FAIRCONDITIONING TRAINING OF TRAINERS WORKSHOP REPORT

Bengaluru, 12th to 14th March 2016

Abstract

The Fairconditioning Program conducted a workshop titled ***'Thoughtful Cooling – A Training of Trainers workshop to incorporate sustainability in the architecture curricula'*** at REVA School of Architecture, REVA University from 12th to 14th March 2016 in Bengaluru. This report provides a basic understanding of proceedings carried out during the workshop, along with the feedback the Fairconditioning team received from the participants.

Table of Content:

Annexure

List of Tables:

1. Executive Summary

The Indo-Swiss *Fairconditioning* programme organised its '*Training of Trainers'* workshop on "*Thoughtful Cooling - A Training of Trainers workshop to incorporate sustainability in the architecture curricula*" for professors teaching architecture in March 2016. The workshop was conducted at REVA School of Architecture, Bengaluru during 12th – 14th March 2016, in accordance with specific Memorandums of understanding signed with all participating institutions.

Professors from three colleges attended the ToT workshop, and nine trainers conducted the workshop over a period of three days, emphasizing on the significance of sustainability in architecture, aiming to embed sustainability as the third pillar along with structure and space through an array of lectures and group activities. The topics discussed during this workshop varied from Sustainable Cooling Technologies, Teaching Aids, Modifying the existing Syllabus to provide a better fit for the students, and Recommending Practices in sustainable architecture pedagogy.

The trainings are part of the Fairconditioning programme, and are designed to significantly improve awareness, knowledge and know-how across tomorrow's architecture and building engineering graduates in the field of energy efficiency.

Similar training workshops will be organized and targeted towards architecture and engineering colleges/universities across the cities of Delhi, Mumbai, Chennai, Jaipur and Pune over the next two years.

The programme seeks to see energy efficiency being seamlessly integrated into the core curricula of architectural colleges and universities, so as to enrich the upcoming Indian workforce with graduates that will be able to handle the responsibility in India's quest for an energy efficient, sustainable building growth. It further aims to provide a linkage between the sustainable energy industry and students or academia.

Shreya Mundhra
Project Assistant, ACIP,
cBalance Solutions Hub
shreya@cbalance.in
+919637871713

2. Introduction

Devised by Noe21 (Geneva) and cBalance Solutions Hub (Pune), Fairconditioning aims to help countries in the tropical regions of the world address their cooling demand with the highest level of energy efficiency and lowest carbon emissions. June 2013 marked the beginning of this program, with the Pilot phase focusing on phasing out air conditioners using synthetic (fluorinated) refrigerants having very high global warming potential and phasing in energy efficient ACs that use natural refrigerants (propane), having low global warming potential.

Presently, Fairconditioning aims to inculcate a culture of energy efficiency in the cooling of interiors in India – involving academia, large corporations and practitioners in the building services area.

Fairconditioning deploys four Projects to promote these objectives, each targeted at intervention groups who influence the perception of energy efficient technology and consumption patterns of a wide range of Indian industries and consumers:

1. Academic Curricula Integration Project - ACIP
2. Technology Adoption Project - TAP
3. Building Energy Modelling and Advisory Project - BEMAP
4. Corporate Thermal Policies Project – CTPP (Up by 2°)

3. Project Overview

3.1. The Academic Curricula Integration Project (ACIP)

The Academic Curricula Integration Project has been designed to enhance action-oriented understanding of sustainable cooling technologies (for the engineering students) and efficient building design centred around ECBC and other relevant sustainable design building guidelines (for architecture professors) through workshops designed to facilitate a two-way process of learning as well as syllabus integration of these programmes. These future professionals armed with up-to-date knowledge will be capable of integrating cooling load reduction strategies and sustainable cooling systems and energy efficiency principles in their practice.

ACIP aims at an ambitious but realistic objective: In 5 years from now, leading architecture and building engineering curricula located in the 5 biggest urban areas of India will have integrated energy efficiency in the substance of their existing curricula.

After events such as the ones described below have been carried out, the ACIP team will carry a follow-up process with staff motivated to install elective courses on energy efficiency in 4th year curricula and to update the compulsory curricula for 2nd and 3rd year students (universities). Events are the visible part of this project designed to be followed with less visible but highly critical working relationships with staff motivated to bring and match best practices in the energy efficiency field with present student curricula.

Approached by the ACIP team, the heads of REVA University, BMS College of Architecture, RV College of Architecture, AAKAR College of Architecture and The Oxford School of Architecture appreciated the programme's goal and were eager to be associated with the project. Memorandums of Understanding were signed with these colleges leading to the workshop activities described below.

3.1.1. Structure of the Project

Academic Curricula Integration Project (ACIP) conducts workshops of two types: Training of Trainers (ToT) and Student Certificate Programmes. The goal of this program is to conduct these workshops across a minimum of 6 cities - Mumbai, Pune, Bengaluru, Delhi, Chennai and Jaipur – over the next two years.

This programme unfolds in two fields of study and teaching: Architecture and Engineering (including both civil and mechanical engineering). Currently the working professionals, professors and fresh graduates are unaware of the best practices in Sustainable Cooling technologies, building construction techniques or sustainable architecture. With the booming real estate and construction sector, India requires people with such skills to move towards a low energy footprint.

3.1.2. Strategy

Methods of designing and building energy efficient buildings in India are widely available, but the problem lies in the implementation of these techniques to actual practice. This primarily happens because this knowledge is far from being transmitted to the next generation of Indian architects and engineers. The Training of Trainers (ToT) workshop aims to bridge this gap, by implementing techniques of sustainable architecture in the core curricula of the colleges and universities. These events organized by Fairconditioning bring a selection of specialised practitioners to share their knowledge with college staff and with students. Specialists are either architects, consultants

specialised in assisting architects with energy related issues, engineers specialised in indoor cooling, etc. They are selected by the Steering Committee for their knowledge as well as their capacity to share their passion in a pedagogically effective manner. When one touches upon several fields of activity (see detailed programme of events in annexes), three-day sessions are insufficient to teach new technologies and skills. However, these three days are sufficient to sensitize staff on new skills and to motivate them towards an inner-academy process leading to new electives and renewed curricula content.

3.1.3. Steering Committee

During the initial phase with REVA University – REVA School of Architecture, a steering committee was constituted comprising of the professors from the specific colleges and Fairconditioning staff and select advisory board members. The Steering committee developed the specific curricula for the workshops, selected the experts on subjects to carry out the training, and defined the venue and calendar of events.

4. Workshop Proceedings

4.1. Workshop Plan

A renowned Architecture College (for its progressive teaching methods and vibrant faculty) is selected and then approached, to act as the project HUB College. Comprising of the project team, professors and department heads from the HUB College, a steering committee is created. This committee aids in the localization and customization of the training content in order to align it with the existing curricula that the colleges are affiliated with. Along with the HUB College, 4 other colleges are approached and a Memorandum of Understanding with each of them is signed, to affirm their intent to support the curricula upgrading by efforts of trained professors after the conclusion of the workshops. Each of the colleges attending this workshop needs to identify a blend of the most suited professors, ensuring that they cover the educational spectrum of design related (3 professors) and technical courses (3 professors) that will be attending the three-day Training of Trainer workshop.

