Rajasthan Technical University

Akelgarh, Rawatbhata Road, Kota-324010

INVITATION LETTER

Package Code: TEQIP-III/RJ/rtur/24   **Current Date:** 28-Jun-2019
Package Name: COMSOL Multiphysics with MEMS Module   **Method:** Direct Contract Goods

To,

Sub: INVITATION LETTER FOR COMSOL Multiphysics with MEMS Module

Dear Sir,

Sr. No	Item Name	Quantity	Place of Delivery	Installation Requirement (if any)
1	COMSOL Multiphysics	2	Coordinator, TEQIP-III RTU (ATU) Office of TEQIP-III, First Floor, VC Secretariat, Rajasthan Technical University, Rawatbhata Road, Akelgarh, , Kota-324010 (Raj.)	YES
2	MEMS Module	2	Coordinator, TEQIP-III RTU (ATU) Office of TEQIP-III, First Floor, VC Secretariat, Rajasthan Technical University, Rawatbhata Road, Akelgarh, , Kota-324010 (Raj.)	YES

2.		Government of India has received a credit from the International Development Association (IDA) towards the cost of the **Technical Education Quality Improvement Programme [TEQIP]-Phase III** Project and intends to apply part of the proceeds of this credit to eligible payments under the contract for which this invitation for quotations is issued.
3.		Quotation
	3.1	The contract shall be for the full quantity as described above.
	3.2	Corrections, if any, shall be made by crossing out, initialling, dating and re writing.
	3.3	All duties and other levies payable by the supplier under the contract shall be included in the unit price
	3.4	Applicable taxes shall be quoted separately for all items.
	3.5	The prices quoted by the bidder shall be fixed for the duration of the contract and shall not be subject to adjustment on any account.

	3.6	The Prices should be quoted in Indian Rupees only.
4.		Each bidder shall submit only one quotation.
5.		Quotation shall remain valid for a period not less than **60days** after the last date of quotation submission.
6.		Evaluation of Quotations: The Purchaser will evaluate and compare the quotations determined to be substantially responsive i.e. which
	6.1	are properly signed; and
	6.2	Confirm to the terms and conditions, and specifications.
7.		The Quotations would be evaluated for all items together
8.		Award of contract: The Purchaser will award the contract to the bidder whose quotation has been determined to be substantially responsive and who has offered the lowest evaluated quotation price.
	8.1	Notwithstanding the above, the Purchaser reserves the right to accept or reject any quotations and to cancel the bidding process and reject all quotations at any time prior to the award of contract.
	8.2	The bidder whose bid is accepted will be notified of the award of contract by the Purchaser prior to expiration of the quotation validity period. The terms of the accepted offer shall be incorporated in the purchase order.
9.		Payment shall be made in Indian Rupees as follows: **Satisfactory Delivery & Installation - 10% of total cost (July 15, 2019)** **Satisfactory Acceptance - 90% of total cost (July 15, 2019)**
10.		Liquidated Damages will be applied: • Liquidated Damages Per Day Min % : 0.1 • Liquidated Damages Max % : 10
11.		All supplied items are under warranty of **12** months from the date of successful acceptance of items.
12.		The items covered under this invitation are required to be delivered & installed at RTU Kota within 30 days from the date of issue of Purchase Order.
13.		*The sealed bid, complete in all respects, must reach, **Coordinator, TEQIP-III, RTU (ATU), VC Secretariat, Rajasthan Technical University, Rawatbhata Road, Akelgarh, Kota-324010** latest by **08 July 2019 up to 16:00 hrs.**, failing which it would be summarily rejected. RTU will not be responsible for postal delay or non-receipt of quotation.*
14.		The quotation would be opened on *08 July 2019 at 16:00 hrs.* at *Coordinator, TEQIP-III, RTU (ATU), VC Secretariat, Rajasthan Technical University, Rawatbhata Road, Akelgarh, Kota-324010* in the presence of bidder representatives who choose to attend the opening. The bidder representatives who are present shall sign an Attendance sheet evidencing their attendance.
15.		Bidder must quote the Financial Rate strictly as per financial Quotation format provided at **Annexure IV.**
16.		Detailed specifications of the items are at **Annexure I.**
17.		Training Clause (if any) **YES**
18.		The bidders must provide a certificate indicating their adherence to all the clauses of the bid as per format in **Annexure II.**
19.		The bidders must provide a Technical Compliance Report per format in **Annexure III.**
20.		Testing/Installation Clause (if any) **YES**
21.		Performance Security shall be applicable: **10%** It should be valid till 30 days after expiry of warranty period of one year and agreement signed within

	15 days from the date of issue of purchase order.
22.	To ensure the price justification of the above proprietary item, bidder shall attach copies of the similar nature of recent purchase orders (minimum two) preferably issued by the government /semi government institutions / autonomous bodies.
23.	Information brochures/ Product catalogue, if any must be accompanied with the quotation clearly Indicating the model quoted for
24.	We look forward to receiving your quotation and thank you for your interest in this project.

