

*f*AIR CONDITIONING

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Introduces

THOUGHTFUL COOLING

A 'deep-dive' Training of Trainers (ToT) workshop to integrate building energy efficiency into architecture academic curricula

WORKSHOP AGENDA

Workshop Dates

16th to 19th February 2019

Venue

Vivekanand Education Society's College of Architecture, Sindhi Society, Chembur East, Mumbai, Maharashtra 400071.

1. Background

Of India's top 55 architecture colleges, less than 25% of the colleges offer courses that embed energy efficiency or sustainable design knowledge into the student's critical thinking and design skill set¹. Only 3 to 4 courses out of the 72 courses over the bachelor's degree course provide training on design, technology and construction of high performance sustainable buildings. As only 5% of India's architecture curricula is focused on learning concepts and strategies (including orientation of the building, using building materials that provide better insulation, appropriate shading devices and ratio of window to wall area that allows daylight to enter without exacerbating the load on the air conditioner, natural ventilation methods etc) to reduce the environmental impact of buildings, it is difficult for students to assess and imbibe these practices in their designs. Considering that there are over 423 registered architecture colleges in India, a total of 17,000 students graduate annually with deficient skills to design environmentally responsible buildings.

Furthermore, professors across architecture and engineering colleges are left to grapple with a dearth of high-quality teaching aids: physical scale-models and virtual (animations etc.). Even the professor's that have realized the lacunae that must be plugged if we are to transform the trajectory of energy consumption from India's relentless growing cities, are faced with unsurmountable administrative complacency from decision making executives in colleges and academic regulatory bodies. There are no punitive consequences, financial incentives, and peer-pressure amongst colleges to transform curricula.

Moreover, the Energy Conservation Building Code (ECBC) and the Bureau of Energy Efficiency (BEE) Commercial Building Energy Performance Benchmarking Programme have established the concept of '*Benchmark Energy Performance Index*' values (kWh/m²/year) for various building usages and climatic conditions. However, these concepts have not yet transformed the Indian building energy consumption scenario due to a lack of awareness, skilled-capacity and insufficient emphasis on increasing uptake of these codes. This dearth of skilled-capacity can only be addressed, most swiftly by augmenting the existing architecture and engineering (RAC course) curricula.

Today, architecture and engineering students are not well versed with concepts of building EE, owing to lack of comprehension towards fundamental concepts of building physics, psychrometry, comfort cooling techniques & technologies, adaptive thermal comfort, etc. This lack of understanding comes from a dearth of teaching aids, innovative learning methods, and content delivery mechanisms that can significantly boost learning and the application of these concepts. As there exists a lack of awareness and/or understanding, building EE uptake has been rather slow. Therefore, even if ECBC becomes mandatory, presently, there isn't enough workforce that will be able to adequately handle its implementation.

The only way to address the aforementioned concerns, is to build capacity within India's architecture and engineering colleges (those that teach Refrigeration & Air Conditioning – RAC design) to focus on horizontal and vertical integration, where relevant subjects are infused with sustainable design principles, abstracted subtly so that the changes go unnoticed, with the goal of thematically expanding the breadth of knowledge imparted from a current two-dimensional focus of 'space' and 'structure', to a three-dimensional realm wherein 'sustainability' is legitimized and centralized as an equal third-axis that shapes the building design process.

¹ Internal cBalance Study, 2016

2. Itinerary

Day 1: Timing: 9:30 am to 5:30 pm		
Number	Time	Title
1.1	9:30 am – 9:35 am	<p>Minute to Arrive</p> <p>We start the session with one minute of silence to help everyone be fully present to assimilate the learnings from the session.</p>
1.1	9:35 am – 10:00 am	<p>Warming Up</p> <p>Trainer: Vivek Gilani Session Jockey: Chingsubam Matouleibi</p> <p>Icebreaker Session</p>
1.2	10:00 am – 11:15am	<p>Nexus between Climate Justice, Built Space and Architecture Education</p> <p>Trainer: Vivek Gilani Session Jockey: Prachi Bhujbal</p> <p>In this session, participants are exposed to the relationship between prevailing problems with our Built Space and Climate change, by relating the environment and economy, through exploring themes of responsibility and justice, eventually providing targets and solutions. It further looks to identify the gaps in architecture education and curricula in the above context.</p>
1.3	11:15 am – 11:40 am	<p>Introduction to the Academic Program, Objectives & Expectations</p> <p>Trainer: Vivek Gilani Session Jockey: Chingsubam Matouleibi</p> <p>This session introduces the Fairconditioning Program, focusing on the Academic Curricula Integration Project. It further highlights the underpinning guiding principles of the program, along with underlying reasons for devising this specific intervention. The participants are further explained the overarching workshop objectives, structure, activities and expectations, and are given a basic understanding in order to embed efficiency and sustainability into the core curricula.</p>
1.3	11:40 am – 11:45 am	<p>Minute to Reflect</p> <p>We end a meeting with one minute of silence to help everyone be fully reflect what they learned during the session.</p>