4.1.1. Pre-Workshop Knowledge Dissemination

The following themes - Architectural Design, Climatology, Materials, Building Technologies, Building Science and Services and History & Theory of Design were identified in order to ensure that all the subjects were covered during the training. All the modules and sessions of the workshop were designed to encompass the aforementioned themes. Furthermore, trainers were provided with a brief, which included the guidelines, limitations and the basic agenda of the workshop to ensure that the delivery was relevant and effective.

A pre-requisite for attending the workshop is the successful completion of an online course (a MOOC) created by the Fairconditioning team. The MOOC is a 9-module online course that helps establish a thorough foundation in scientific and technical concepts that are related to Building Physics, Passive Design Strategies and Sustainable Cooling Technologies. It is considered to be a pre-requisite since the ToT workshop will be intensely focusing on imparting pedagogy related training through the technical and design concepts discussed in the MOOC.

4.1.2. Workshop Activities

The topics covered over the three days of the ToT workshop include a revision of the MOOC, followed by an introduction to Sustainable Cooling Technologies and the different ways in which they can be implemented into the syllabus of these colleges. The ToT project effort further encompasses devising and compiling of teaching aids (physical models, software tools, testing and evaluation aids) and conduct training sessions that empower, guide, and provide actionable-knowledge to teachers who can then seamlessly embed syllabus content related to efficient and sustainable cooling strategies (design and technology) across courses covering climatology, building materials, building technologies, structural design, history and theory of design, architectural design and building science and services. Group activities involving professors from different backgrounds (technical and design) were carried out, which further helped in the redefining of existing curricula to achieve a sustainability-integrated syllabus. Extensive feedback forms were also provided to all the participants, in order to get their opinion to help improve on the organisational and content aspects of the workshop.

4.1.3. Post-Workshop Follow-Up

Post-workshop follow-ups involve the establishment of city-level support groups comprising of resource persons who can be contacted by the professors for any problems they face in their efforts to integrate the augmented syllabi in college curricula. These groups will also involve the professors to be in touch with the Fairconditioning team for any guidance or assistance in the implementation of a sustainability-integrated syllabus. Furthermore, teachers will have regular access to the physical teaching aids post successful completion of the workshops. This is anticipated to take the shape of a laboratory situated in a specific college campus or be conceived as a library wherein colleges could borrow aids for a limited period of time during the academic year.

4.2. Workshop Stakeholders

4.2.1. Trainers

Table 1. Detailed list of the sessions conducted and the name and designation of the trainers.

Trainer	Sessions Conducted	Designation/ Organization
Dominic Mathew	Quiz Recap, Best Practices in Sustainable Architecture Curricula-Syllabus-Lesson Plans, Pedagogy, and Teaching Aids, Building a Sustainability-Integrated Curricula-Syllabus (Technical and Design), Teaching Aids for Sustainability-related Syllabi Topics – Part 1 – Classroom Teaching Aids	Delhi Project Manager - ACIP, cBalance Solutions
Nitin Pasricha	Converting Knowledge into Action, What Next & Participant Feedback	Project Manager – ACIP, cBalance Solutions
Debashree Pal	Rethinking Pedagogy	Architect, Visiting Faculty – RV College of Architecture
Sindhu Srikanth	Best Practices in Sustainable Architecture Curricula-Integration - Part 1 (Local)	Professor, BMS College of Architecture
Shreya Mundhra	Virtual Teaching Aids	Project Assistant – ACIP, cBalance
Pankaj Rathore	Radiant Cooling	Business Development Manager, Uponor
Surendra Shah	Structural Cooling	Founder, PanAsia
Suresh Vaidya Rajan	Physical Teaching Aids	Architect
Vivek Gilani	Introduction, Natural Refrigerants, MOOC Recap 1 and 2	Managing Director, cBalance Solutions
Vrajlal Kanetkar	Active Cooling Principles and Evaporative Cooling	Engineer, Professor

4.2.2. Trainees

Table 2. List of the participants and their respective colleges.

Name of Participant	College/Organisation
Sindhu Srikant	BMS College of Architecture
Satish Shivarudraiah	BMS College of Architecture
Mithila Kumar	BMS College of Architecture
Bhagyalaxmi M	BMS College of Architecture
Neeraja Jayan	REVA University
Jagdeeshra Chandra	REVA University
NS Nalini	REVA University
Sandhya BK	The Oxford School of Architecture
Usha Pattabhi	The Oxford School of Architecture
Betty Chacko	The Oxford School of Architecture
Shubhra Pande	The Oxford School of Architecture
Jaya Narula	The Oxford School of Architecture
Bindu Malhotra	AAKAR College of Architecture
Suresh Murthy	RV College of Architecture

4.2.3. Venue

REVA University, REVA School of Architecture

Rukmini Knowledge Park,
Kattigenahalli,Yelahanka,
Bengaluru - 560064

Contact Number: Ph: +91-80-65687563 , 64 , 65

4.3. Workshop Outline

Table 3. Detailed list and narrative of the sessions conducted during the workshop.

Day 1: Timing: 9.45am to 6.00pm		
Number	Time	Title
1.1	9:45 am – 10:00 am	**Warming Up** **Trainer: Vivek Gilani** **Session Jockey: Shreya Mundhra** The trainer facilitates collective understanding of agenda for the workshop, the contents of each module, the overarching objective of the workshop, and the final goal of the 3 day process.
1.2	10:00 am – 10:30 am	**Climate Justice, Built Space and an Introduction to the Fairconditioning (ACIP)** **Trainer: Vivek Gilani** **Session Jockey: Shreya Mundhra** The trainer introduces the Fairconditioning Program, focusing on the Academic Curricula Integration project. The trainer additionally elucidates the relationship between the existing problems with our Built Space and Climate change, further underpinning the guiding principles of the overarching program, and the underlying reasons for devising this specific intervention. The trainer will further highlight upon the realm of curricula integration as viewed by the Program's Executive Board and Board of Advisors.
1.3	10:30 am - 11:15 am	**Workshop Objectives and Participant Expectations** **Trainer: Vivek Gilani** **Session Jockey: Shreya Mundhra** The trainer presents the overarching workshop structure, content, activities and objectives. The trainer further highlights key takeaways - all in the context of embedding efficiency and sustainability into the curriculum cores: A. Best Practices in Pedagogy, B. Physical, Virtual and Classroom Teaching Aids C. Redefining syllabus (topics within a course) within the boundaries of university curricula, D. Developing lesson plans to effectively deliver redefined syllabus.

