



FACULTY GUIDE

2024-25



Solar™
Decathlon
India



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INDIAN INSTITUTE FOR
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Alliance for an™
Energy Efficient
Economy



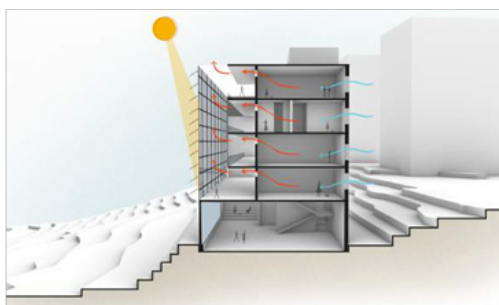
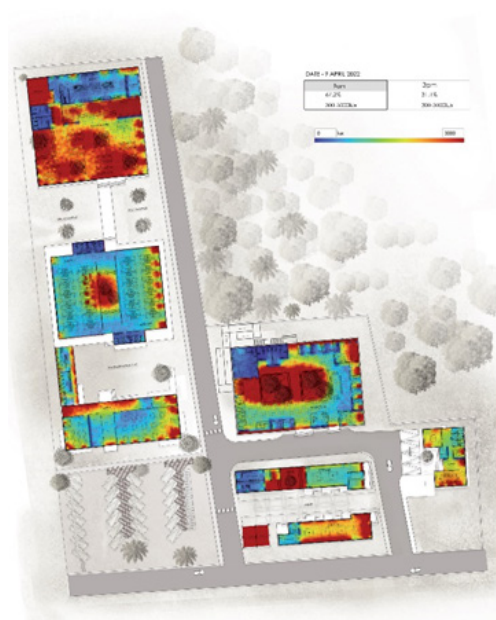
SOLAR DECATHLON INDIA

World's Largest Net-Zero Building Challenge

Solar Decathlon India invites multidisciplinary teams from Indian institutions to design net-zero-energy-water buildings. The teams compete and work on real building projects, by partnering with a developer or a client to propose affordable and market-ready solutions that we need for urgent Climate Action.

Extreme weather events due to Climate Change are becoming more frequent and regular. Since 40% of India of 2040 is not yet built, we have a huge opportunity to ensure that we influence this growth to be net-zero and carbon neutral. The tide is changing with government and corporates committing to carbon neutral targets. Clients and investors are asking for lower carbon footprints.

Solar Decathlon India is conducted by the Indian Institute for Human Settlements (IIHS) and the Alliance for an Energy Efficiency Economy (AEEE) under the aegis of the Indo-US Science and Technology Forum (IUSSTF). It is supported by the Department of Science and Technology.



INTRODUCTION



Solar Decathlon India is a 9-month long challenge for undergraduate and postgraduate students from India to combat Climate Change by innovating and designing net-zero energy and climate resilient building solutions. Student teams partner with the industry to develop resilient net-zero-energy-water solutions for real building projects. They learn, get hands-on experience, and see opportunities to have their ideas implemented in the real world. Students compete in one of six divisions to design customised solutions which need to excel in ten contests.

THE DIVISIONS




BUILDING DIVISIONS

There are five building divisions that present unique and critical building problems that India currently faces. The ten contests of the Building Divisions cover diverse areas that embody the expectations of high performance, market-ready, climate resilient, and net-zero building projects. Teams must address all ten contests in their proposed designs.

 Multi-Family Housing	 Education Building	 Construction Worker Housing
 Community Resilience Shelter	 Office Building	10 CONTESTS Energy Performance Water Performance Embodied Carbon Resilience Affordability Engineering and Operations Architectural Design Innovation Health and Wellbeing Value Proposition

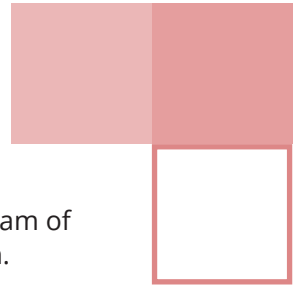
PRODUCT DIVISION

There is one product division where teams are required to develop a tested prototype for their product solution. The ten contests of the Product Division cover diverse areas that embody the expectations of a successful product. Teams must address all ten contests in their product solution.

