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CONTACT INFORMATION

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KEYWORDS

*Lighting & Daylighting, Sky-luminance Measurement & Modeling, HDR Imagery, Computer Vision, Occupant Visual Comfort, Whole Building Energy Simulation*


EDUCATION

**Ph.D.** *(Integrated MSc-PhD program)*
Energy Science and Engineering — **Supervisors:** Prof PC Ghosh & Prof R Banerjee
Indian Institute of Technology Bombay, Powai, Mumbai. India — *July 2012 – Dec 2018*
**Title:** ***Assessment of Sky Luminance for Indoor Daylight Modeling***

Understanding Daylight behavior is important while designing Energy-efficient Buildings. Daylight Distribution differs across sky-types: Overcast, Intermediate and Clear; but Building Simulation software often use generic models in predicting Indoor Daylight Distribution. Identifying ambient sky-type can help predict Building Performance with higher accuracy. The core contributions of this work are summarised as follows:

- A measurement based approach is proposed for dynamically identifying closest CIE model-sky.
- A low cost sky-scanner is developed at about 1/600 the cost of commercially available device, and its performance is validated. The sky-scanner is used for angular discretised sky-luminance measurement on continuous basis.
- Measured data collected over extended period is statistically analysed using Python, and closest sky-models are identified for various time-points.
- An algorithm is developed in Python for predicting indoor daylight distribution based on measured/modeled sky-luminance distribution. The utility of this device as singular sensor in centralised light control is being explored.

**M.Sc.** *(Integrated MSc-PhD program)* — **(CPI 8.19/10)**
Energy Science and Engineering — **Supervisor:** Prof PC Ghosh
Indian Institute of Technology Bombay, Powai, Mumbai. India — *July 2010 – June 2012*
**Title:** ***Design & Evaluation of Retrofit Devices for Daylight Enhancement in Buildings***

A low-cost retrofit design for light-transport was proposed, developed and studied towards harnessing natural light in built structures, with special focus towards commercial buildings with 9-5 work profile.

- Plastic optical fibres were used with two axis sun-tracking in the design of a light-transport system using concentrator. Sun-tracking apparatus was built using Arduino microcontroller.
- A computational interface was designed in Visual Basic — using measured data and research insights — to recommend optical fiber/concentrator area for adequate indoor daylighting.
- Alternate design based on 2-axis rotating light shelves at the window openings was used for comparison studies.
- Economic analysis was done towards large scale feasibility of this project.

**B.Sc.** — **(81.6%)**
Department of Physics
**Loyola College** (Autonomous), Chennai. India — July 2007 – May 2010

## Achievements connected to Sustainability & Design

### AWARDS

- Awarded second at **KPIT Shodh National Best PhD Thesis Awards**, KPIT - IISER Pune Energy and Mobility PhD conference *(Poster Category)*, Pune, March 2019.
- **Design analysis award** ('Highly Commended'), towards the student modelling competition at the biennial International Building Performance Simulation Association (**IBPSA**) conference: Building Simulation 2017 at San Francisco, USA (award received by Dr Ronita Bardhan).
- Awarded Second at NTPC's **2nd Global Energy Technical Summit 2015** at New Delhi, India (award received by Mr. Reeshab Goenka), Nov 2015.
- Finalist in **Holcim International Conference** on Sustainable Architecture 2013: Representing IIT Bombay in a competition between 8 reputed international universities organized by Holcim Foundation, Apr 2013.
- Awarded Second in **McDonnell Academy (MAGEEP)** Conference on Sustainability 2012: Competition between 28 international universities hosted by **WUStL** with IITB and TISS at Mumbai, Dec 2012.
- Winning team member (PR Head) at **GlobalTech** competition in sustainable architecture: **Tower of Babylon 2011** hosted by ETH Zurich, July 2011.

