Innovations @ Indian Institute of Technology Hyderabad

IIT Hyderabad (IITH), established in 2008, is ranked among the top 10 Engineering institutions in India in National Institute Ranking Framework (NIRF), ever since NIRF rankings started (2016) (ranked 8th in 2023 and 2024). IITH is ranked 3rd in NIRF-Innovation Rankings, ever since this vertical has been introduced in 2023. IITH has been striving for excellence passionately with a motto of "*Inventing and Innovating in Technology for Humanity (IITH)*". IITH has unique relation with Japan, with JICA supporting the infrastructure development at IITH and strong collaboration with Japanese universities and industry through FRIENDSHIP program, in addition to other international collaborations. Some of the unique features of IITH and recent initiatives are captured below.

Some Important Statistics:
- 5300+ students (60% being PG+PhD students), 325+ faculty and 345+ staff.
- 11,500+ Scopus publications with 2,15,000+ citations, 4400+ projects worth Rs. 1400+ Cr (Rs. 250 Cr in 2023-24), 500+ patents (210+ patents in 2024 and a commitment to "Patent a Day: Mission 365" for 2025 to earn 365 patents by the end of 2025) and 260+ startups (1,100+ jobs and Rs. 1,500+ Cr revenue).

1. Academic Innovations:
1.1 Several Firsts:
- First institute in India to start Fractal Academics, giving a lot of flexibility to students and faculty.
- First IIT to start unique BTech programs such as (a) Eng. Sciences, (b) Artificial Intelligence (c) Biomedical Eng., (d) Biotech. & Bioinformatics, (e) Industrial Chemistry, (f) Computational Eng. and (g) IC Design & Technology.
- First IIT to start a multidisciplinary BTech program on Computational Engineering to create competent computational engineers for the manufacturing industry.
- First IIT to introduce another multidisciplinary BTech in Engineering Sciences, where students can pick up any courses of their choice to graduate.
- First IIT to introduce semester-long internship with 6 credits in BTech curriculum (6th semester, Jan-July) to get connected closely with industry.
- First IIT to set up a Department of Heritage Science and Technology (HST) that offers an MTech in HST.
- First IIT to start BTech in IC Design & Technology (2022). AICTE has adopted the curriculum of IITH for this program and started this program in about 180+ engineering colleges in 2023-2024. In addition, IITH also has several MTech programs such as Systems Packaging, Microelectronics & VLSI, E-Waste Management, Semiconductor Materials & Devices, Quantum & Solid-State Devices, to support India Semiconductor Mission.
- First IIT to introduce MTech in Techno-Entrepreneurship through its Entrepreneurship & Management department, wherein student develops a prototype and a business model to commercialize it by the end of 2-year program.
- First IIT to introduce Open to All Teaching (OAT) program to open its courses to the whole world through hybrid classrooms to become a Viswa Guru.
- First IIT to offer Diploma to a UG student after completing 50% of credits (without backlogs) to pursue their startup dreams with an option to come back within 5 years to complete the remaining 50% credits. A UG student who completes all credits within 3 years with 8.5+ CGPA can pass out with a degree without the need to stay all 4 years.

1.2 Unique Departments & Programs:
- A flexible BTech curriculum that has 10% basic sciences, 10% basic engineering, 60% professional major, 10% liberal/creative arts and 10% free electives and only 60% credits coming from the Major.
- Unique departments/schools such as AI, Climate Change, Design, Liberal Arts, Entrepreneurship & Management, Heritage Science & Technology, a School of Innovation & Entrepreneurship, and a School of Sustainability.
- IITH offers Minor and Double Major in all branches of UG.
- MTech programs with other organisations: E-waste management (with CMET), Smart mobility (with TiHAN), Additive manufacturing (with DRDO), Sustainable Engineering (with Greenko), Lightweighting Engineering (with industries support and support from Siegen University, Germany)
- Joint PG programs with Hospitals: MTech in Medical Device Innovation (with AIG, wherein the student does a 4-month immersion in a hospital and develops a medical device at the end of 2 years), MTech in Ophthalmic Engineering (with LVPEI) (to create laser technology experts for eye-care) and MSc in Medical physics (with Basavatharakam Cancer hospital, wherein the student spends 1 year in hospital to become radiation expert).
- Supporting Innovations by the students (call for proposals twice a year) through BUILD (Bold & Unique Ideas Leading to Development) projects with funding, mentorship and space in TIP, and providing a semester break with 6 credits to students to pursue such innovations.