 Residential Cooling Retrofit	10 CONTESTS Cooling Performance Co-benefits Target Market User Desirability Ease of Installation Technical Feasibility Financial Feasibility Novelty Go-to Market Strategy Value Proposition
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Every year the competition produces spectacular results for the participating students and for their partners. The solutions they introduce, advance design and technology innovations that will in turn transform buildings in the coming days. In the 2023-24 challenge, over 2200 students from 188 institutions in India formed 175 multidisciplinary teams.

SDI aligns with India's Nationally Determined Contributions under the Paris Accord. It tackles climate change impacts, offering affordable, forward-looking solutions while fostering innovation and creating career pathways in line with the National Education Policy 2020.



WHAT IS THE COMMITMENT FROM THE COLLEGE?

- The college only commits to enabling a faculty member to be a mentor for your team of participating students. Additional faculty members can act as advisors to the team.
- Colleges are encouraged to include this into their coursework to recognise the effort the students put in and the learning they get. While this is not mandatory, past experiences have shown that inclusion in coursework enables the faculty mentor focus to help the students on producing better solutions. The Council of Architecture recognises SDI and allows colleges to award academic credits to students for their SDI participation.

WHAT DOES THE COLLEGE GET?

- All students and faculty mentors get access to online self-learning modules on passive design, renewable energy, water sufficiency, HVAC design, resilient design, cost estimation, embodied carbon etc.
- They get access to best practices and industry expert mentors.
- All students and faculty mentors get access to DesignBuilder and other building performance simulation software.
- Faculty mentors can attend a faculty development programme in September.
- Solar Decathlon India gives your college a platform and support to enable your students to learn about sustainability with an interdisciplinary and comprehensive problem-solving experience.

WHAT DO THE STUDENTS GAIN?

HANDS ON EXPERIENCE	<ul style="list-style-type: none">• Participation in the challenge gives the students hands-on experience in developing innovative solutions for net-zero buildings.
BEST PRACTICES	<ul style="list-style-type: none">• They understand concepts and best practices for high-performance buildings.
WORKFORCE READY	<ul style="list-style-type: none">• They learn multidisciplinary teamwork and other soft skills that makes them workforce ready.
JOBS	<ul style="list-style-type: none">• Students in teams that qualify for the finals get access to our career fair.
INCUBATION	<ul style="list-style-type: none">• The students' work can result in research, publications, and patents.• For select teams, Solar Decathlon India offers incubation opportunities.

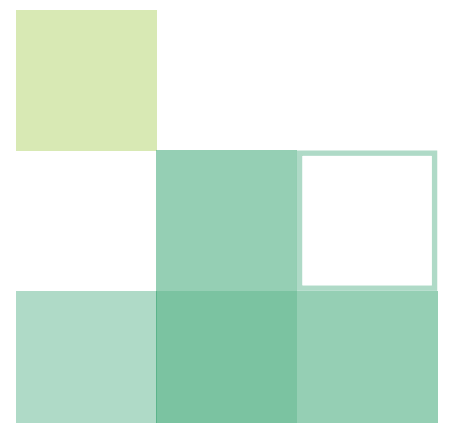


HOW DO YOU FORM A TEAM?