Break 1	*11.15 - 11.30 pm*	*Recess for the mind*
1.4	11.30 am - 12:30 pm	**MOOC Recap - Part 1** **Trainer: Vivek Gilani** **Session Jockey: Shreya Mundhra** This session involves a topic-by-topic coverage of key concepts, ensuring that the nuances are absorbed and understood and the common pitfalls and misconceptions related to each topic are highlighted. Topics to be covered in this session include - Heat Transfer in Buildings, Psychrometrics and Climate Analysis. The trainer addresses the following: 1. The relationship between buildings and heat, 2. The idea of cooling load and the primary processes that give rise to it, 3. The influence of sensible and latent heat on building design, and how the psychrometric chart for the building location helps aid this process, 4. Prioritisation of cooling load reduction and passive design strategies before exploring sustainable cooling technologies and renewable energy supply, 5. Teaching methods, exercises, activities that will be useful in conveying these concepts in the classroom and 6. Vital information with respect to technical concepts that architecture students need to understand in order to apply them in their design studios.
1.5	12:30 pm - 1:30 pm	**MOOC Recap - Part 2** **Trainer: Vivek Gilani** **Session Jockey: Shreya Mundhra** This session is the second part of the MOOC Recap, the trainer will cover the following topics - Thermal Comfort, Passive Building Design and Fundamentals of Solar Geometry. The trainer addresses the following key takeaways: 1. Establishing thermal comfort as the goal while recognizing artificial cooling as merely one of the means to achieve it, 2. Adaptive comfort criteria and its energy and environmental conservation benefits, 3. Prioritization of cooling load reduction and passive design strategies before exploring sustainable cooling technologies and renewable energy supply, 4. Reading solar charts for a given location and rapidly gauging passive design implications emerging from it, 5. Aids and tools for design passive features, 6. Teaching methods, exercises, activities that will be useful in conveying these concepts in the classroom and 7. Vital information with respect to technical concepts that architecture students need

		to understand in order to apply them in their design studios.
Break 2	*1:30 pm - 2:15 pm*	*Fuel Up (Lunch, Walk, Breathe)*
1.6	2:15 pm - 3:15 pm	**Sustainable Cooling Technologies – Structure Cooling** **Trainer: Surendra Shah** **Session Jockey: Vivek Gilani** In this session the trainer addresses Building Science and Services (BSS) professors to enable understanding of the courses related to fundamental science concepts underlying the technology, operation principles, environmental and cost benefits, safety and technical constraints. It further aims to ensure that the professors are able to convey the environmental, spatial and structural implications, to the students, for using this technology in comparison to conventional HVAC systems for their building design. The trainer addresses the following key takeaways: 1. That these are already commercially available and implementable technologies. They are sustainable technologies and not alternative. 2. That the technology will be mainstreamed in a few years and hence the familiarity/fluency with it will be a part of professional competence for architects, 3. That space, structure and environmental implications of technologies are understood from an architecture student's perspective to apply them in their design studios, 4. An environmental benefit of this technology as it reduces vapour compression, 5. Partial addressing of cooling load (does not dehumidify) can be overcome by blending with conventional HVAC systems to still derive energy efficiency and low f-gas benefits.

1.7	3:15 pm – 3:50 pm	**Sustainable Cooling Technologies – Natural Refrigerant Air Conditioning** **Trainer: Vivek Gilani** **Session Jockey: Shreya Mundhra** In this session the trainer addresses Building Science and Services (BSS) professors to enable understanding of the courses related to fundamental science concepts underlying the technology, operation principles, environmental and cost benefits, safety and technical constraints. The trainer further aims to ensure that professors are equipped with adequate knowledge to convey the environmental, spatial and structural implications, to the students, for using this technology in comparison to conventional HVAC systems for their building design. The trainer addresses the following key takeaways: 1. That the teachers are able to recognize, and further help their students to realize that these are already commercially available and implementable technologies. They are sustainable technologies and not alternative. 2. The Teachers are able to recognize that the technology will be mainstreamed in a few years and hence the familiarity/fluency with it will be a part of professional competence for architects, 3. That space, structure and environmental implications of technologies are understood from an architecture student's perspective to apply them in their design studios, 4. The environmental benefit of this technology as it replaces f-gasses, 5. Safety implications and application constraints.

1.8	3:50 pm – 4:30 pm	**Active Cooling Principles** **Trainer: Vrajalal Kanetkar** **Session Jockey: Vivek Gilani** In this session the trainer explains professors to enable understanding of the courses related to fundamental science concepts underlying the technology, operation principles, environmental and cost benefits, safety and technical constraints. The trainer further aims to ensure that professors are equipped with adequate knowledge to convey the environmental, spatial and structural implications, to the students, for using this technology in comparison to conventional HVAC systems for their building design. The trainer addresses the following key takeaways: 1. Heat transfer processes that comprise a conventional refrigeration cycle, 2. Primary pieces of equipment that perform functions in a conventional HVAC system, 3. Concepts of HVAC efficiency and key environmental issues arising out of the use of conventional HVAC: energy intensiveness, direct and indirect GHG emissions, Total Equivalent Warming Impact (TEWI) of f-gas refrigerants and 5. Space, structure and environmental implications of technologies.
Break 3	*4.30 pm - 4.45 pm*	*Recess for the mind*
1.9	4:45 pm – 5:25 pm	**Sustainable Cooling Technologies – Evaporative Cooling** **Trainer: Vrajalal Kanetkar**

		Session Jockey: Vivek Gilani In this session the trainer addresses Building Science and Services (BSS) professors to enable understanding of the courses related to fundamental science concepts underlying the technology, operation principles, environmental and cost benefits, safety and technical constraints. The trainer further aims to ensure that the professors are able to convey the environmental, spatial and structural implications, to the students, for using this technology in comparison to conventional HVAC systems for their building design. The trainer addresses the following key takeaways: 1. That these are already commercially available and implementable technologies. They are 'sustainable' and not alternative technologies, 2. That the technology will be mainstreamed in a few years and hence the familiarity/fluency with it will be a part of professional competence for architects, 3. Space, structure and environmental implications of technologies are understood from an architecture student's perspective to apply them in their design studios, 4. An environmental benefit of this technology as it avoids vapour compression 5. Climatic and other constraints of evaporative cooling, overcoming them by blending with conventional HVAC systems to still derive energy efficiency and low f-gas benefits.
1.10	5:25pm – 6:00 pm	**Sustainable Cooling Technologies – Radiant Cooling** **Trainer: Pankaj Rathore** **Session Jockey: Shreya Mundhra** In this session the trainer addresses Building Science and Services (BSS) professors to enable understanding of the courses related to fundamental science concepts underlying the technology, operation principles, environmental and cost benefits, safety and technical constraints. The trainer further aims to ensure that the professors are able to convey the environmental, spatial and structural implications, to the students, for using this technology in comparison to conventional HVAC systems for their building design. The trainer addresses the following key takeaways: 1. That these are already commercially available and implementable technologies. They are 'sustainable' and not alternative technologies, 2. That the technology will be mainstreamed in a few years and hence the familiarity/fluency with it will be a part of professional competence for architects, 3. Space, structure and environmental implications of technologies are understood from an architecture student's perspective to

		apply them in their design studios, 4. An environmental benefit of this technology as it avoids vapour compression 5. Climatic and other constraints of evaporative cooling, overcoming them by blending with conventional HVAC systems to still derive energy efficiency and low f-gas benefits.
Day 2: Timing: 9.45am to 6.00pm		
2.1	*9:45 am - 10:30 am*	*Day 1 Recap Quiz and Discussions* **Trainer: Vivek Gilani** **Session Jockey: Shreya Mundhra**
2.2	10.30 - 11:15 pm	**Best Practices in Sustainable Architecture Curricula-Integration – Part 1 (Local)** **Session Jockey: Dominic Mathew** In this session, the trainer from within the participating participants presents case studies & experiences, as successful examples of sustainability integration in Design Courses and Technical Courses. The session involves a brief understanding of efforts in enhancing the syllabus, developing lesson plans, using modern pedagogy techniques, and integrating use of physical, virtual and classroom teaching aids to integrate sustainability ubiquitously in the architecture curricula. The trainer aims to instil confidence in the participants, which further catalyses inventive thinking and assertive actions to translate and emulate relevant successes in their own context. The trainer further seeks to stimulate ideas for group activity session on Day 3, demonstrating that the presented ideas are already in practice in contexts similar to theirs and are not futuristic fantasies.
Break 1	*11.15 - 11.30 pm*	*Recess for the mind*
2.3	11.30 am – 12.30 pm	**Best Practices in Sustainable Architecture Curricula – Integration – Part 2 (Global and National)** **Trainer: Dominic Mathew** **Session Jockey: Shreya Mundhra** In this session, the trainer presents and discusses case studies & experiences from the colleges and universities in India and other countries as successful examples of sustainability integration in Design Courses and Technical

