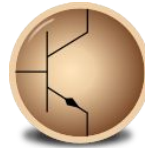




OOSC™

Opportunity Open Source Conference

Hands On Workshop on Open Source EDA Tool eSim



Sumanto Kar
eSim Team
FOSSEE, IIT Bombay

About Me



- M.Tech in Industrial Engineering & Operations Research, IIT Bombay (2025 batch)
- B.E. in Electronics Engineering from Mumbai University (2021 batch)
- My interests:
 - a. contributing to the open-source EDA tools.
 - b. Actively involved with the FOSSEE project.
 - c. Contributing to the development, integration, documentation, and outreach of eSim, an open-source EDA platform used across universities in India.
 - d. My work focuses on strengthening open technical ecosystems, enabling reproducible engineering workflows, and bridging the gap between academic research and community-driven software development.
- Hobbies: Music, Art and Electronics stuff



LinkedIn

Mail Id:

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Mob. No. 7718065095



About FOSSEE

- Free/ Libre Open Source Software for Education (FOSSEE)
- Ministry of Education, Government of India (MoE)
- Free/ Libre Open Source Software (FLOSS)
- Training
- Skill based education
- FOSSEE Website: <https://fossee.in>



FOSSEE offerings



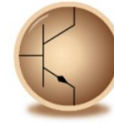
<https://fossee.in>



Scilab



Python



eSim



FLOSS Arduino



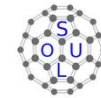
Osdag



DWSIM

OpenModelica

OpenModelica



SOUL



R



QGIS



FOCAL



OpenFOAM



Commercial Equivalence

Open Source software	Commercial software	Streams where the software can be used
Scilab	Matlab	All Engineering and Science Streams
R	SPSS	CS/IT Engineering. BSc, MSc Statistics/ Mathematics
Open Source Hardware Arduino, OpenPLC, Arduino on Cloud, CircuitJS		All Engineering, Polytechnics, Science Streams and Schools
Jmol	ChemDraw	



Commercial Equivalence

Open Source software	Commercial software	Streams where the software can be used
DWSIM	Aspen Plus / HYSYS/ ChemCad/ Simsci PRO/II	Chemical Engineering
OpenModelica	Dymola / Comsol Multiphysics	All Engineering and Science streams
Osdag (For the design of steel structures)	RAM Connection Tekla Connection Designer STAAD.PRO (partially)	Civil Engineering and Structural Engineering
GIS	ArcGIS	All domains including Engineering, Science, Arts, Medicine, etc



Activities promoted

Interesting Projects and Prospects

Case Study Project	Research Migration Project
Textbook companion Project	Lab Migration Project
Case Study Upgradation Project	Flowsheeting Project
Circuit Simulation Project	Science and Concept Map Project
Semester Long Internship (~ 3 months)	Summer Fellowship (~ 2 months)



More about Spoken Tutorial

- **Spoken Tutorial** is a multi-award-winning educational content portal
- **Principal Investigator: Prof. Kannan Moudgalya**
- **Enabled Free and Open Source Software Learning**
- It has **self-paced, multi-lingual** courses
- Side-by-side practice ensuring that learners are actively learning.
- Various disciplines of:
 - Engineering,
 - Pure Sciences,
 - Commerce,
 - Management
 - Several other UG, PG and even school students can learn from it
- Spoken Tutorial Website: <https://spoken-tutorial.org/>



Why India Needs to Lead in Semiconductor Manufacturing

- **Strategic Priority:** Chips power everything — from smartphones to defense and space.
- **Economic Independence:** Reduces heavy import dependence and boosts “Make in India.”
- **Job Creation & Innovation:** Builds a high-skill ecosystem in design, fabrication, and testing.
- **National Security:** Ensures trusted and secure supply for critical sectors.
- **Design to Manufacturing Transition:** Moves India from “Design for Others” to “Design and Make in India.”
- **Global Opportunity:** With supply chains shifting, India can emerge as a **new global hub** for semiconductors.