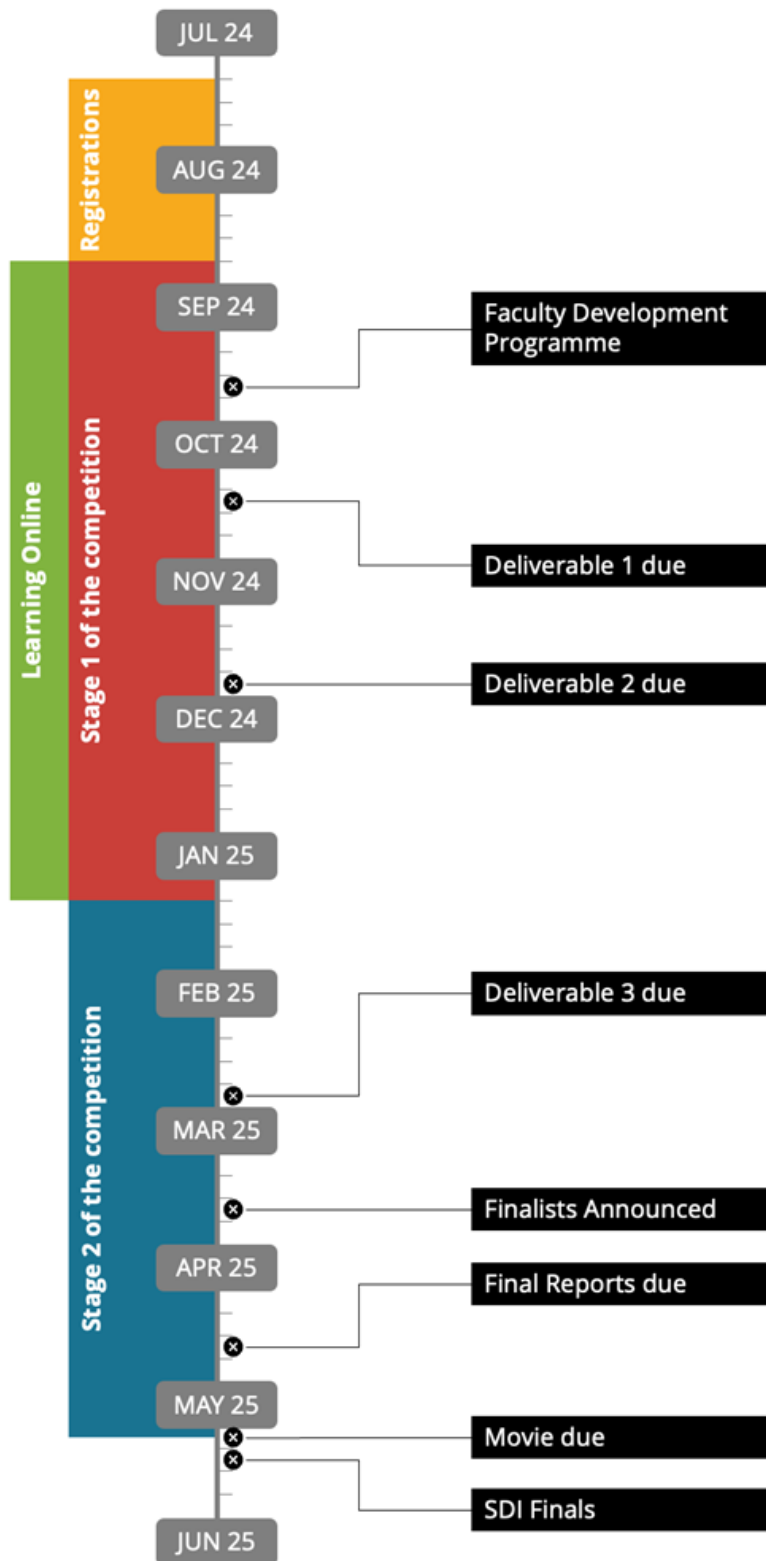
- Students from any college and discipline may form a team. A college can have more than one team. Students from more than one college are encouraged to collaborate and form a team.
- A team can be made up of a minimum of 5 and maximum of 15 members. Each team needs to be multidisciplinary, with teams participating in the Building Divisions having at least one student each with a background in architecture and engineering.
- Each team must have a faculty instructor to mentor the team.
- Teams from the building divisions must partner with a client or real estate developer (Project Partner), and teams from the product division must partner with product manufacturers and professionals in the building industry (Industry Partner).