		Courses. This session revolves around understanding the different global and national efforts made in enhancing the syllabus, developing lesson plans, using modern pedagogy techniques, and integrating the use of physical, virtual and classroom teaching aids to integrate sustainability ubiquitously in the architecture curricula. The trainer aims to instil confidence amongst participants, which further catalyses inventive thinking and assertive actions to translate and emulate relevant successes in their own context. The session further aims to stimulate ideas for the group activity session on Day 3, demonstrating how these ideas are already in practice in contexts similar to theirs and are not futuristic fantasies.
2.4	12.30 pm – 1.00 pm	**Building a Sustainability-Integrated Syllabus – Design & Humanities Courses** **Trainer: Dominic Mathew** **Session Jockey: Shreya Mundhra** In this session, the trainer elaborates on options and recommendations for embedding the sustainability content into key course syllabi of Regional University curricula. The session includes illustrative examples of upgrades to syllabus content for design and humanities courses, including lesson plans for covering them through the 5 years. Key ideas explored by the trainer during this session are integration of lecture and studio-based courses (horizontal integration), integration of virtual, classroom and physical aids, and activating multiple learning techniques as opposed to largely instructional pedagogy. The trainer seeks to elucidate the different ideas for creatively leveraging the room for the interpretation of curricula content and syllabus topics to intimately integrate sustainability in unprecedented ways. The session also aims to stimulate ideas for the group activity session on Day 3, demonstrating that these ideas are already in practice in contexts similar to theirs and are not futuristic fantasies.
2.5	1.00 pm - 1.30 pm	**Building a Sustainability-Integrated Curricula-Syllabus – Technical Courses** **Trainer: Dominic Mathew** **Session Jockey: Shreya Mundhra** In this session, the trainer discusses the options and recommendations for embedding sustainability content into the key course syllabi of Regional University curricula. The

		trainer would present illustrative examples of upgrades to syllabus content for technical courses and lesson plans for covering them through the 5 years. Key ideas explored during this session are integration of lecture and studio-based courses (horizontal integration), integration of virtual, classroom and physical aids, and activating multiple learning techniques as opposed to largely instructional pedagogy. The trainer seeks to elucidate the different ideas for creatively leveraging the room for the interpretation of curricula content and syllabus topics to intimately integrate sustainability in unprecedented ways. The session also aims to stimulate ideas for the group activity session on Day 3, demonstrating that these ideas are already in practice in contexts similar to theirs and are not futuristic fantasies.
Break 2	*1:30 pm - 2:15 pm*	*Fuel Up (Lunch, Walk, Breathe)*
2.6	2:15 pm - 3.45 pm	**Rethinking Pedagogy** **Trainer: Debashree Pal** **Session Jockey: Dominic Mathew** In this session, the trainer describes the different frameworks and approaches to rethink and re-invent pedagogy to Integrate Sustainability in Architecture Curricula. The trainer 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 would also aim to help the participants understand the different soft skills and presentation skills that they could develop, in order 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 of the 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 group activity sessions on Day 3, demonstrating that these ideas are already in practice in contexts similar to

		theirs and are not futuristic fantasies.
2.7	3.45 pm – 4:15 pm	**Teaching Aids for Sustainability Pedagogy – Part 1 (Classroom Aids)** **Trainer: Dominic Mathew** **Session Jockey: Shreya Mundhra** This session is a compilation and demonstration of Classroom Teaching Aids across all teaching formats (lectures, projects, study trips and studios): research papers, tools for quiz taking (eg. clicker), assignments, exercises, quiz banks, exam formats, field trip suggestions, problem sets. The trainer seeks to stimulate ideas for group activity sessions on Day 3 wherein syllabus re-thinking and lesson plans devising activities for lecture and studio courses will require integration of teachings aids for facilitating educational objectives through a spectrum of systems of learning including interactive, experiential, and associative learning.
Break 3	*4.15 pm - 4.30 pm*	*Recess for the mind*
2.8	4.30 pm – 5.00 pm	**Teaching Aids for Sustainability Pedagogy – Part 2 (Virtual Aids)** **Trainer: Shreya Mundhra** **Session Jockey: Dominic Mathew** This session is a compilation of virtual teaching aids that consists of websites, MOOCs, freeware software's, tools from meta portals that include Building Energy Modelling Tools, Sun Angle Calculations, Weather Data, LCA Tools. The trainer aims at stimulating ideas for group activity sessions on Day 3 wherein syllabus re-thinking and lesson plans devising activities for lecture and studio courses will require integration of teachings aids for facilitating educational objectives through a spectrum of systems of learning including interactive, experiential, and associative learning.
Day 3: Timing: 9.45am to 6.00pm		
3.1	9.45 am – 10.45 am	**Teaching Aids for Sustainability Pedagogy – Part 3 (Physical Aids)** **Trainer: Suresh Vaidya Rajan**

		Session Jockey: Dominic Mathew For this session, the trainer would showcase pictorial and live demonstration of Physical Teaching Aids (scale models) suggested for use by teachers as part of lesson plans for passive design, building physics and sustainable cooling pedagogy - including concepts of heat transfer, climatology, psychrometry, solar geometry, thermal mass, shading devices, building envelop design, ventilation, conventional refrigeration cycle, and sustainable cooling technologies. The session further aims at a) developing DIY-kits to infuse sustainability into the design consciousness and process of students, b) cultivating an instinctive visual, tactile and non-numerical understanding of technical subjects, c) breed familiarity with, and make less daunting, the engineering aspects of energy efficiency and cooling technologies, befriending numbers, and blurring the boundaries with HVAC engineering. The trainer would also aim to stimulate ideas for the group activity sessions on Day 3, wherein syllabus re-thinking and lesson plans devising activities for lecture and studio courses will require integration of teaching aids for facilitating educational objectives through a spectrum of systems of learning including interactive, experiential and associative learning.
3.2	10:45 am - 12:00 pm	**Syllabus Renaissance - Part 1 (Lecture Courses)** **Mentor: Suresh Vaidya Rajan, Dominic Mathew** **Session Jockey: Shreya Mundhra** This session focuses on redefining syllabus topics and lesson plans for Technical, Design and Humanities Courses. In this session, participants modify existing syllabus content (topics covered) 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 quiz for their course based on revised sustainability-integrated syllabus.
3.3	12:00 pm - 1:30 pm	**Report Back and Discussion** **Mentor: Suresh Vaidya Rajan, Dominic Mathew** **Session Jockey: Shreya Mundhra** The session is comprised mainly of the presentations from the groups across Humanities, Design and Technical courses, with their results hoping to show how they could improve on