## Teaching Experience

### CEPT UNIVERSITY

- BE4001 **Lighting Daylighting and Integrated Design Lab:** Lead Instructor for a mandatory 14-credit 12h/wk (studio-typology) course, Monsoon 2019.
- BE4602 **Fundamentals for Energy Efficiency Thesis Work (FEET-Work):** Lead-Instructor for a mandatory 3-credit 3h/wk (seminar-typology) course, Monsoon 2019.
- BE4703 **Light Shadow and Architecture:** Lead-Instructor for a 2-credit elective 2h/wk (seminar-typology) course, Spring 2020.
- BE4601 **Renewable Energy Systems:** Co-Instructor for a mandatory 3-credit 25% @ 3h/wk (seminar-typology) course, Monsoon 2019.
- BE4002 **Passive Comfort Lab:** Module-Instructor for a mandatory 14-credit 20h/sem (studio-typology) course, Monsoon 2019.

### INDIAN INSTITUTE OF TECHNOLOGY BOMBAY

- EN624 **Energy Conservation in Buildings:** co-instructor *(with Prof Prakash C Ghosh)* in a 6-credit 3h/wk (seminar-typology) course to a mixed class of B.Tech, M.Tech, and MSc-PhD students, Autumn Semester 2017.
- US605 **Introduction to Building: Functional Design and Science** (Guest lecture on Connecting Solar Geometry to Building Design, invited by Prof Ronita Bardhan), March 2018.

## Publications, Patent and Conferences

### BUILDING DAYLIGHT TECHNOLOGIES

- Maskarenj M, Chawla G, Banerjee R, Ghosh PC, *Evaluation of dynamic sky-type using novel angular sky luminance measurement system*, Building and Environment (Impact 4.539) 2018; 146:152-165.
- Maskarenj M, Banerjee R, Ghosh PC, *Design and development of a low-cost angular sky luminance measurement system*, Building and Environment (Impact 4.539) 2018; 142:22-33.
- Maskarenj M, Avasare M, Ghosh PC, *Analysis of Plastic Optical Fiber based Daylight System Suitable for Building Applications*, Applied Mechanics and Materials, 2014; 492:101-105.
- Maskarenj M, Chawla G, Banerjee R, Ghosh PC, Indian **Patent** Application Number 201821007607 titled *"System for measuring sky luminance and a method thereof"* filed in Feb 2018.

- Thounaojam A, Vaidya P, Mundhe P, **Maskarenj M**, *Evaluation of a low-cost method of HDR photography for Daylight Assessment*, 53rd International Conference of the Architectural Science Association (ANZAScA), IIT Roorkee, India (Nov 2019).
- Manapragada NVSK, **Maskarenj M,** *Indoor daylight illuminance: a comparison between experimentally determined varying CIE sky-type and a predefined CIE sky model*, The International Conference on Future Cities-2019, IIT Roorkee, India (Dec 2019).
- Maskarenj M, Banerjee R, Ghosh PC, *A low cost sky-scanning device as centralized sensor for real-time light control in building management application.* OSA Light, Energy and the Environment Congress, Singapore (Nov 2018)
- Maskarenj M, Banerjee R, Ghosh PC, *Incorporating Daylight in buildings: a prediction approach using low-cost sky-luminance measurement device.* International Conference on Computational Intelligence and Internet of Things 2018, NIT Agartala, India (Dec 2018).
- Maskarenj M, *Design and Simulation of a Laboratory Building*, **Building Simulation 2017**, San Francisco, USA (Aug 2017).

**BUILDING SEWAGE MANAGEMENT: WASTE TO ENERGY**

- Kumar SS, Kumar V, Malyan S, Sharma J, Mathimani T, **Maskarenj M**, Ghosh PC, Pugazhendi A, *Microbial fuel cells (MFCs) for bioelectrochemical treatment of different wastewater streams*, Fuel (Impact 5.128) 2019; 254:115526.
- Maskarenj M, Chavali R, Mathur A, Ghosh PC, Mitra SK, *Mitigation of Biofouling Through In-Plane Application of Weak DC Current in Presence of Antimicrobials*, ASME 2015 13th International Conference on Nanochannels, Microchannels, and Minichannels, San Francisco, USA (2015).
- Maskarenj M, Goenka R,Ghosh PC, *Effect of Cathodic Platinum Loading on System Performance in a Microbial Desalination Cell system*, Proceedings of the 2nd NTPC GETS Summit, New Delhi, India (2015).