Placeholder images



TIMELINE



EXPERIENCES FROM THE PAST

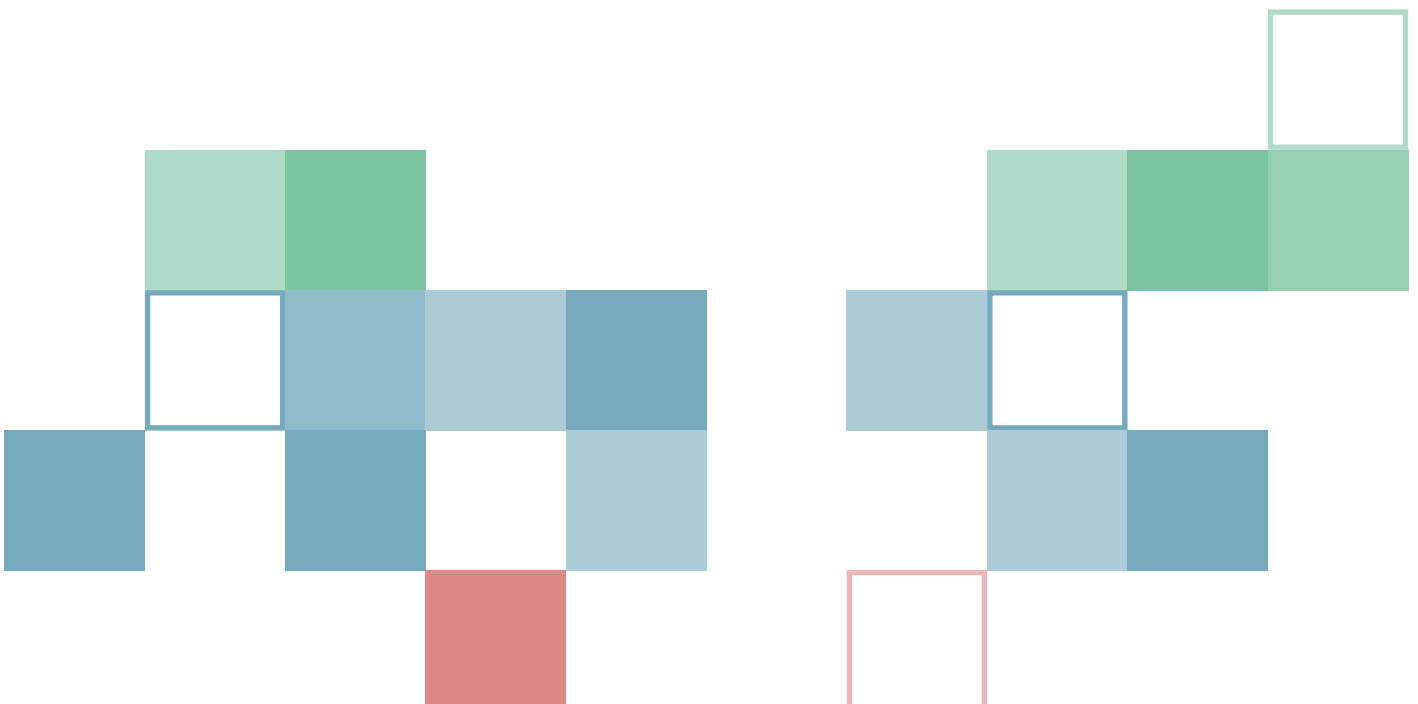
In 2022-23, Team V⁰ from VNIT Nagpur won the coveted Grand Prize for the most promising and investment-worthy net-zero design of a police station in Nagpur's Smart City initiative, which includes making government buildings accessible and open to the public, designing sustainable buildings, and utilizing smart technologies to promote good governance. They prioritised thermal comfort, with an innovative movable external bamboo skin to reduce cooling loads resulting indoor temperatures capped at 32 degrees Celsius, ensuring resilience during heat-waves. They envisioned a grid-interactive solution for a micro-grid community that shared energy, resulting in 27% cost saving.

In 2021-22, students from IIT-Ropar, MBS School of Planning & Architecture, NIT Srinagar, IUST Kashmir, and Sardar Patel College of Engineering formed a "rainbow" team called Tejasvi. In partnership with SEEDS India, they designed a Community Resilient Shelter for Golaghat (Assam) in a seismic and flood prone zone. Their building aspired to be net-zero-energy-water with novel features like algorithms to optimise solar tracking and battery management, earthquake resistance with bracing and local materials, exploring the use of zerund bricks.