		their existing syllabus.
Break 2	*1:30 pm - 2:30 pm*	*Fuel Up (Lunch, Walk, Breathe)*
3.4	2:30 pm - 4:15 pm	**Syllabus Renaissance – Design Studio** **Mentor: Suresh Vaidya Rajan, Dominic Mathew** **Session Jockey: Shreya Mundhra** This session involves the participants to redefine a design brief and lesson plan from the previous three subject groups. As a core design studio renaissance, the groups are required to include teaching aids, learning systems and experiential learning, along with an assimilation of the previous Renaissance Part -1 session.
3.5	4:15 pm - 5:15 pm	**Report Back and Discussion** **Mentor: Suresh Vaidya Rajan, Dominic Mathew** **Session Jockey: Shreya Mundhra** Intercollegiate composite groups present outcomes and results of their discussions.
3.6	5:15 pm - 5:45 pm	**Converting knowledge into action** **Trainer: Dominic Mathew** **Session Jockey: Shreya Mundhra** Participants individually articulate any empowerment emerging from the training workshop, their persistent concerns, and primary needs that they wish to have fulfilled. Questions pertaining to what each professor considers to be his/her major sources of empowerment and source of uncertainty or concern in their endeavour to integrate the 3 major principles: building physics, building energy efficiency, and sustainable cooling principles, into their lesson plans for the coming year will be asked during this session.
3.7	5:45 pm - 6:15 pm	**What Next & Participant Feedback** **Trainer: Dominic Mathew** **Session Jockey: Shreya Mundhra** The trainer explains post-workshop follow-up, support structure and process.

4.4. Workshop Outcome

4.4.1. Overall learning's for project enhancement

Learning's from the workshop are stated as follows:

- Participants expressed that the MOOC was too technical, and suggested that it should be more graphical. They further highlighted how graphical content would assist them to understand these concepts.
- Participants communicated their enthusiasm towards Half-Day Workshops that would be conducted across all participating colleges. In order to extend the idea of thoughtful cooling and discussing the different methods of revising their syllabus to integrate sustainable architecture into their curricula.
- Participants further voiced that conducting this workshop for students would initiate a direct engagement with them, and would also expose them to the different available sustainable techniques.
- Schedule for the ToT workshop needs to be revised, allocating more time to Syllabus Renaissance sessions, Teaching Aids and Rethinking Pedagogy sessions and lesser time towards the revision of the MOOC.
- Participants also suggested the use of lesson plans from the Council of Architecture syllabus, instead of focusing on one syllabus for the entire duration of the Architecture program.

4.4.2. Module-wise learning's

Table 4. List of Module wise learning's

Module Title	Trainer	Comments
Workshop Objectives and Participant Expectations	Vivek Gilani	Audience Questions/Remarks: • Use of different species of trees - such as deciduous to cool the spaces around in a better manner could also be included as a topic in this workshop. • Is there a good compilation of Indian vernacular architecture?
MOOC Recap	Vivek Gilani	Audience Questions/Remarks: • Analogy to explain thermal mass concepts - time lag and decrement factor- you ride a bike, there is a big pebble on the road, of you don't have a shock absorber you will fly, but if you do you will stay put - this is the decrement factor since it damps the vibration • Are there any freeware software's that can be

		used for understanding the sun path chart diagram?
Active Cooling Principles	Vrajalal Kanetkar	Audience Questions/Remarks: • Larger the size of the AC, lesser the operation cost? Does this always apply? • Where is it currently in use?
Sustainable Cooling Technologies – Evaporative Cooling	Vrajalal Kanetkar	Audience Questions/Remarks: • What is the difference between mechanical ventilation and the air conditioning system • Bengaluru has good weather outside, how is it possible to use the air from outside to cool the inner spaces? • The psychrometric process can be made smarter, with respect to the climatic zone
Sustainable Cooling Technologies – Radiant Cooling	Pankaj Rathore	Audience Questions/Remarks: • Is there any particular floor thickness that needs to be provided?
Teaching Aids for Sustainability Pedagogy - Part 2 (Virtual Aids)	Shreya Mundhra	Audience Questions/Remarks: • Instead of providing a list of all the software's that can be used, the ones that would work the best could be selected and then explained during the presentations.
Syllabus Renaissance	Dominic Mathew, Suresh Vaidya Rajan	Audience Questions/Remarks: • A framed outcome or guidelines for what is expected of the participants in this session could be created and given to them, so that they understand the point of this session entirely.

The aforementioned questions and suggestions have been absorbed by the ACIP team and will seek to modify and re-structure the workshop accordingly.

4.4.3. Syllabus Renaissance

Participants were divided into three groups, representing technical, design and humanities subjects of the existing syllabus to modify the content in order to develop semester-long lesson plans, identify essential teaching methodologies, determine physical, virtual and/or classroom teaching aids and devise a sample project, test, and quiz for their course based on revised sustainability-integrated syllabus. The syllabus generated by Visvesvaraya Technological University, Bengaluru was followed for the sessions. This was made to be applicable only for

lecture courses. The Session was differentiated by two parts: Part 1 involved redefining the existing syllabus for technical and humanities courses, and Part 2 involved restructuring the design brief and lesson plan from the previous sessions three subject groups. Both parts had two groups, working towards integrating sustainability in their syllabus. Mentioned below is a brief summary of the session, highlighting the key takeaways based on the redesigning of the syllabus for the chosen subjects:

Syllabus Renaissance Part 1:

Theory of Architecture, Design Subject

This group reworked the outline for Theory of Architecture, for the second semester. The primary aim of this restructured syllabus was to direct the creative thinking minds of the students onto a streamlined conscious path. This focused on including the different passive and sustainable cooling techniques discussed during the workshops. Suggestions included focusing on introducing the essence of the subject in the first week, ensuring that the students understand what is expected of them. The lesson plan also includes exposing the students to the different available building technologies, especially with respect to the materials used. They also suggested that using proper material collection, models and visuals aids further enhance the understanding of each student.

History of Architecture - II, Humanities Subject

This group reworked the outline for History of Architecture – II. The structure of this reworked syllabus is divided into three broad sections. The first section includes the different suggestions identified by the group to improve the syllabus and integrate sustainability efficiently into the curricula. One of the suggestions includes moving the study of the specific Indian civilizations to the second semester, where they would understand and easily be able to identify the different passive design strategies and climate responsive design principles used in the Vedic Civilization. The second section focuses on explaining how there are a percentage of hours that is dedicated to integrating the sustainable aspects into each of the modules. The third section involves the use of Teaching Aids and tools to help their process of teaching. For example, outdoor learning involved the processes of associative and experiential learning, through the means of a field trip, to understand and highlight the sustainable techniques portrayed through the different styles of architecture, amongst the different types of civilizations they would be studying.

Building Construction & Materials (BCM), Technical Subject

This group reworked the BCM syllabus of I to VII semester, while incorporating the concept of sustainability into the construction modules. They proposed the grouping of Building Construction into its various components (sub-structure and super-structure) and materials under three categories – Conventional (where the students study the current practices and the related materials, Vernacular (which involves the study of the regional construction practices including local and related materials) and Alternative (which involves the study of the on-going alternative construction practices including local and the related alternative and recycled materials. They came up with a list of parameters that affect the sustainability aspect of a building, which would

further be the lens through which the students studied and analysed the different construction materials, and these parameters are: Physical Properties, Specific Applications, Life-Cycle, Environmental Impact and the Relevance for Passive Design. In addition to these suggestions, this group further provided a list of supporting teaching aids, including site visits, experiential ways of teaching and learning and horizontal and vertical integration with architectural design studios.