(Authorized Signatory)

Name & Designation

Coordinator, TEQIP-III (ATU)
Rajasthan Technical University
Kota (Rajasthan)

Sr. No	Item Name	Specifications
1	COMSOL Multiphysics	COMSOL Multiphysics, Floating Network Licence (FNL) for one (1) concurrent user. SAC Code 997331 This licence is for academic use only. This is a perpetual license.: **2 Qty** COMSOL Multiphysics® is a general-purpose software platform, based on advanced numerical methods, for modeling and simulating physics-based problems. With COMSOL Multiphysics, the user will be able to account for coupled or multiphysics phenomena. With more than 30 add-on products to choose from, it is possible to further expand the simulation platform with dedicated physics interfaces and tools for electrical, mechanical, fluid flow, and chemical applications. Additional interfacing products connect the COMSOL Multiphysics simulations with technical computing, CAD, and ECAD software. All licenses are perpetual, and support multicore/multiprocessor computers at no additional charge. The floating network license (FNL) allows for an unlimited number of nodes in server/cluster to be utilized for the simulations. **Product Features** Geometry Modeling • Primitive solid objects, including block, cone, cylinder, sphere, ellipsoid, torus • Parametric helix • Parametric curves and surfaces • Interpolation curves • Extrude, revolve, sweep • Boolean operations union, intersection, difference, and partition • Hybrid modeling with solids, surfaces, curves, and points • Work Plane with 2D geometry modeling • CAD import and interoperability with add-on CAD Import Module and LiveLink products for CAD □ CAD repair and defeaturing with add-on CAD Import Module and LiveLink products for CAD Meshing • Free tetrahedral meshing • Swept mesh with prism and hex elements • Boundary layer meshing • Free triangular meshing of 3D surfaces and 2D models • Mapped and free quad meshing of 3D surfaces and 2D models • Copy mesh operation • Virtual geometry operations • Mesh partitioning of domains, boundaries, and edges. Finite Elements • Nodal-based isoparametric Lagrange elements of order 1,2,3, and

higher
- Curl elements (also known as vector elements, or edge elements), of order 1,2,3 (requires add-on modules), adapts to curved surfaces and edges
- Specialized elements such as Hermite and Argyris
- Stabilization schemes for convection dominated models: crosswind, streamline, and isotropic diffusion

Equation-Based Modeling

- Several different templates for general second-order systems of nonlinear partial differential equations (PDEs)
- Partial differential equations on the weak form
- Algebraic equations
- Ordinary differential equations (ODEs)
- Differential algebraic equations (DAEs)
- Sensitivity analysis (Optimization available with add-on Optimization Module), Curvilinear coordinate computation

Application Builder

- Ability to save models as specialized applications for use throughout organization.
- Design applications using drag-and-drop tools, in the Form Editor, or by programming using the Method Editor.
- Include specific features from the model or introduce new ones through programming using the Method Editor.
- Run applications on COMSOL Multiphysics or with COMSOL Server using either an installed or web-based client.

Solvers

- Direct sparse solvers: MUMPS, PARDISO, SPOOLES
- Iterative sparse solvers: GMRES, FGMRES, BiCGStab, conjugate gradients, preconditionerbased
- Preconditioners: SOR, Jacobi, Vanka, SCGS, SOR Line/Gauge/Vector, geometric multigrid (GMG), algebraic multigrid (AMG), Auxiliary Maxwell Space(AMS), Incomplete LU, Krylov
- Nonlinear solvers: Gauss-Newton, double dog-leg, fully-coupled, segregated
- Time-dependent solvers: variable-order BDF, generalized-alpha
- Adaptive meshing with L2 norm and user-defined functional norm
- Moving mesh with arbitrary Lagrangian-Eulerian (ALE) method
- Automatic remeshing for moving mesh

Materials

- Isotropic and anisotropic materials
- Discontinuous materials
- Spatially varying materials
- Time-varying materials
- Nonlinear material properties as a function of any physical quantity