Break 1	11:45am – 12:00pm	Recess for the mind
1.4	12:00 pm – 12:05 pm	Minute to Arrive
1.4	12:05 pm – 1:25 pm	<p>Building Heat Transfer</p> <p>Trainer: Vivek Gilani Session Jockey: Prachi Bhujbal</p> <p>In this session, participants are introduced to concepts of building heat transfer through an exploration of the relationship between buildings and heat, ideas of cooling load, primary processes that give rise to it and the influence of sensible and latent heat on building design. It further introduces participants to various teaching methods, exercises, activities, that will be useful in conveying all the aforementioned concepts in the classroom.</p>
1.4	1:25 pm – 1:30 pm	Minute to Reflect
Break 2	1:30 pm – 2:00 pm	Fuel Up (Lunch, Walk, Breathe)
1.5	2:00 pm – 2:05 pm	Minute to Arrive
1.5	2:05 pm – 2:45 pm	<p>Thermal Comfort</p> <p>Trainer: Vivek Gilani Session Jockey: Chingsubam Matouleibi</p> <p>This session focuses on establishing thermal comfort as the goal with respect to artificial cooling, along with adaptive comfort criteria and the energy and environmental conservation benefits of it. It further introduces participants to various teaching methods, exercises, activities, that will be useful in conveying all the aforementioned concepts in the classroom.</p>
1.6	2:45 pm – 4:15 pm	<p>Psychrometry & Climate Analysis</p> <p>Trainer: Vivek Gilani Session Jockey: Prachi Bhujbal</p> <p>In this session, the concept of psychrometry and climate analysis are introduced to the participants, explaining how the psychrometric chart for a specific climatic zone, helps in designing energy efficient buildings. It further introduces participants to various teaching methods, exercises, activities, that will be useful in conveying all the aforementioned concepts in the classroom. This session further includes an introduction to passive design strategies, and the prioritisation of cooling load reduction before exploring sustainable cooling technologies and renewable energy supply.</p>
1.6	4:10 pm – 4:15 pm	Minute to Reflect
Break 3	4:15 pm – 4:30 pm	Recess for the mind
1.7	4:30 pm – 4:35 pm	Minute to Arrive

1.7	4:35 pm – 5:30 pm	<p>Organization Change Management: Part 1(Mindfulness)</p> <p>Trainer 1: Dhruv Gupta, Trainer 2: Vivek Gilani Trainer 3: Chingsubam Matouleibi Trainer 4: Prachi Bhujbal</p> <p>In this session, participants come together to identify cognitive and behavioural biases, associated heuristics which impede organizational and operating process transformations required for entrenching curricula integration process. Furthermore, they will be designed to spur collective intelligence amongst stakeholders in the academic power structures (eg. amongst teachers of parallel subject streams such as humanities, technology and design, between these groups, and between professors and management) to foster consonance, counter parochialism, and mitigate potential future situations of discord amongst management and professors during the course of the pilot engagement.</p>
1.7	5:30 pm – 5:35 pm	Minute to Reflect
Day 2: 9:30 am to 5:30 pm		
2.1	9:30 am – 9:35 am	Minute to Arrive
2.1	9:30 am – 11:10 am	Organization Change Management: Part 2 (Empathy)
2.1	11:10 am – 11:15 am	Minute to Reflect
Break 1	11:15 am – 11:30 am	Recess for the mind
2.1	11:30 am – 11:35 am	Minute to Arrive
2.2	11:35 am – 12:30 pm	<p>Passive Design Strategies</p> <p>Trainer: Vivek Gilani Session Jockey: Chingsubam Matouleibi</p> <p>In this session, the different climatic zones requiring different means of cooling are delved in to, with the help of the psychrometric chart. This session includes an introduction to passive design strategies, and the prioritisation of cooling load reduction before exploring sustainable cooling technologies and renewable energy supply. It furtherintroduces participants to various teaching methods, exercises, activities, that will be useful in conveying all the aforementioned concepts in the classroom.</p>
2.3	12:30 am – 1:45 pm	<p>Solar Geometry</p> <p>Trainer: Vivek Gilani Session Jockey: Prachi Bhujbal</p>