In 2021-22, Team Nexa from Jamia Millia Islamia partnered with Larsen & Toubro and designed an on-site construction worker housing in Ardoi village, Rajkot. They developed a lightweight, modular structure that can be dismantled. The project encourages a circular economy by using straw panels for walls, which helps in minimising the pollution caused by the burning of crop waste of rice and wheat. Using passive measures for shading and powered by solar, their project is net positive.

In the 2021-22 Challenge, Team Builders from Jindal School of Art and Architecture, Shiv Nadar University and Jamia Milia Islamia designed a net-zero energy and a net-positive water solution for Hamara school by the Society for Human Welfare and Development. Their solution included passive design techniques like parametric kinetic facades to optimise shading, light, and ventilation in the building. Their Project Partner has approved their design and is currently planning implementation of the Team's solution.

In 2020-21, Team Scribble from SPA Bhopal and Reva University developed a net-zero office building design for the National Health Mission Headquarters in Bhopal. The project was earmarked as a sustainable building by the project partner, and Team Scribble designed a net-zero solution within the same budget. They also came up with department level energy budgets and tracking those with Intelligent Building System in the form of an app.



MESSAGES FROM PAST PARTICIPANTS AND PARTNERS



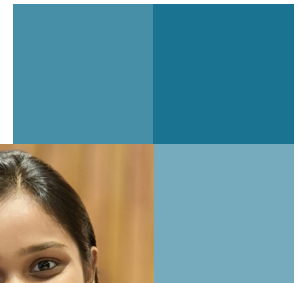
Solar Decathlon India supported our efforts with a series of informative webinars and self-learning modules, featuring animated videos that elucidated crucial concepts for designing sustainable buildings.

Additionally, we had the opportunity to collaborate with industry partners, enhancing our practical knowledge and expertise.

Pankaj Chaurasia
Team EcoORB – Winner, Best Movie
2023-24 Challenge

Participating in this competition has been an invaluable experience, allowing me to meet with outstanding individuals dedicated to building a sustainable and greener future.

Riddhi Badgujar
Team Navya – Runner Up, Residential Cooling Retrofit
2023-24 Challenge

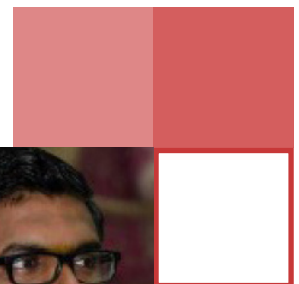


If your project (Team Arnima) is really so cheap, I'd be interested in buying your project because it is a prime and great example of something that can actually go get built.

L Venkatesh, Director, Integrated Digital Delivery, Invicara
Industry Expert, Jury
2021-22 Challenge

We had integrated the SDI requirements in college academics for only interested students. In the upcoming years we intend to make it mandatory for all the students of a particular class to register in various Divisions suitable to their semester requirements.

Prof. Anand Achari, Vivekanand Education Society's College of
Architecture
Faculty Mentor
2022-23 Challenge





If this project (Team V°) is implemented, I'm sure it is going to have a profound social impact, on the way people look at public buildings.

**Harleen Oberoi Head – Project Management, Tata Realty & Infrastructure Limited & Sr. VP, Tata Housing Development Company Ltd.
Project Partner and Real Estate Industry Jury
2023-24 Challenge**

Very impressive in terms of innovation which all the students are carrying and it is nice to see that students are already thinking in that direction. SO the future of India is in safe hands.

**Nilesh Sonawane - Business Development Leader, Owens Corning
Jury – Construction Worker Housing
2023-24 Challenge**



We had a Great Time in the Solar Decathlon India 2024 for the Climate Smart Innovation Exhibition & Award (CSI)! The event provided a wonderful opportunity to connect with numerous industry professionals and meet some of our valued customers, who have been using our air quality monitors. Hearing their positive feedback and satisfaction with our products was truly gratifying. We are honoured to have been selected as one of the top 25 climate innovators. The entire experience was enriching, and the event was exceptionally well-managed.

**Airveda
Climate Smart Innovation Exhibitor
2023-24 Challenge**

EXAMPLES OF HOW SDI HAS BEEN INTEGRATED INTO COURSEWORK

Here are a few examples of how some institutions have integrated the SDI challenge in their coursework.