2. Industry Connect:

- 1-credit "Industry Lectures" course as a mandatory course for MTech students and encouraging MTech students to do projects on industry defined problems for a full year.
- Semester-long internship for BTech/BDes students.
- IITH offers several industry-focused multidisciplinary MTech programs such as Additive Manufacturing, Energy, Smart Mobility, Climate Change, Sustainable Engineering, etc.
- Online MTech programs such as EV Technology, Computational Mechanics, Integrated Computational Materials Engineering (ICME), Industrial Metallurgy, HST, and MDes, for working professionals. The program gives flexibility with 4 years to complete it with an exit option of Executive MTech, after completing Coursework.
- Waived residential requirement for PhD for working professionals to strengthen collaborations.

3. Research Innovations:

- Thrust Areas: AI/ML, Future communications (5G, 6G & beyond), Autonomous navigation & smart mobility, Healthcare, Semiconductors & devices, Advanced Materials, Climate change & Sustainability, Additive manufacturing, Catalysis, Energy, Sensors, Computation engineering, and advanced materials characterization.
- India's first academic institute with an autonomous vehicle transporting people for the past 1.5 year (25,000 km and 30,000 passengers)
- India's first Testbed for autonomous vehicles – TiHAN.
- Leading in 5G/6G - developed India's first 5G NB-IOT Chip, which has gone for mass production. Demonstrated 5G ORAN technology in USA.
- 4 Incubators for startup support: ITiC for technology, Centre for Healthcare Entrepreneurship (CfHE) for medical innovations, FabCI for fabless chip design and TiHAN.
- About 30 Centres in various areas of research including, Additive Manufacturing (DRDO support), Medical Devices (ICMR support) and Transportation (NHAI support), IITH-DRDO DIA CoE and SATHI-CISCoM (DST support).
- India's first NVAITC (NVIDIA AI Technology Center). Centre for Research and Innovation in AI (क्रिया).
- Rural Development Centre (RDC) to support rural innovations.
- 850 Teraflop high-performance computing (HPC) facility.
- Technology Research Park (TRP, for industries to collaborate with IITH) and Technology Incubation Park (TIP, for startups) with 150,000 sft each.
- A Dean for Innovation, Translation & Startups and a Technology Transfer Office to support technology development with higher TRL levels.
- Effective utilization of 560+ research facilities through slot booking using a web portal.
- IITH-NIMS (Tsukuba, Japan) Research Centre. IITH-Swinburne Joint Research Centre (SIMMECT). IITH-Deakin Joint Research Centre (AMRITH), IITH-Purdue Joint Centre on Semiconductors & Chips.
- Joint Doctoral Program (JDP) with several universities: Swinburne Univ. of Technology, Deakin Univ., Australia, and National Tsing Hua Univ., Taiwan and Kathmandu Univ., Nepal.
- Fellowship for International Research Scholars in Technology (FIRST) to attract foreign students to do PhD at IITH with a higher fellowship in comparison to regular PhD students.

4. National Initiatives:

- Creating Database of Indian Researchers abroad by IITH for Vaibhav Summit conducted by MoE.
- G20 event on Digital Technologies including 5G/6G and Autonomous navigation held at IITH.
- Model G20 event organized by IITH for students of almost 65,000 colleges of India.
- Coordinating Glue Grant Scheme of MoE from Hyderabad to address grand challenges of India.
- Maintaining Research Scholars Database for all IITs.
- IITH is leading in training competent human resources in semiconductors field with support from Purdue & NTHU.
- Conducted an All IIT Dean (R&D) and an all IIT & NIT Dean (Acad) Summit.
- Supporting research eco-system in India by making 480 equipment of IITH available on I-STEM portal.
- Creating research culture among BTech students by enabling about 50 NIT BTech students to spend their final year BTech at IITH from 10 NITs (5 NITs from northeast) and about 20 from Kathmandu University.
- BUILD projects for student driven innovations for the whole nation with Greenko support.
- IITH Coordinating GIAN (Global Initiative for Academic Networking) program for the country.
- IITH Co-Chairing Indo-US initiative for Critical & Emerging Technologies (iCET) from India.
- IITH is Chairing the Empowered Committee for Industry & International Collaborations (ECIIC).
- IITH organized successfully IInvenTiv-2024, an R&D Fair showcasing about 120 technologies.