Syllabus Renaissance Part 2:

Architectural Design Studio 2nd and 4th Semester

Architectural design studio for the 2nd and 4th semester was selected by this group, to explain how the different subjects within Architecture - such as History of Architecture, Building Construction and Design, Theory of Architecture are all interrelated. This group emphasized on the importance of understanding each of these subjects in detail before focusing on reworking on one of them. They suggested different methods of focusing on the sustainability related concepts under each of these subjects, explaining them for each of these subjects in the context of architectural design. This would help the students understand the importance of each of these subjects while working on their final building design. For example, History of Architecture could be integrated within the curricula of Architectural Design Studio by asking the students to study any traditional architectural styles. They could use historical features in the present day context and then use passive technology of the olden days to adapt and mix the techniques, increasing their understanding of these topics.

Architectural Design Studio, 4th Semester

Architectural Design Studio for the 4th Semester, which represented the culmination of COA's Level 1 of Architectural Education, an equivalent to the 3rd semester Architectural Design Studio subject of the VTU syllabus was chosen by this group. They believed that it was necessary for the students to understand the basics of architectural design before delving into more advanced design and theory concepts. This revised structure compared the progress of the design studio against the understanding of student learning experiences (Kolb's Cycle of Learning) and expected outcomes (Bloom's Taxonomy). They then suggested the mapping theory subjects along with the studio process, and the integration of teaching aids in each phase of the studio process. This design was for over a period of 16 weeks, which had the following milestones Case Study > Literature Study > Intro to Project > Site Analysis > Concept > Design Development > Presentation. This restructured design also includes a self-study component, where each of the students presents a self-guided research report on some aspect related to the studio brief.

Architectural Design Studio, 5th Semester

The aim of teaching Architectural Design Studio in the 5th Semester is to understand how the symbolic and aesthetic thematic abstracts and the imagery, influence architecture. It also seeks to provide an understanding of the use of technologies developed in other fields as a precursor to architecture. The primary goal was identified to understand the need for creating architecture as

an envelope to system dependent programs. This group decided to select a 5 Star Hotel, to explore the studio framework over 16 weeks. They suggested the use of energy efficient building technology and passive design strategies, by incorporating it in the building design. Documenting existing design strategies, analysing case studies and literature studies would follow the course of the subject. It would also include site visits, modelling, and analysis focusing on zoning and concept development, by understanding the importance of the site. It would also focus on ensuring that the students understand the importance and relevance of structures and implementing the different sustainable cooling technologies into their designs.

4.5. Feedback Summary

4.5.1. Oral Feedback

Participants individually articulated any empowerment emerging from the training workshop, their persistent concerns, and primary needs that they wish to have fulfilled. A summary of these responses are stated below:

Aspects that made them feel empowered:

Participants suggested that the workshop was a good recap of all basic concepts they studied throughout college. They strongly believed that the different creative and interactive ways of teaching discussed during the three days would help them help their students understand technical concepts in a much simpler and far more effective manner. They additionally felt that the integration of sustainability into the syllabus, as a group activity for the syllabus renaissance sessions made them more aware and conscious about how they could exactly work on that, in their own respective courses and hence found it extremely helpful. The participants also brought up the varied backgrounds of trainers, and how different topics explored during the three days were an eye-opener and helped them de-learn and re-learn several concepts.

Participants concern while integrating sustainability into their syllabus:

The increasing class size (number of students) was identified to be a major concern, highlighting that most students come from different backgrounds, therefore, standardising the method of teaching is difficult. Additionally, they felt that this led to uncertainty towards incorporating sustainability into their core curricula and explaining these concepts to their students. The participants also brought up the lack of time being a major concern for them, and suggested certain ideas we could incorporate in our agenda for specific modules, to ease the process of knowledge dissemination. Some of the participants also pointed out that the MOOC was too technical for their understanding and the use of graphics or practical exercises would be a better of way of explaining these concepts.

Support required from the Fairconditioning team:

The participants highlighted that holding this workshop for the students directly would help immensely, as they would be getting a first-hand experience and exposure to all this material. If conducted directly, the students would also be working with the models, thus would get a better understanding of all the data that was provided to the participants during the workshop. They also expressed how networking with technical experts and industry members would help them allow the students to interact with them openly, further exposing them to a platform to discuss these sustainable cooling technologies. Furthermore, they suggested that the Fairconditioning team could document each institutions carbon footprint, to make individuals more aware about the consequences of their actions, increasing awareness. They also suggested improving the interaction with other colleges, while comparing the work being done in each to understand more about the level each college is at and what can be learned from them.

4.5.2. Written Feedback

Participants were also provided with a feedback form, whose responses have been calculated and stated below:

- All participants responded positively and believed that all the topics were explained well and they had very minimal problems with respect to the content and understanding of the basic concepts and ideas.
- Most of the participants also believed that the workshop met their expectations, and it was conducted better than expected, covering in detail the topics of sustainable cooling technologies.
- Participants responded positively, when asked about the relevance of each of the presentations for the modules. Minor changes in a few of the sessions were mentioned, which are noted and will modify and re-structure the workshop accordingly.
- With respect to the jargon used during the workshop, the participants responded positively, stating that there was an average amount of jargon used.
- Participants believed that the overall pace of delivery of all the trainers during the workshop was average, however they wished that more time was spent on certain concepts, which has been accounted for and will be modified for the future workshops.
- Participants expressed that different pedagogical, interactive and group activity based sessions were well spread out. However, it was identified that they wanted the MOOC Recap, Syllabus Renaissance and Teaching Methodology and Teachings Aids sessions to be more extensive.

Annexure

A. Photographs

Figure 1. Introductory Session, conducted by Vivek Gilani on Day 1.

Figure 2. MOOC Recap, conducted by Vivek Gilani on Day 1.

Figure 3. Structure Cooling sessions, conducted by Surendra Shah on Day 1.