Physics-Based Modeling

- Electric currents

		• Electrostatics
		• Heat transfer in solids and fluids
		• Joule heating
		• Laminar flow
		• Pressure acoustics
		• Solid mechanics
		• Transport of diluted species
		• Additional physics interfaces are available in add-on modules
		Results
		• Visualization oSurface plots oIsosurface plots oArrow plots oSlice plots oStreamline plots oContour plots
		• Post processing,Integration, average, max, and min of arbitrary quantities over volumes, surfaces, edges, and points
		• Custom mathematical expressions including field variables, their derivatives, spatial coordinates, time, and complex-valued quantities
		Import/Export
		• Import and export of text, Excel, image, movies, meshing, and CAD formats in COMSOL Multiphysics and add-on products are listed below.
		Other Discretization Schemes
		• Discontinuous Galerkin method
		• Finite volume method, boundary elements method, and particle tracing method are available in add-on products
2	MEMS Module	MEMS Module for use with COMSOL Multiphysics, Floating Network : **2 Qty** Licence (FNL) for one (1) concurrent user. SAC Code 997331 This licence is for academic use only. This is a perpetual license.
		The design and modeling of microelectromechanical systems (MEMS) is a unique engineering discipline. At small length scales, the design of resonators, gyroscopes, accelerometers, and actuators must consider the effects of several physical phenomena in their operation. Consequently, COMSOL Multiphysics is ideally suited for MEMS applications. To this end, the MEMS Module provides predefined user interfaces with associated modeling tools, referred to as physics interfaces, for a variety of coupled physics, including electromagnetic-structure, thermalstructure, or fluid-structure interactions. The user can include a variety of damping phenomena in their model: thin-film gas damping, anisotropic loss-factors for solid and piezo materials, anchor damping, and thermoelastic damping. For elastic vibrations and waves, perfectly matched layers (PMLs) provide state-of-the-art absorption of outgoing elastic energy.
		Piezoelectric and piezoresistivemodeling tools allow for simulations where composite piezoelastic-dielectric materials can be combined in any imaginable configuration. The MEMS Module includes analyses in the stationary and transient domains, as well as fully-coupled eigenfrequency, parametric, quasi-static, and frequency response analyses. The user can easily perform lumped parameter extraction of capacitance, impedance, and admittance, and connect to external electrical circuits via SPICE netlists. Built

upon the core capabilities of COMSOL Multiphysics®, the MEMS Module can be used to address virtually any phenomena related to mechanics at the microscale.

Product Features

- Buckling
- Elastic waves
- Elastohydrodynamics
- Electrostatics
- Electrostatic actuation
- Fluid-structure interaction (FSI)
- Joule heating
- Large deformations □ Gravity force

- Modal analysis
- Mechanical contact
- Perfectly matched layers (PMLs)
- Piezoelectricity
- Piezoresistivity
- Prestressed structures
- Solid mechanics
- Rotating Frames with centrifugal, Coriolis, and Euler forces

- Thermal stress
- Thermoelasticity
- Thin-film damping
- Sensors
- SPICE circuits
- Vibrations
- Viscoelasticity
- Spin softening effect

Application Areas

- Accelerometers
- Actuators
- Bulk Acoustic Wave (BAW) devices
- Cantilever beams □ Capacitors

- Gyroscopes
- Magnetostrictive devices
- Resonators
- Piezoelectric devices
- Piezoresistive devices

- RF MEMS
- Sensors
- Surface Acoustic Wave (SAW) devices
- Thermal actuators

COMPLIANCE STATEMENT FOR VARIOUS CLAUSES IN BID

Package No.-----------------------

S. No.	Clause mentioned in Invitation letter	Please mention Agreed /Not Agreed	Remarks
1.	Payment Terms		
2.	Delivery Period – 30 days		
3.	Warranty – 12 Months		
4.	Bid Validity – 60 days		
5.	Training		
6.	Testing/ Commissioning/ Installation included		

Signature of Supplier

Name: _____

Address: _____

Contact No: _____

TECHNICAL COMPLIANCE STATEMENT

Package No.------------------------

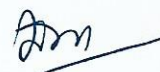| S. No.	Technical Specification of the equipment asked in the bid	Technical Specification of the equipment offered by the bidder with Model No.	Remarks
1.	As per detailed specifications in **Annexure I**		

Note: Bidder must give the Model No. of each furniture items quoted along - with original literature

Signature of Supplier

Name: _____

Address: _____

Contact No: _____

FORMAT FOR QUOTATION SUBMISSION
(In letterhead of the supplier with seal)

Date: _____

To: _____

_____

Sl. No.	Description of goods \ (with full Specifications)	Qty.	Unit	Unit rate in Rs. (Including Ex Factory price, excise duty, packing and forwarding, transportation, insurance, other local costs incidental to delivery and warranty/ guaranty commitments)	Total Price (Without taxes) (A)	GST %	GST Amount Rs.	Total Price (Including GST) Rs.	Make & Model No. quoted
1.	As per detailed specifications in **Annexure I**	01	No.						
				Total Cost					

Total Price (exclusive of taxes) (in Words) _____

Total Price of Bid (Inclusive of taxes) (In Words) _____

We agree to supply the above goods in accordance with the technical specifications for a total contract price of Rs. ——————————————————— (Amount in figures) (Rupees ———————————————————————amount in words) within the period specified in the Invitation for Quotations.

We confirm that the normal commercial warranty/ guarantee of **12 months** shall apply to the offered items and we also confirm to agree with terms and conditions as mentioned in the Invitation Letter.

We hereby certify that we have taken steps to ensure that no person acting for us or on our behalf will engage in bribery.

Note :	
i)	*Discount or any other offers affecting the package price must be mentioned here only. Discount or any other offers affecting the package price mentioned at any other place of the bid will not be considered.*
ii)	*In case of discrepancy between unit price and total price, the unit price shall prevail.*
iii)	*Bids shall be evaluated based on total price.*

Signature of Supplier

Name: _____

Address: _____

Contact No: _____