India Semiconductor Mission (ISM)

India Semiconductor Mission (ISM) Goals:

- Build a **domestic design and manufacturing ecosystem**
- Develop a **skilled semiconductor workforce**
- Promote **R&D and innovation** in chip design
- Achieve **Atmanirbhar Bharat** in semiconductor technology

Challenges:

- Costly commercial EDA tools
- Limited access in academia
- Dependence on foreign design ecosystems



How our eSim team Contributes

Key Contributions:

-  *Democratizes chip design*: Free access for students, startups & researchers
-  *Skill development*: Hands-on training through workshops & marathons
-  *Supports innovation*: Enables research in analog, RF, and mixed-signal circuits
-  *Ecosystem collaboration*: Connects academia, startups, and ISM initiatives



Impact & Way Forward

ISM Objective	eSim's Role
Design ecosystem	Open, indigenous EDA toolchain
Skilled manpower	Training thousands of learners
R&D innovation	Customizable platform for new ideas
Self-reliance	Reduces foreign EDA dependence

eSim is building the foundation for a self-reliant chip design ecosystem in India.



The Team

eSim Team

- Mr. Sumanto Kar
- Mr. Varad Patil
- Ms. Shanthi Priya K
- Mr. Aditya Minocha

Sr. Managers :

- Mrs. Usha Viswanathan
- Mrs. Vineeta Ghavri
- Mrs. Payel Mukherjee

Principal Investigator

Prof. Prabhu Ramachandran (Aerospace Engineering, IIT Bombay)

Former Principal Investigator

Prof. Kannan Moudgalya(EduPyramids)

eSim

- Developed at FOSSEE, IIT Bombay
- An open-source **EDA** tool for circuit design, simulation, analysis, and PCB design
- Integrates leading FOSS tools: **KiCad**, **Ngspice**, **Verilator**, **Makerchip**, **GHDL**, **OpenModelica**
- Released under the **GPL v3.0** license



Features of eSim

- Schematic Design
- SPICE simulation
- Digital Simulation using Makerchip Web IDE
- Mixed-Signal Simulation using NgVeri and NGHDL
- PCB designing
- Device modeling
- Integration with various PDKs
- Modular(subcircuit) designing
- Support for Ubuntu and Windows OS and Docker support
- Interface with OpenModelica
- Schematic Converters(PSpice to eSim and LTSpice to eSim)
- Cloud Version also available
- Locally running **AI chat bot and debug** Support coming soon!



Start-Up Screen

eSim-2.3

Generate SoC

Projects

Welcome

About eSim



eSim is an open source EDA tool for circuit design, simulation, analysis and PCB design. It is an integrated tool built using open source softwares such as KiCad (<https://www.kicad.org/>), Ngspice (<https://ngspice.sourceforge.io/>), GHDL (<http://ghdl.free.fr>), Verilator (<https://www.veripool.org/verilator/>), Makerchip IDE (<https://www.makerchip.com/>), and SkyWater SKY130 PDK (<https://skywater-pdk.rtfid.io/>). eSim source is released under **GNU General Public License**.

This tool is developed by the **eSim Team at FOSSEE, IIT Bombay**. To know more about eSim, please visit: <https://esim.fossee.in/>.