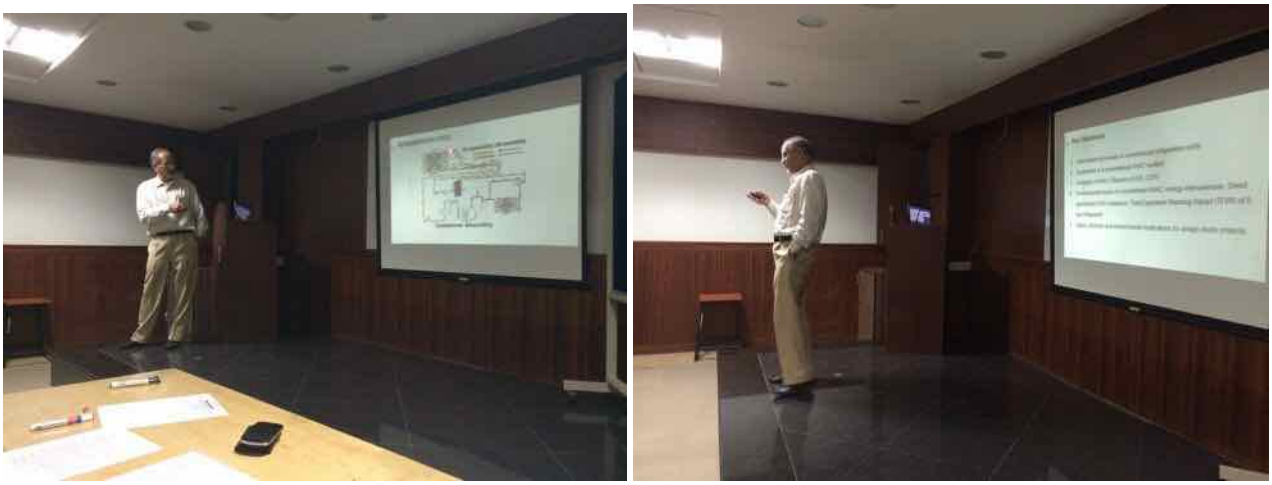


Figure 4. Active and Evaporative Cooling sessions, conducted by Vrajalal Kanetkar on Day 1.

Figure 5. Radiant Cooling sessions, conducted by Pankaj Rathore on Day 1.

Figure 6. Quiz Recap, conducted by Dominic Mathew on Day 2.

Figure 7. Best Practices Architecture Curricula-Integration - Part 1 (Local), conducted by BMS College on Day 2.

Figure 8. Best Practices in Sustainable Architecture Curricula-Integration - Part 2 (Global & National) and Building a Sustainability-Integrated Syllabus - Technical Courses sessions, conducted by Dominic Mathew on Day 2.

Figure 9. Physical Teaching Aids session, conducted by Suresh Vaidya Rajan on Day 3.

Figure 10. Syllabus Renaissance Sessions, condcuted on Day 3

B. Quiz

THOUGHTFUL COOLING

A Training of Trainers workshop to incorporate sustainability in the architecture curricula

---

Recap Quiz

Building physics fundamentals

1. Latent heat results in rise in temperature of the objects
    a. True
    b. False
2. Sensible heat results in increase in _____ of objects
3. What is the difference between R-value and U-value (*hint: this is a simple one line technical answer*)

4. All objects emit radiation irrespective of the temperature.
    a. True
    b. False
5. The “greenhouse effect” is of concern because
    a. It may block incoming solar radiation and lead to a cooling of the Earth
    b. It may block incoming solar radiation and make solar collectors ineffective
    c. It may cause such serious air pollution problems that our health is affected
    d. It may trap incoming solar radiation and lead to a warming of the Earth
6. Good radiant barriers are also thermally…
    a. Poor Absorbers
    b. Good Reflectors
    c. Both
    d. Neither
7. Enthalpy is the sum of _____ heat and _____heat.
    a. Sensible
    b. Radiant
    c. Conductive

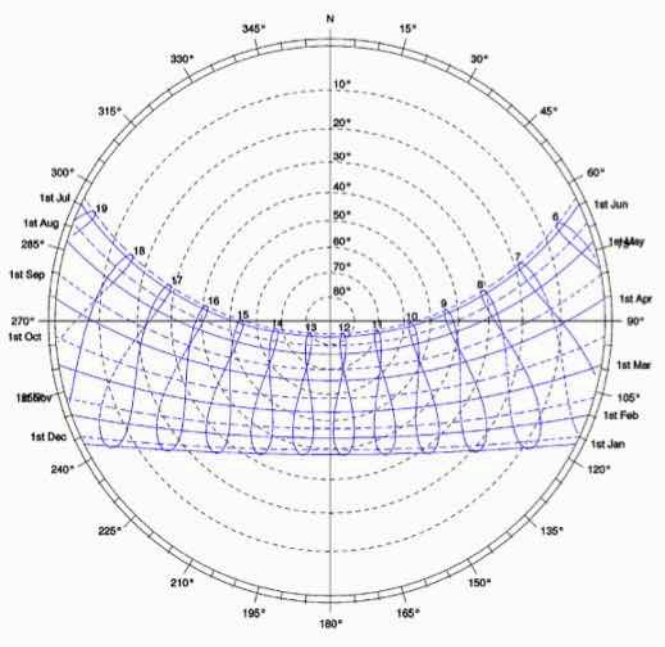
d. Latent

e. transient

8. At 100% saturation, an air has equal dry bulb temperature and…
    a. Wet bulb temperature
    b. Dew point temperature
    c. Both
    d. Neither
9. Which of the following statements is FALSE?
    a. Conduction heat transfer requires temperature difference
    b. Convection heat transfer requires the motion of a fluid
    c. Latent heat transfer always involves a change of phase
    d. Radiant heat transfer cannot occur across a vacuum
10. Dry bulb temperature is a measure of…
    a. total enthalpy
    b. sensible heat
    c. saturation
    d. latent heat

Solar Geometry

11. Label all parts of the sun path diagram given below.



12. What is the length of the shadow of a building that is 40ft tall located in Mumbai oriented due south on February 5th, 1:30pm. *(Use basic manual calculation. No need to refer to sun path diagram)*

    Azimuth = 205 ; Altitude = 52

13. Horizontal overhangs as shading devices are best suited for which direction?
    a) North
    b) South
    c) East
    d) West
14. A shadow mask:
    a) is another name for an eggcrate shading device
    b) describes the path of shading as it tracks across a building interior space
    c) graphically shows the extent of shading provided by a given shading device
    d) is an overlay to the thermal comfort zone chart that accounts for solar radiation

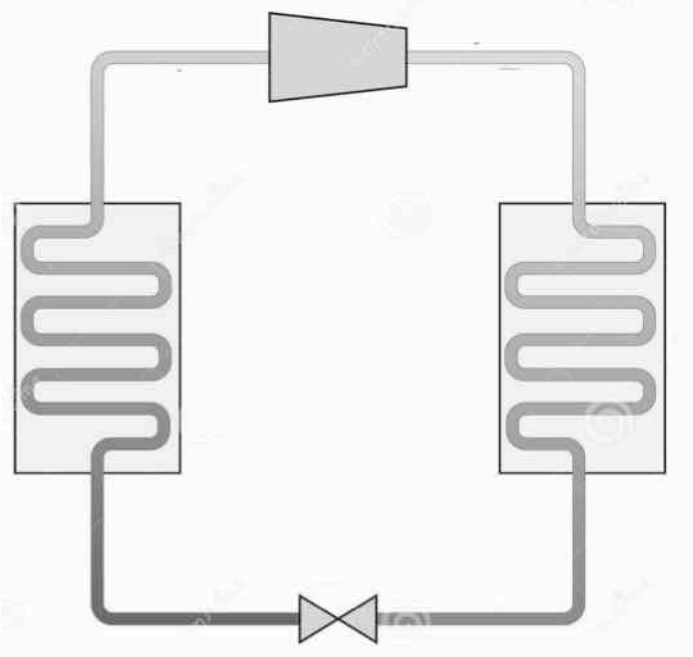
Passive design and climate

15. The way a building is designed will determine its thermal loads.
    a. Yes
    b. No
16. Arrange the following in the right order of the process to be followed for passive design buildings?
    a. Use renewable energy
    b. Use low energy passive technologies for heating/cooling
    c. Reduce thermal loads
    d. Use highly efficient active systems for heating/cooling
17. What constitute internal loads of a building?
18. What is the unit of measurement for ‘ENERGY’ and ‘THERMAL LOADS’? Is there any difference?