## Thesis Guidance

- **Mr. Kaushik Jayaveeran**, M.Tech (BEP) student, 2018-20, '*Evaluation of robustness of existing Glare metrics for Indian context*', Role: Thesis Guide.
- **Ms. Mayuri Agrawal**, M.Tech (BEP) Student, 2018-20, '*Enhancing daylighting for a Coaching Institute of 5 floors located in Solapur by giving retrofit solutions*', Role: Thesis Guide.
- **Mr. Sreejith Jayaram**, M.Tech (BEP) Student, 2018-20, '*A Control Algorithm for shading devices through HDR luminance capture for daylight utilization and glare protection*', Role: Thesis Guide.
- **Mr. Thoudam Siddarth**, M.Tech (BEP) Student, 2018-20, '*Parametric adaptive facade design for users' visual comfort*', Role: Thesis Guide.
- **Ms. Suyashi Srivastava**, M.Tech (BEP) Student, 2018-20, '*Tree Shading Factor as an input for Thermal models through Hemispherical photography*', Role: Thesis Co-Guide *(jointly with Prof Swati Puchalapalli).*

## Other Achievements

**ORGANISATIONAL INITIATIVES: ACADEMIC**

- Helped **Team Shunya** (IIT Bombay's Net-Zero building, and an entry to Solar Decathlon Competition) in *early stage net-building energy simulation*, May 2017.
- Student Overall Coordinator, **International Conference on Advances on Energy Research** 2013 at Dept of Energy Sc. & Engg. IIT Bombay, convened under Prof Prakash C Ghosh, Dec 2013.
- Student team leader, Organising committee, **Global Tech Conference** at IIT Bombay, Dec 2012.

**ORGANISATIONAL INITIATIVES: NON-ACADEMIC**

- Organised and lead the team for making an introductory video to MSc-PhD program in Energy Science and IIT Bombay — part of the Department's outreach and endorsement, May 2016.
- Built web-interface for **StartupDesire**, a former entrepreneurial venture, using **Drupal CMS** (Drupal 7) , Apr-Nov 2016.
- Made informational videos on behalf of organising teams at **Techfest** and **Avenues** events at IIT Bombay, 2013.
- Helped organizers at **AIEEE** the annual event of Center for Environmental Engineering; and **Energy Day** the annual event of Dept of Energy Science and Engineering, 2012.

**FILM MAKING**

- Winner of 48 hour movie making competition at film premier league, 2013. Winner of PG Cult short movie making competition, 2013.
- Finalist in Malhar video making competition at Malhar, St Xavier's College, 2012.
- Awarded second in Incept Video-making challenge: E-Cell competition at IIT Bombay, 2012.

**SPORTS**

- Winners at Basketball General Championship at IIT Bombay 2011 and 2013.
- Managed a team in Institute Basketball league (Playoff 2013) at IIT Bombay.

**ORATORICAL**

- Winning Speaker in Debate at Women's Christian College (2010), Alpha College (2010), and Ethiraj College (2009). Awarded second place in open house discussion at IIT Madras (2010), and in paper presentation at Madras Christian College (2010).

**MISCELLANEOUS**

- Winner in physics quiz at IIT Madras (2010), Alpha College (2010), Women's Christian College (2010), Institute of Mathematical Science (2009), Madras Christian College (2009), Ethiraj College (2009). Awarded second place in physics quiz at Stella Maris college (2008), Loyola College (2007).
- Co Founder of Amateur Astronomy Association of Loyola, Loyola College, Chennai.
- Completed internship on quasar related astrophysics at B M Birla Planetarium,2009-10
- Choreographed Energy department dance team for Group Dance at PG Cult 2012 and 2013.

TECHNICAL SKILLS

**Programming and Scripting Languages**: Python, MATLAB, Visual Basic
**Operating Systems**: Windows, Linux
**Content Management Systems**: Drupal, Wordpress
**Development Boards**: Arduino, Raspberry Pi
**Tools**: OpenStudio, EnergyPlus, Trimble SketchUp, Rhino/Grasshopper, Autodesk 3DS Max, Corel Draw, Adobe Dreamweaver, Adobe Photoshop, Sony Vegas, Adobe AfterEffects, LaTex

REFERENCES

Prof. Prasad Vaidya, **Phone:** +1 612 877 0210, **E-mail:** pvaidya@iihs.ac.in
Prof. Rangan Banerjee, **Phone:** +9122 2576 7883, **E-mail:** rangan@iitb.ac.in
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