		Participants are introduced to the concepts of solar geometry along with an understanding of how reading solar charts for a given location can help in identifying the passive design implications. It further introduces participants to various teaching methods, exercises, activities, that will be useful in conveying all the aforementioned concepts in the classroom. This session further involves an introduction to shadow masking and different shading devices and how they work to reduce the heating load of a building.
2.3	1: 45 pm – 1:50 pm	Minute to Reflect
Break 2	1:50 pm – 2:25 pm	Fuel Up (Lunch, Walk, Breathe)
2.4	2: 25 pm – 2:30 pm	Minute to Arrive
2.2	2:30 am – 3:30 pm	<p>Active Cooling Principles</p> <p>Trainer: Vivek Gilani Session Jockey: Chingsubam Matouleibi</p> <p>In this session, participants are introduced to the concept of active cooling along with details of how it can be applied across different building design. This session further includes an understanding of different heat transfer processes that comprise a conventional refrigeration cycles, primary pieces of equipment that perform functions in a conventional HVAC system along with concepts of HVAC efficiency. It also explores the environmental issues arising out of the use of conventional HVAC systems.</p>
2.3	3:30 pm – 4:15 pm	<p>Sustainable Cooling Technologies – Natural Refrigerants</p> <p>Trainer: Vivek Gilani Session Jockey: Prachi Bhujbal</p> <p>In this session, participants are made to understand the concept of natural refrigerants, through an overview of the existing refrigerants, along with the issues and environmental implications of using this technology. This session aims to make the participants recognize that these technologies are already commercially available and implementable technologies, along with the environmental benefits of using natural refrigerants, as they replace f-gasses.</p>
2.3	4:15 pm – 4:20 pm	Minute to Reflect
Break 2	4:20 pm – 4:35 pm	Recess for the Mind
2.4	4:35 pm – 4:40 pm	Minute to Arrive
2.4	4:40 pm – 5:30 pm	<p>Sustainable Cooling Technologies – Evaporative Cooling</p> <p>Trainer: Vivek Gilani Session Jockey: Chingsubam Matouleibi</p>

		In this session, participants are introduced to the idea of Evaporative Cooling and Indirect Evaporative Cooling, identifying the applications, benefits, constraints and differences between these two technologies. This session aims to make the participants recognize that these technologies are already commercially available and implementable technologies, and the environmental benefits as it avoids vapour compression.
2.6	5:30 pm – 5:35 pm	Minute to Reflect
Day 3: 9:30am to 5:30pm		
3.1	9:30 am – 9:35 am	Minute to Arrive
3.1	9:35 am – 10:00 am	Sustainable Cooling Technologies – Evaporative Cooling (contd.)
3.2	10:00 am – 11:30 am	Sustainable Cooling Technologies – Structure Cooling Trainer: Vivek Gilani Session Jockey: Chingsubam Matouleibi In this session, participants are introduced to the principles behind the working of structure cooling, further exploring the need for alternatives to HVAC and the differences between Radiant and Structure Cooling, along with the benefits, constraints and applications of using this technology. This session aims to make the participants recognize that these technologies are already commercially available and implementable technologies, along with the environmental benefits of using structure cooling, as it reduces vapour compression.
3.2	11:30 am – 11:35 am	Minute to Reflect
Break 1	11:35 am – 11:45 am	Recess for the mind
3.2	11:45 am – 11:50 am	Minute to Reflect
3.2	11:50 am – 1.15 pm	Sustainable Cooling Technologies – Radiant Cooling Trainer: Vivek Gilani Session Jockey: Prachi Bhujbal In this session, participants are introduced to the basic principles required in the working of radiant cooling, along with the different types, benefits, constraints and application of using this technology. This session aims to make the participants recognize that these technologies are already commercially available and implementable technologies, along with the environmental benefits of using radiant cooling, as it reduces vapor compression.
3.2	1:15 pm – 1:20 pm	Minute to Reflect
Break 2	1:20 pm – 1:45 pm	Fuel Up (Lunch, Walk, Breathe)
3.3	1:45 pm – 1:50 pm	Minute to Reflect