To discuss more about eSim, please visit: <https://forums.fossee.in/>

eSim Started.....
Project Selected : None

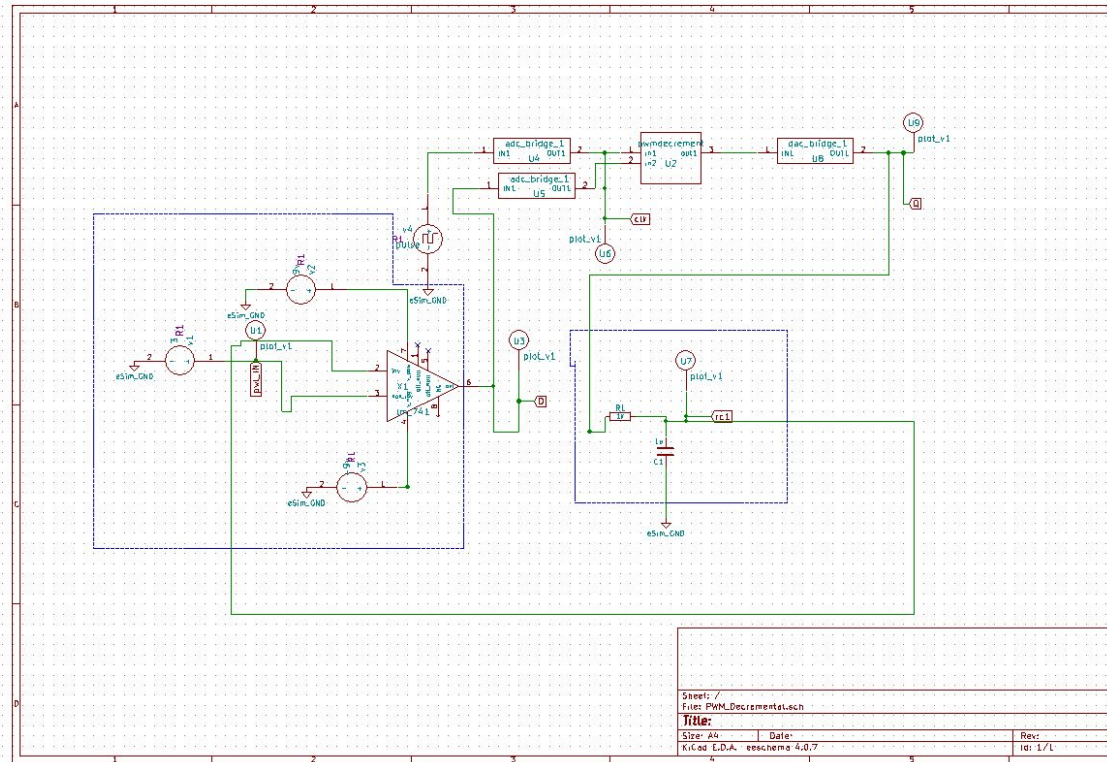
[INFO]: Workspace : C:\Users\Sumanto\eSim-Workspace
[WARNING]: Please select the project first. You can either create new project or open an existing project
[INFO]: Kicad to Ngspice Conversion is called
[WARNING]: Please select the project first. You can either create new project or open an existing project

16

Schematic Editor

[PWM_Decremental /] (D:\FOSSEE\Sim\Examples\Mixed_Signal\PWM_Decremental)

File Edit View Place Preferences Tools Help



Sheet: /
File: PWM_Decremental.sch
Title:
Size: A4 Date: Rev:
KiCad E.D.A. eeschema 4.0.7 id: 1/1

Promo Video

(2 minutes)

Current Activities under eSim

- [Circuit Simulation Project](#)
 - The contributor gets
 - Recognition on the website,
 - A certificate from FOSSEE, IIT Bombay
 - We have 300+ verified submissions throughout the country
- [Lab Migration Project](#)
 - The contributor gets
 - Recognition on the website,
 - A certificate from FOSSEE, IIT Bombay
 - We have migrated 8 Institutional Labs to Open Source

eSim Marathon

- eSim Marathon

- The contributor gets
 - Recognition on the website,
 - A certificate from FOSSEE, IIT Bombay
- We have 100+ winners from throughout the country

Conducted Activities under eSim

- eSim Marathon Details:

	Year	Domain	Version	Partners
Circuit Design and Simulation Marathon using eSim	May-June, 2021	SKY130 circuits	eSim-2.1	FOSSEE, IIT Bombay, VSD, MoE
Mixed Signal Circuit Design and Simulation Marathon	Feb-March, 2022	eSim NgVeri and NGHDL feature	eSim-2.2	IIT Bombay, FOSSEE, Spoken-Tutorial, VSD, Redwood EDA, C2S
Mixed Signal SoC design Marathon using eSim & SKY130	Sept-Oct 2022	eSim SKY130 feature and eSim NgVeri and NGHDL feature	eSim-2.3	IIT Bombay, Google FOSSEE, Spoken-tutorial, VSD
Circuit Design & Simulation with IHP SG13G2	Oct-Nov 2025	eSim NgVeri and NGHDL feature + IHP PDK	eSim-2.5	IITB, FOSSEE, IHP, Spoken Tutorial, IEEE CEDA, IEEE CAS, EduPyramids

Current Activities under eSim

- Research Migration Project(Newly started)
 - Reproduce already published work using eSim.
 - Work must be the outcome of a peer-reviewed process in reputed journals, conferences, or workshops
 - The proposed published work is the outcome of commercial tools viz. PSpice, Multisim, etc. use.
 - The contributor gets
 - Recognition on the website,
 - A certificate from FOSSEE, IIT Bombay