EXAMPLE 1

This institution offers undergraduate and postgraduate programmes in architecture. The SDI Challenge was integrated in the Environmental Design Studio for the Master's programme in semesters 1 and 2. Since the Environmental Design Studios are expected to focus on building performance and environmental impacts of buildings, SDI aligned well with these studios. Engineering students from an institution in the same university were included to form the multidisciplinary team. The students initially developed concepts individually and the most promising design concepts were taken forward by the class as a team. At this stage the students took up specific roles within the team. The students presented the work to the faculty, and were graded based on their presentations. Faculty mentors asked industry experts to guide the students in areas such as HVAC and structural design.

EXAMPLE 2

This institution offers undergraduate and postgraduate programmes in architecture. The SDI Challenge was introduced as a Choice-Based Studio in 5th semester in the undergraduate architecture programme. In a Choice-Based Studio, students are presented with the problem they will work on, and they can elect to be part of this studio. Of a total strength of 160 students in the 3rd year, about 40 students elected to take the studio, forming multiple teams that participated in the SDI challenge. Engineering students from an institution in the same university were included to form multidisciplinary teams. During the 3rd semester, the students completed the Self Learning Modules, and completed Deliverables 1 and 2 as part of their studio. They learned simulations and came up with design proposals. The faculty used the Self Learning Modules as teaching materials to engage the students in discussions and supplemented the webinar and simulation training offered by SDI with their own training and expert lectures. In the 6th semester, the students work on their own to complete Deliverable 3 and 4 for SDI.

EXAMPLE 3

This institution offers undergraduate programmes in architecture, engineering, and design. The university syllabus has existing elective courses related to energy efficiency, climate responsive, and high-performance buildings. SDI is offered under such electives for the 5th, 6th, 7th, and 8th semester students. Students work in one or more teams. Students from other programmes within the university are added to the team to complete the multidisciplinary requirement for SDI. The SDI Deliverables are evaluated by the faculty for grading; there are no additional presentation or submission requirements. Students are asked to attend webinars and complete the Self Learning Modules. Faculty hold discussions with the students on the content of these learning resources, which also helps them assess if the students are attending the webinars and completing the Self Learning Modules.