3.3	1:50 pm – 3:00 pm	Organization Change Management: Part 3 (Behavioral Change)
3.4	3:00 pm – 3:55 pm	<p>Rethinking Pedagogy</p> <p>Trainer: Vivek Gilani Session Jockey: Prachi Bhujbal</p> <p>In this session participants are introduced to the different frameworks and approaches to rethink and re-invent pedagogy to Integrate Sustainability in Architecture Curricula. This session further aims at dissecting current pedagogical lacunae in the teaching process practiced in lecture and studio courses and graduating to a higher understanding of the pedagogical craft required to embed sustainability into technical, humanities and design education. Understanding the process of identifying relevant educational objectives (Bloom’s taxonomy that spans the realm of remembering, understanding, applying, analysing, evaluating and creating) and integrating the spectrum of systems of learning (associative, indirect + interactive, experiential, co-operative, and project-based) into lesson plans and activities that encompass existing and augmented syllabus content. The trainer also aims to help the participants understand the different soft skills and presentation skills that they could develop, to get students invested in the idea of holistic design in alignment with principles of building physics. The session ensures to provide a deeper level of understanding and application of Kolb’s learning cycle, Bloom’s taxonomy of learning objectives, other imperative and often-ignored systems of learning, beyond that conventionally applied techniques of studio and lecture courses in architecture colleges. It also aims to stimulate ideas for the following group activity sessions, demonstrating that these ideas are already in practice in contexts similar to theirs and are not futuristic fantasies.</p>
3.5	3:55 pm – 4:00 pm	Minute to Reflect and Minute to Arrive
3.5	4:00 pm – 4.10 pm	<p>Introduction to Lesson Plan Integration</p> <p>Trainer: Vivek Gilani Session Jockey: Prachi Bhujbal</p> <p>This session focuses on setting the expectations for the Lesson Plan Co-creation session, explaining the need to redefine lesson plans, along with introducing the basic framework for this revision, developed by the Fairconditioning team.</p>
3.5	4:10 pm – 4:15 pm	Minute to Reflect

Break 3	4:15 pm – 4:30 pm	Recess for the mind
3.6	4:30 pm – 4:35 pm	Minute to Arrive
3.6	4.35 pm to 5.30 pm	<p>Lesson Plan Co creation session (Among Professors)</p> <p>Trainer 1: Vivek Gilani Trainer 2: Prachi Bhujbal</p> <p>Participants are expected to modify existing syllabus content for courses in the University mandated curricula, develop semester-long lesson plans for them, identify essential teaching methodologies, determine physical, virtual and/or classroom teaching aids and devise a sample project, test, and assignments for their course based on revised sustainability-integrated syllabus.</p>
3.6	5:30 pm – 5:35 pm	Minute to Reflect
Day 4: 9:30 am to 5:30pm		
4.1	9:30 am – 9:35 am	Minute to Arrive
4.1	9:35 am – 11:15 am	<p>Lesson Plan Co creation session (Among Professors)</p> <p>Trainer 1: Vivek Gilani Trainer 2: Prachi Bhujbal</p> <p>Participants are expected to modify existing syllabus content for courses in the University mandated curricula, develop semester-long lesson plans for them, identify essential teaching methodologies, determine physical, virtual and/or classroom teaching aids and devise a sample project, test, and assignments for their course based on revised sustainability-integrated syllabus.</p>
4.1	11: 15 am – 11:20 am	Minute to Reflect
Break 1	11:20 am – 11:30 am	Recess for the mind
4.2	11:30 am – 1:00 pm	Lesson Plan co creation session (Among Professors) – contd.
Break 2	1:00 pm – 1:30 pm	Fuel Up (Lunch, Walk, Breathe)
4.3	1:30 pm – 3:30 pm	Lesson Plan co creation session (Among Professors) – contd.
Break 3	3:30 pm – 3:45 pm	Time for attending Critical Tasks
4.3	3:45 pm – 3:50 pm	Minute to Arrive
4.3	3:50 pm – 5:00 pm	<p>Lesson Plan Presentations</p> <p>Trainer: Vivek Gilani Session Jockey: Chingsubam Matouleibi</p> <p>The session is comprised of presentations from the groups across Humanities, Design and Technical courses, with their results hoping to show how they could improve on their existing syllabus.</p>

4.3	5:00 pm – 5:05 pm	Minute to Reflect
4.4	5:05 pm – 5:35 pm	<p>What Next & Participant Feedback</p> <p>Trainer: Vivek Gilani Session Jockey: Chingsubam Matouleibi</p> <p>Participants are made aware of post-workshop follow up process and the support structure offered.</p>

3. Point of Contact

Chingsubam Matouleibi

Project Manager

Email: matouleibi@cbalance.in

Tel: +91-9637461176

Prachi Bhujbal

Project Assistant

Email: prachi@cbalance.in

Tel: 9767859363

4. Venue Details

Vivekanand Education Society's
College of Architecture,
Sindhi Society,
Chembur East,
Mumbai,
Maharashtra
Pin: 400071.