June 25th, 2024

Global Tender for TCAD Silvaco Licenses

This is a global tender for the purchase of TCAD Silvaco licenses for the purpose of training and research in semiconductor technology.

Indian Insitute of Science (IISc) is India's premier research university. CeNSE is a multidisciplinary research department at IISc that houses a 14,000 sq. ft. cleanroom and characterization facility used by 50 faculty members from various disciplines at IISc. CeNSE also runs multiple training programs to service the India Semiconductor Mision (ISM), such as the Indian Nanoelectronics Users Program I2I (INUP-I2I); Training for Tribal Students in Semiconductor Technology; and Lam Research-IISc training in SEMulator3D. These programs have allowed 4200 participants from more than 700 universities and institutes all over India to use the facilities at CeNSE. Consequently, any tool in CeNSE receives significant exposure to the scientific and industry community. The vendors are requested to factor this exposure's value into their quotes. Details of existing facilities and training programs can be gleaned from:
http://nnfc.cense.iisc.ac.in/
http://mncf.cense.iisc.ac.in/
https://inup.cense.iisc.ac.in/
http://www.cense.iisc.ac.in/mota_training/
http://www.cense.iisc.ac.in/lam_training/

Procedure

1. Vendors must submit technical and commercial proposals in **two separate sealed envelopes**.
2. **The deadline for submission of proposals is July 16th, 2024, 5:30 pm Indian Standard Time.**
3. Proposals should arrive in hardcopy at CeNSE Office, GF-05, Centre for Nano Science and Engineering, Indian Institute of Science, Bangalore 560012, India, by the deadline. **Please mention "Tender for Silvaco Licenses" on the cover.**
4. The technical proposal should contain a technical compliance table with 5 columns.
    a. The first column must list the technical requirements in the order given in the technical requirement below.
    b. The second column should provide instrument specifications against the requirement. Please provide quantitative responses wherever possible.
    c. The third column should describe your compliance with a "Yes" or "No" only. Ensure that the entries in column 2 and column 3 are consistent.
    d. The fourth column should state the reasons/explanations/context for deviations, if any.
    e. The fifth column can contain additional remarks from the OEM. You can use this opportunity to highlight technical features, qualify responses to previous columns, or provide additional details.

5. Vendors can submit multiple bids.
6. In the commercial bid, please provide itemised cost of the system and required accessories.
7. As an option, please provide itemised cost for any suggested accessories/add-ons that may enhance the tool's usability, capability, accuracy, or reliability. Vendors are encouraged to quote for as many add-ons as their tool portfolio permits.
8. The quotes should include the cost of shipping as a separate line item.
9. Vendors who meet the technical requirements will be considered for the commercial negotiation.
10. Any questions can be directed to Prof. Sushobhan Avasthi, TF-06, Centre for Nano Science and Engineering, Indian Institute of Science, Bangalore 560012, India. (savasthi@iisc.ac.in)

Terms and Conditions

1. The decision of the purchase committee will be final.
2. The RFQ must include references to 3 previous installations in India. Please provide the names and contact addresses of the referees so that the committee can contact them independently. Details of such number and type of licenses should be provided. The reference letters can disqualify vendors with poor track records of service.
3. The lead time for the delivery of the license should be at most four weeks from the date of receipt of our purchase order.
4. The indenter reserves the right to withhold placement of the final order. The right to reject quotations, split the requirements, or relax any of the above conditions without assigning any reason.
5. Wherever requested in this specifications sheet, data must be supplied along with technical compliance documents. Technical bids without supporting data will be deemed as technically non-compliant.
6. All guaranteed specifications must be demonstrated upon request in an active installation. Failure to demonstrate any promised specifications will be deemed as technical non-compliance.
7. Printed literature and published papers to support compliance with the prescribed specifications must be provided.
8. Technical evaluation by the institute may include a demonstration to verify the functionalities and capabilities of the system quoted. Any discrepancy between the promised and demonstrated specifications will be deemed technical non-compliance. If the need arises, the vendor must be ready to visit IISc for a techno commercial discussion physically.
9. The **validity of the commercial quotation should be at least 60 days from the last date for the submission of the** tender.

GFR 2017 Mandate

This is a purchase to support semiconductor manufacturing and research. Hence, this purchase is exempt from the Global Tender Enquiry (GTE), as per OM F.4/1/2023 -PPD from the Ministry of Finance. Global and domestic vendors are encouraged to apply.