Conducted Activities under eSim

- [FOSSEE Fellowships & Internships](#)
 - FOSSEE Fellowship 2026(upcoming)
 - FOSSEE Semester Long Internship(Spring) 2026
 - Winter Internship 2025
 - Semester Long Internship(Autumn) 2025
 - Spoken Tutorial Fellowship
 - And before as well ...
 - The contributor gets
 - Recognition on the website,
 - A certificate from FOSSEE, IIT Bombay
 - Honorarium

Conducted Activities under eSim

- FOSSEE Workshops/Conferences
 - eSim Team(solely)
 - In collaboration with some org
 - 4 workshops/webinars per week

Let's explore the eSim website:
<https://esim.fossee.in/>



Learning eSim:

https://spoken-tutorial.org/tutorial-search/?search_foss=eSim&search_language=English



Our Outreach

Marathon Statistics:

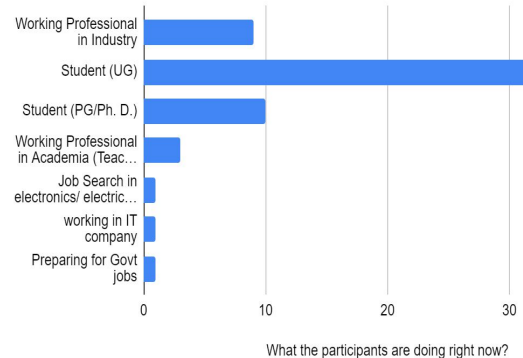
- 2000+ registrations
- Over 100 winners
- Around 9 designs sent to Fab
- Published Papers

A repository of 600+ circuits contributed from India and abroad

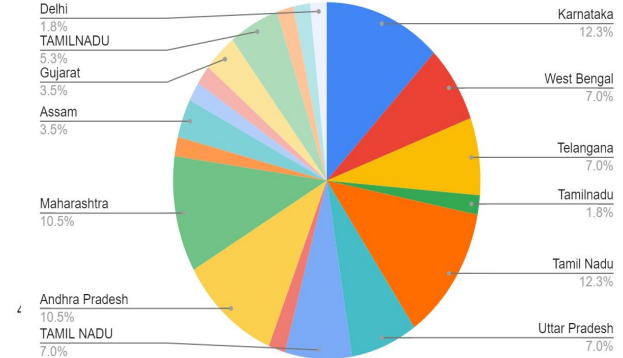
Fellowship/Internships Statistics in 2026:

- 100+ fellows and interns

What the participants are doing right now?



Count of State



Conducted Webinars/Workshops with various institutions for promoting eSim

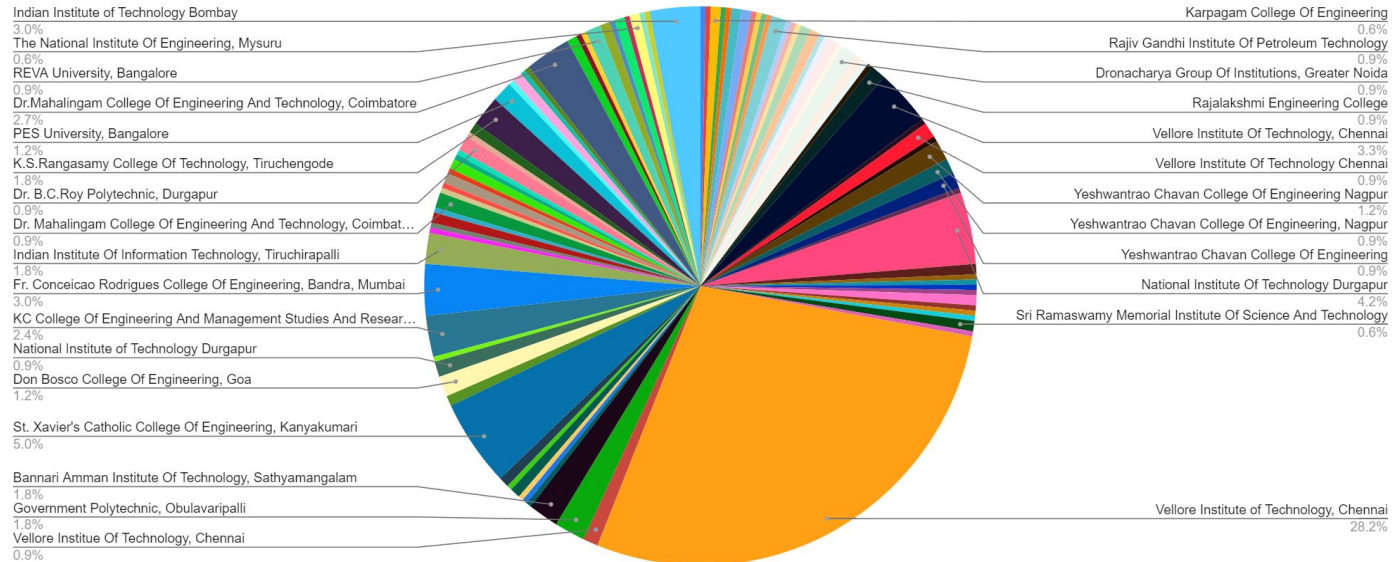
eSim Hardware Workshop with 3000 participants in 2019

