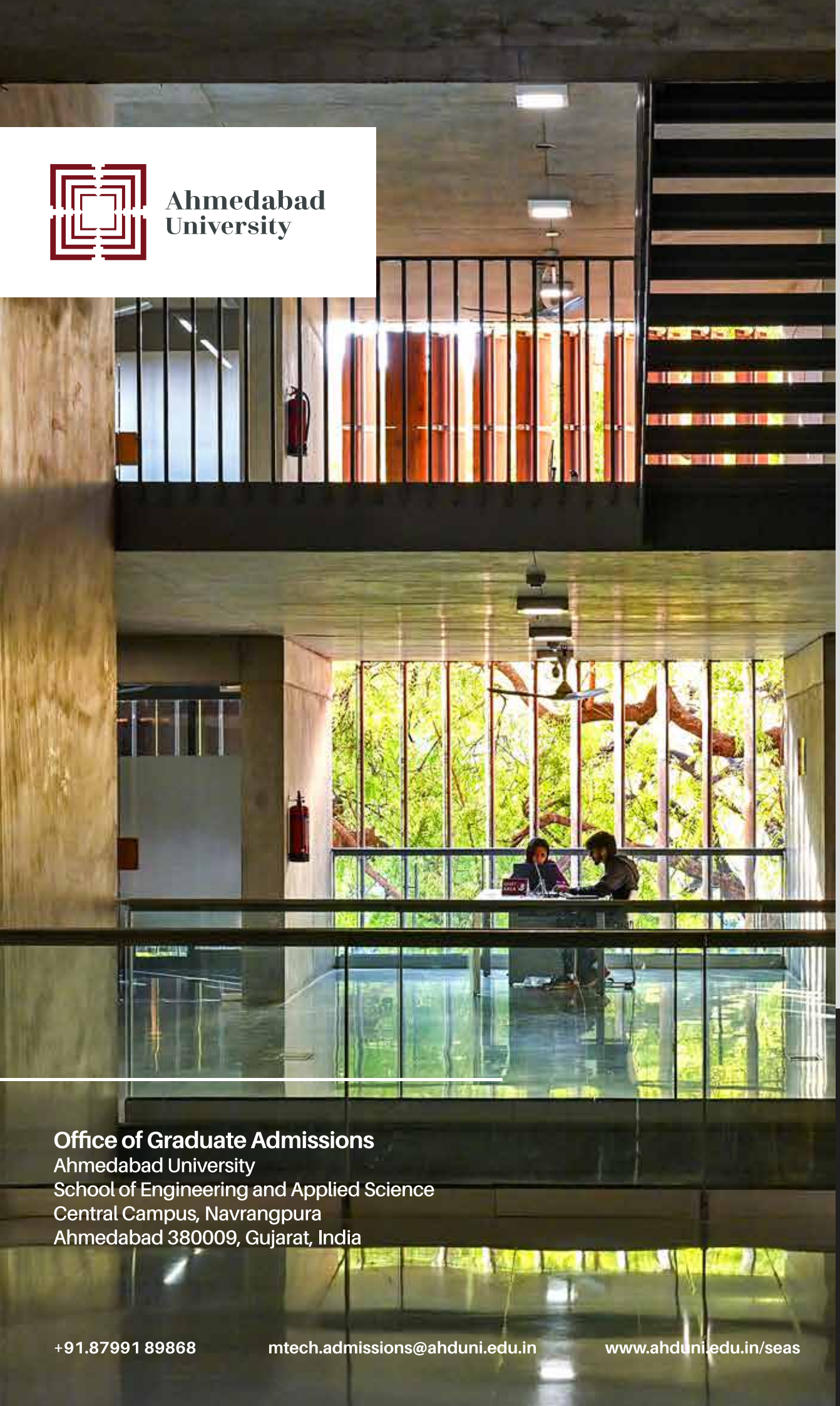
Candidates can submit their application without a score and update the entrance test scores later

Shortlisted candidates will be called for faculty interaction on campus or online

Based on a holistic assessment, offers will be made to deserving candidates

## Fee Structure and Financial Aid

Please scan the QR code to view the fees and the financial aid.



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