19. In hot humid climates the difference between dry bulb and wet bulb temperature is generally,
    a. Small
    b. large
    c. adiabatic
    d. variable
20. In general, hot dry climates are most likely to experience which one of the following?
    a. night sky re-radiation of absorbed solar heat
    b. wet winters
    c. minimal swings in daily temperature
    d. extremely diffuse sunshine
21. What is ECBC ? What is EPI ?

Sustainable cooling technologies

22. Label the parts of the following simple refrigeration cycle. Indentify the high and low temperature side. Identify the high pressure and low pressure side. Show the direction of heat flow.



23. Small residences and offices use (select all that apply)
    a. Window air conditioners
    b. Split air conditioners
    a. Central air conditioning
    b. All of the above

24. What psychrometric process is indicated by A,C,E, and G ?

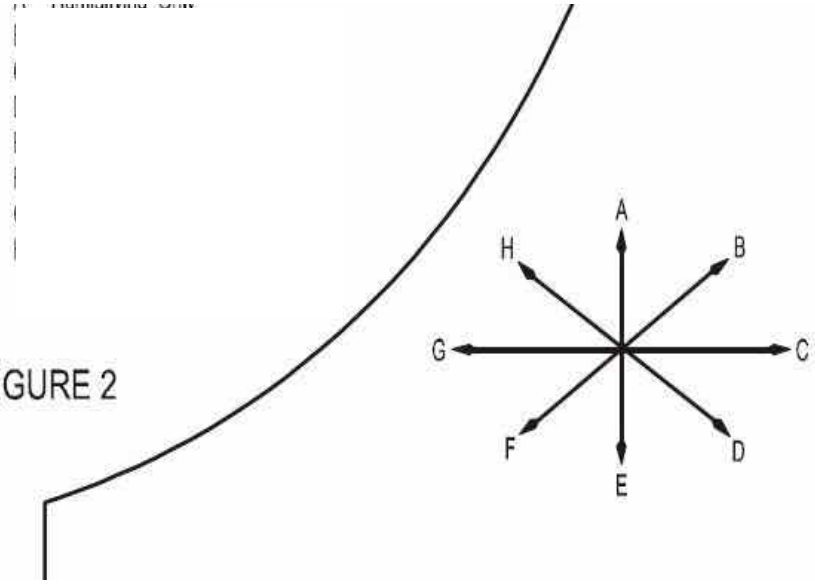


FIGURE 2

25. Which of the following is an environment friendly refrigerant? Why?
    a. Water
    b. Ammonia
    c. Propane

d. HCFC-22
e. HFC-134a

26. Evaporative cooling entails all of the following except…
    a. saturation
    b. lower dry bulb
    c. phase change
    d. sensible heating
27. What is the COP? Where is it used ?
    a. Common Operating Parameters
    b. Coefficient of Power
    c. Coefficient of Performance
    d. Coefficient of Plumbing
28. Radiant cooling system can be applied to _____ , _____ and _____
29. Two stage evaporative cooling system add more humidity to a space compared to a single stage system
    a. True
    b. False
30. Evaporative cooling system supplies 100% fresh air whereas radiant cooling system does not supply any fresh air.
    a. True
    b. False

Extras:

31. Radiation heat transfer can occur in vacuum
    b. True
    c. False
32. *Wall A* has R-value of 2.5 sqm.C/W and *Wall B* has a R-value of 4 sqm.C/W. Which wall would you recommend for improving energy efficiency? Why?
    a. Wall A
    b. Wall B
33. What is the range of values for the emissivity of a surface?
    a. -1 to 1
    b. 0 to 5

c. 1 to 10

d. 0 to 1

34. Which is the cooler side of a vapor compression system?

a. Evaporator

b. Condenser

c. Compressor

35. In absorption refrigeration systems, the compressor of vapor compression systems is replaced by:

a. Absorber

b. Generator

c. Pump

d. All of the above

36. What are the typical energy end uses of a building ?

a. Heating/cooling

b. Lighting

c. Equipment

37. Screw, scroll, reciprocating and centrifugal are types of .....

a. Refrigerator

b. Evaporator

c. Cooling tower

d. Chiller

e. Compressor

38. Radiant cooling system add humidity to a space

a. True

b. False

C. Feedback Form

Architecture Training of Trainer Workshop – 23 to 25 January 2016

Fairconditioning Feedback Form

Dear Professor, your feedback will help us to ensure that we continue to meet your training needs and improve our future workshops.

1. Full Name (Optional)

2. The objectives of each session were clearly communicated?

    a. Strongly Disagree
    b. Disagree
    c. Neither Disagree nor Agree
    d. Agree
    e. Strongly Agree

3. How well did the workshop meet your expectations? Was it…?
    a. A lot better than expected
    b. Better than expected
    c. About what I expected
    d. Worse than expected
    e. A lot worse than expected

4. Score the trainer and/or the presentation based on the following criteria (Read the scoring details carefully)

Topic	**Use of Jargon** ***(Scale of 1-10, where 10 is excessive and 1 is negligible)***	**Relevance of Presentation** ***(Scale of 1-10, where 10 is extremely fast and 1 is too slow)***	**Pace of Delivery** ***(Scale of 1-10, where 10 is extremely fast and 1 is too slow)***	**Concepts were explained clearly (Scale of 1 – 10, where 10 is Strongly Agree and 1 is Strongly Disagree)**	**Q & A Sessions were adequate (Scale of 1-10, where 10 is Strongly Agree and 1 is Strongly**	**Other**

					Disagree)	
1.2. Climate Justice, Built Space and an Introduction to Fairconditioning						
1.3. Workshop Objectives and Participant Expectations						
1.4 & 1.5. MOOC Recap						
1.6. Active Cooling Principles						
1.7. Sustainable Cooling Technologies – Natural Refrigerant Air Conditioning						
1.8. Sustainable Cooling Technologies – Structure Cooling						
1.9. Sustainable Cooling Technologies – Evaporative Cooling						
1.10. Sustainable Cooling Technologies – Radiant Cooling						
2.3. Best Practices in Sustainable Architecture Curricula Integration – Part 2 (Global and National)						
2.4. Building a Sustainability-Integrated						

Syllabus-Design and Humanities Courses						
2.5. Building a Sustainability-Integrated Curricula-Syllabus-Technical Courses						
2.6. Rethinking Pedagogy						
2.7. Teaching Aids for Sustainability Pedagogy – Part 1 (Classroom Aids)						
2.8. Teaching Aids for Sustainability Pedagogy – Part 2 (Virtual Aids)						
3.1. Teaching Aids for Sustainability Pedagogy – Part 3 (Physical Aids)						

5. Which topics/concepts would you have liked to spend more time on?

6. Did you find any presentation(s) outstanding?

7. Were the different pedagogical, interactive and group activity based sessions well spread out? If not, which sessions would you like to see more/less of?

8. What are your comments on the overall workshop duration, session(s) duration, structure…etc?

Thank you so much for taking the time to write your honest responses.

The Fairconditioning Team

Like and visit us at: http://www.faceboook.com/fairconditioning