Postal campaign to reach out to many people!

Our Outreach

Total
337
Submissions

Circuit Simulation Submissions



This shows the power of youth of our country!!!

Interesting Stories/Testimonials

eSim was earlier named Oscad. But Pspice got worried and asked us to change the name since it sounding similar to their proprietary software OrCAD. **Such was the impact of eSim!!!**

This marathon was a gateway to many other associated events and most importantly it played a major role in terms of my **offcampus placements**. My learnings and connections that I had built during and after the marathon is really something that I'm thankful to eSim. Thank you so much for helping students from **tier 3 colleges** build their career in VLSI.

-One of the Marathon participants

I got an outstanding classification and for that I had to work really hard which made me more knowledgeable and proficient. Also the result was really motivating. All this happened just one month before my placements which gave a big boost to my motivation which indeed helped me achieve a good job.

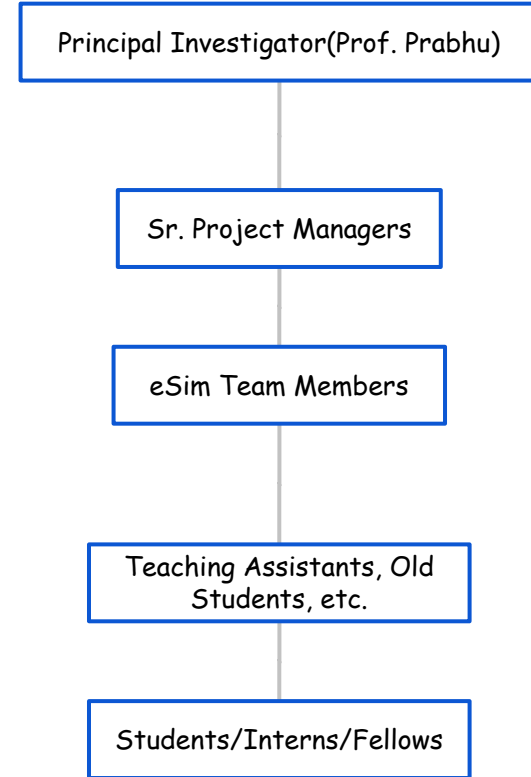
-One of the Marathon participants

Our Collaborators

- FOSSEE Team Members
- Undergraduate, graduate and researchers from all over the country and abroad
- Various industry partners
- Coordinating with the teams of Swadeshi Processors (like AJIT, SHAKTI and VEGA)
- Earlier collaborated with the Google SkyWater
- Connecting with IHP Fab, Germany
- Part of the **Indian Semiconductor Mission**
- Reaching out to many other Open Source Fabs!!!

Managing Strategy

- We follow kind of Agile Workflow for the tool development
- Different Workflow Levels is given alongside



Join the hands in developing eSim!!!

Computer Science Domain	Electrical Domain
eSim on every Platform	Design ICs(e.g. 74xx series)
Support for the Cloud Version	Design System on Chips(SoCs)
Improving the UI	Power Devices Integration
Fixing the bugs	RF Components Integration
Integrating with OpenROAD	Create Device Models
Tool Manager Development	Create VLSI IPs
Create automated tests	Simulation for tapeout
Develop ChatBot	Testing Thoroughly

Join the hands in developing eSim!!!

Please visit the GitHub repositories of the eSim:



<https://github.com/FOSSEE/eSim>



<https://github.com/FOSSEE/nghdl>

Thank you!!!

contact-esim@fossee.in

Let's start with the Workshop.