Technical Requirements

1. Licenses:
   1.1. Quantity: 18
   1.2. We are looking for academic licenses that will be used for R&D, teaching, training, and outreach.
   1.3. Fully networked licenses that can be run from a license server.
   1.4. Software installation files should be freely downloadable from the OEM website. Alternatively, OEM can give us the installation files, which will be hosted on an internal server visible only on the intranet or VPN.
   1.5. Installation files must be available for MacOS, Windows, and Linux platforms.
   1.6. Software updates, bug fixes, and maintenance must be available for three years from the date of license delivery.
2. We are a layout-driven Simulator for Process, Device Physics, Atomistic modelling, SPICE model generation, and Parasitic parameter extraction.
   2.1. Efficient multi-threading computation on multi-core computers.
      2.1.1. Support multiple converging criteria
      2.1.2. Optimisations to handle computation at edges and corners
   2.2. Meshing & model building
      2.2.1. In-built structure editor for 2D and 3D structures
      2.2.2. Parameterised layout specification
      2.2.3. 2D and 3D Meshing
      2.2.4. Visualisation of variables in 2D and 3D.
      2.2.5. Extraction of 1D and 2D data profiles.
      2.2.6. Structures files that can be imported/exported between process/device/atomistic simulators.
      2.2.7. Comprehensive semiconductor material library.
      2.2.8. User-defined materials
   2.3. Must be fully backwards compatible with previous Silvaco TCAD files created since 2014 onwards (10 years).
3. Process Simulation: Simulation of standard IC fabrication processes
   3.1. General
      3.1.1. Support layout and Masking
      3.1.2. User defined annealing recipes
      3.1.3. Diverse set of examples
      3.1.4. SUPREM like syntax
   3.2. Photolithography & Layout
      3.2.1. Import of GDSII layouts
      3.2.2. Aerial image formation
      3.2.3. Effects of phase shift and transmission variations (PSM and APSM)

3.3. Ion Implantation
    3.3.1. Complete moment tables of implant species in silicon like B, BF2, P, As, Si, and Sb
    3.3.2. Implant energy of 1 eV to 1 MeV.
    3.3.3. Dosage of 1e11 to 1e17 cm^{-2}
    3.3.4. Automatically handle issues like channeling, back scattering
    3.3.5. Model dose, tilt and rotation.
    3.3.6. Monte Carlo implant modelling
    3.3.7. Amorphization
    3.3.8. Damage annealing
3.4. Dopant diffusion, activation, and annealing.
    3.4.1. Complete material database of substitutional species like B, P, As, an Sb.
    3.4.2. Complete material database of interstitial species like Fe, Au, Cu, Al, W.
    3.4.3. Support diffusion in most common media, like Si, SiGe, III-V, SiO2, SiNx, and TiN
    3.4.4. Support multiple diffusion profiles.
    3.4.5. Diffusion of point defects
    3.4.6. Flash annealing.
3.5. Oxidation
    3.5.1. Dry and wet oxidation
    3.5.2. Ultrathin oxide growth
    3.5.3. Halogenic oxidation
3.6. Dry etching:
    3.6.1. Model isotropic and anisotropic etching.
    3.6.2. Selectivity
    3.6.3. Line of sight effects
    3.6.4. Effect of redeposition
3.7. Wet etch processes
3.8. Deposition processes
    3.8.1. Comprehensive database of commonly deposited materials like Si, SiO2, HfO2, SiNx, Al, W, TiN, Cu, etc.
    3.8.2. Line of Sight effects
    3.8.3. Conformal and Non-conformal deposition
    3.8.4. Selective deposition
    3.8.5. Epitaxial deposition
3.9. Stress:
    3.9.1. Calculation of cumulative stresses from various processes.
    3.9.2. Evaluate and image stress history
    3.9.3. Model lattice mismatch stress
    3.9.4. Model thermal expansion mismatch stress
    3.9.5. Model oxidation stress
    3.9.6. Model stress on Si, III-V, and graded substrates.

4. Device Simulation capabilities
4.1. General
    4.1.1. User-defined equations
    4.1.2. Diverse set of examples
4.2. In-built models and equations:
    4.2.1. Standard transport equations for carriers
    4.2.2. DC, AC and transient carrier transport analysis and effect of temperature
    4.2.3. Range of recombination and generation models

4.2.4. Range of mobility models.
4.2.5. Material models for silicon, SiGe, GaN, and other semiconducting materials
4.2.6. Effect of stress on mobility and bandgap
4.2.7. Self-heating effects
4.2.8. Light absorption and photo generation models for arbitrary geometries
4.2.9. DC, AC, transient and spectral optical responses
4.2.10. FDTD calculations
4.2.11. Ray tracing
4.2.12. Light reflection and transmission using the transmission matrix method
4.2.13. SPICE integration for combined circuit simulation
4.2.14. Radiation effects and single-event effects on device operation

5. Atomistic Simulations
   5.1. Electronic structure calculation using tight binding model parameters and Wannier 90 Hamiltonians
   5.2. Standard crystal structure support: crystal symmetry groups including zincblende, wurtzite, simple-cubic, diamond, and trigonal structure of graphene
   5.3. Supports standard 3D and 2D crystal structures including zincblende, wurtzite, simple-cubic, and graphene.
   5.4. Multiphysics solvers:
      5.4.1. Poisson Schrödinger solver
      5.4.2. Non-Equilibrium Green's Function (NEGF)
      5.4.3. Electron-phonon and phonon-phonon effects
      5.4.4. Quantum transmission boundary method (QTBM).
      5.4.5. Strain-dependant and force-field relaxation calculations.
   5.5. Atomistic prediction of potentials, charges, mobility, and band-edge shifts that can be imported into traditional TCAD.
   5.6. I-V characteristics of tunnelling.
6. Parasitic Extraction
   6.1. Layout driver parasitic extraction for capacitance, resistance, and inductance.
      6.1.1. Extract R, R-C, fully distributed R-C models
   6.2. Integrated netlist extractor
   6.3. Supports liquid crystals
   6.4. Supports dummy and floating conductors.
   6.5. Import of structure files from other modules like process and device solvers.