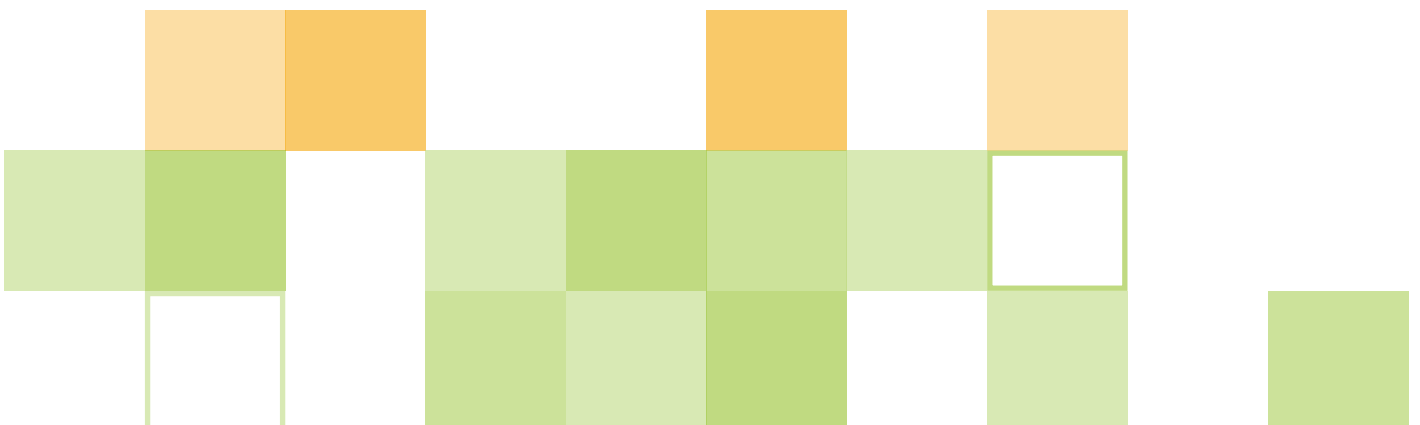


EXAMPLE 4

This institution offers undergraduate and postgraduate programmes in architecture, planning, energy engineering, urban design, and landscape. Each cohort of students has multiple divisions, and individual studio divisions have up to 40 students. In the 5th semester design studio in the architecture programme, the faculty from one or more studio divisions choose a design problem that aligns with one of the SDI Divisions. The students who are part of those studio divisions work on the problem, using the SDI contests as the evaluation criteria. Students in the postgraduate programs who have an engineering background are added to the teams to complete the multidisciplinary requirement for SDI. Students work on SDI deliverables and are graded for the deliverables as well as their presentations in class. The 6th semester is a services studio, where the students are expected to detail out their previous design for services. The faculty align this studio with the Deliverables 3 and 4 of SDI. Faculty members bring in additional mentors to help the students with simulations, HVAC design, renewable energy systems etc., and these often become the industry partners for the teams.

EXAMPLE 5

This institution offers undergraduate and postgraduate programmes in design, art, architecture, and urban design. The university has a subject called 'College Project' in the syllabus. All students in this institution are required to do one College Project in each semester. College Projects have to be approved by faculty. Typically, a College Project is research or design of a real building to gain practical experience. The students in this institution often work on design competitions as College Projects and the faculty encourage the students to look into SDI. The students talk to their seniors who have participated previously, get inspired to participate, and form one or more teams. They approach the faculty for approval of SDI as a College Project. The students then approach their friends from engineering colleges, who are then added to the team to complete the multidisciplinary requirement for SDI. Since SDI goes across 2 semesters, students work on it over 2 semesters as a College Project. Beyond SDI, the students present their work to faculty members who are not involved in SDI, and these faculty members grade them.



ORGANISERS*



The Indian Institute for Human Settlements (IIHS) is a national education, research, practice, and capacity development institution committed to the equitable sustainable and efficient transformation of Indian cities and settlements. A proposed Institution of Eminence (IOE), IIHS aims to transform the current nature of urban education as one of the most important drivers for India's national development and sustainable global futures. Its interdisciplinary approach to research and practice helps build new global knowledge and trains urban professionals. IIHS is jointly conducting Solar Decathlon India with AEEE.



Alliance for an Energy Efficient Economy (AEEE) supports policy implementation and enables the energy efficiency market with a not-for-profit motive. AEEE collaborates with diverse stakeholders such as policymakers, government officials, business and industry, consumers, researchers, and civil society organisations, thereby contributing toward meeting India's goals on energy security, clean energy, and climate change. AEEE is jointly conducting Solar Decathlon India with IIHS.



The Indo-U.S. Science and Technology Forum is a bilateral organisation that promotes Science, Technology, Engineering, and Innovation through substantive interaction among government, academia, and industry. It provides Solar decathlon India as a platform for innovation towards sustainable economic development, encouraging the use of renewable energy sources towards promoting the design of buildings that are energy efficient and self-reliant in energy use.

SUPPORTERS

Govt Support



Knowledge Partner[†]



Programme Support[#]



Affiliates[□]



* The roles and responsibilities of AEEE and IIHS are separate and distinct, with independent budgets, financial resources and execution.

† AEEE and COA have signed a Memorandum of Understanding for knowledge collaboration on net-zero buildings in India.

#The American Council for an Energy Efficiency Economy (ACEEE) has funded AEEE for activities relating to SDI.

□ ISHRAE (India) and IEEE SA (India) are acting as outreach partners to SDI. Solemma provides free software licenses to all student participants and faculty mentors for the SDI competition. There is no financial implication. The respective teams at their own risk and responsibility, may enter into relevant agreement(s) with Solemma for use of the Solemma software. Teams are however free to use any dynamic simulation modelling software of their choice. ClimateLaunchpad India to provide incubation to finalist team(s) of SDI.



For more information, visit
SolarDecathlonIndia.in

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