



INTELLIGENT

SURFACES

ENERGY MODELLING & CREATING INTELLIGENT
BUILT ENVIRONMENT

SAT-SUNDAY //
SEPTEMBER 31-01

v5.05

COURSE DESCRIPTION \ \

Enhancement in computation and analyzing data in real time has evolved the way we design our built environment and create building facades. We have been following our intuition to predict the size or shape of any space, but the new technologies now allow us to solidify our prediction and provide better solution. The new digital techniques, combined with human sensibility and manual (analogue) techniques, are opening new grounds of design exploration that are directed towards seamless integration of form, material, and its shape. This integrated process entails a shift from traditional prediction-based model to the processes of a generative and performative nature. This has resulted, in evolving our Design process, reflecting a synthesis of form, material, and performance.

Intelligent Surfaces focuses on creating building surfaces based on the weather data collected and modelling as per the energy requirement. Participants will be working on exercises, using techniques presented in the workshop. Workshop exercises will use Energy Modelling in combination with Computational Fluid Dynamics, Optimization & Evolutionary Solvers and Vectorial Fields to design forms of different scale and complexity. The proposed workflow will combine the use of general Weather data, Solar access analysis, daylight simulations, radiance skies, comfort charts, wind simulation, on Rhino, Grasshopper and CFD with some plugins, such as Weaverbird, and Lunchbox. During the workshop, participants will also be introduced about how to make their design more interactive using sensors and actuators with the help of firefly plugin.

STRUCTURE \ \

Participants will learn to generate their form by creating energy model for a built form in Rhino. This form will be analysed using the evolutionary solvers and components of ladybug and honeybee to optimize design. We will also take a tour to understand wind using CFD on built forms. The workshop will also demonstrate use of laser cutting machine as a part of the exercise that deal with different design challenges, interrogating the aesthetic potential of built design. Each topic will be presented with both theoretical introduction and practical application. In the evening of Second day, participants will split into groups to develop their own projects, with direct supervision by the tutor, and towards their last day evening presentation.

DAY 1 SATURDAY (8 HOURS)

1. INTRODUCTION TO THE BASIC OF ENERGY MODELLING (WEATHER DATA, COMFORT CHARTS, SUN DIAGRAM, ETC.
2. INTRODUCTION TO LADYBUG TOOLS, HONEYBEE AND FIREFLY
3. VECTORIAL FIELD
4. LIST OF DATA MANIPULATION IN GRASSHOPPER
5. CALCULATE OUTDOOR THERMAL COMFORT, DRAW INTERACTIVE DIAGRAMS AND APPLY CONDITIONAL STATEMENTS, GENERATE CUSTOMIZED RESULT VISUALIZATIONS.

DAY 2 SUNDAY (8 HOURS)

1. PREPARING DAYLIGHT SIMULATION, GRID BASED AND VIEW BASED DAYLIGHT SIMULATION.
2. CREATE RADIANCE MATERIALS AND RADIANCE SKIES.
3. PREPARE AND INTERPRET GEOMETRY FOR ENERGY MODELLING.
4. INTRODUCTION TO SENSORS, ACTUATORS AND MICROCONTROLLERS TO MAKE DESIGN INTERACTIVE.
5. DESIGN PROJECT ASSIGNMENT WITH THE USE OF LADYBUG TOOLS AND AN OPTIMIZED ENERGY MODEL FOR BUILDINGS
6. INTRODUCTION TO LASER CUTTING/3D PRINTING
7. PROJECT DEVELOPMENT THROUGH ITERATIONS, REVIEWS AND CREATING CLIMATE RESPONSIVE BUILDING FACADE

TAKE AWAYS \ \

- Using CFD to create environmentally responsive buildings.
- Learning how to use wind and solar to your own advantage in designing.
- In order to experiment on your own Arduino kit an extra amount of **50 USD** for Arduino kit has to be paid. Your designed model along with you and some more goodies.

TOOLS \ \

All the participants should have following tools installed on their workstations:

1. **Rhinoceros SR12** or Higher (30-day Trial version can be downloaded from <https://www.rhino3d.com/download>)
2. **Grasshopper for Rhino** (<http://www.grasshopper3d.com/page/download-1>)
3. **Ladybug tools for grasshopper** (<http://www.food4rhino.com/app/ladybug-tools>)
4. **Weaverbird for grasshopper** (<http://www.giulio-piacentino.com/weaverbird/>)
5. **Lunchbox for grasshopper** (<http://www.food4rhino.com/app/lunchbox>)
6. **Firefly for Grasshopper** (<http://www.food4rhino.com/app/firefly>)
7. **Arduino IDE 1.6.0** (<https://www.arduino.cc/en/Main/OldSoftwareReleases>)
8. **AutoCAD**
9. **Autodesk CFD**
10. **Adobe Suite**

REGISTRATION \ \

A total of **20 seats** are available for the workshop per workshop coordinator. Registration will close 3 days prior to the workshop or till the seats last.

Please follow the link to complete the registration:

1 PASS permits 1 PARTICIPANT in 1 WORKSHOP

Refer to the **eduPass** Section to learn more about the [Professional/Student/Group/Multiple registration](#).

CALENDAR \ \

The workshop will be held on:

AUGUST 31 : 10:30 AM - 7:30 PM (SATURDAY)
SEPTEMBER 01 : 10:30 AM - 7:30 PM (SUNDAY)

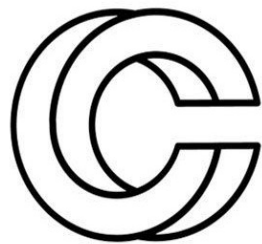
VENUE: Third Floor, 145/1, Shahpur Jat, New Delhi



REQUIREMENTS \ \

- Participants should bring their own computer with above mentioned software installed. More details will be sent to the registered participants.
- Intermediate knowledge of 3D modelling acquired on Rhino. (If you wish to gain expertise in Rhinoceros Join our workshop Algorithms and Parametric Fabrication in Design V 5.01)
- Intermediate knowledge of Grasshopper. (If you wish to gain expertise in grasshopper Join our workshop Programming Morphologies V 5.02)
- In order to experiment on your own Arduino kit an extra amount of **50 USD** for Arduino kit has to be paid.
- Link to the respective software for download will be sent to the registered participants separately.





CLASSROOM COMPETITIONS

Classroom competitions are a part of this series of workshops and is meant for all the designers who want to explore their way with hands on experience to gain skills and create real world projects. Under this series you participate in workshops at one of these Micro-studio and get awarded a trophy.

In association with **UNI**, we are now expanding our vision of creating these micro-studios globally with a fusion of online design community and offline classrooms.

This fusion will help us in combining different ideologies and diverse methodologies, to create a continuum which links ideas such as exploration, debate and collaboration at a global level to understand and create **'Architecture of Everything'**





EDUPASS

EDUpass is a pass which can be used to participate in any workshop in this series (registration to be done 3 days prior the commencement of the workshop). Multiple EDUpasses can be purchased and used in a group to attend a single workshop or a single participant can register for multiple workshops.

For example, If you had purchased 6 passes, you can register to 6 different workshops or bring along 5 other friends/colleague with you to attend a single workshop of your choice.



HOW DOES IT WORK?

A Participant can purchase as many passes as he/she wants and 1 PASS permits entry to any 1 workshop and classroom competition of his/her choice.



SPARRO

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