

# INDIAN INSTITUTE OF TECHNOLOGY DELHI

## Invitation for Expression of Interest

IITD/EOI/ETSC(SP-4649)/2024

Dated : 27-05-2024

Subject: Expression of Interest for providing Virtual Reality modules to IIT Delhi

Dear [Recipient's Name],

I am writing to express our institute's strong interest in acquiring virtual reality (VR) modules to enrich and elevate our educational offerings. As a leading institution dedicated to fostering innovation and providing an exceptional learning experience for our students, we recognize the immense potential of VR technology to revolutionize teaching and learning across various disciplines.

Virtual reality has emerged as a powerful tool for immersive learning, offering students the opportunity to engage with course material in dynamic and interactive ways that transcend traditional classroom boundaries. By incorporating VR software into our curriculum, we aim to achieve the following:

**Enhance Learning Outcomes:** VR simulations can provide students with realistic, hands-on experiences that deepen their understanding of complex concepts and theories, ultimately improving learning outcomes and retention rates.

**Foster Creativity and Collaboration:** VR environments encourage creativity and collaboration by enabling students to explore, experiment, and problem-solve together in virtual spaces, regardless of their physical location.

**Expand Access to Education:** Virtual reality technology has the potential to overcome geographical barriers and make education more accessible to students who may not have the means to travel or attend traditional on-campus classes.

**Prepare Students for Future Careers:** By exposing students to cutting-edge VR tools and technologies, we can better prepare them for careers in fields such as engineering, healthcare, architecture, and more, where VR is increasingly being used for training and simulation.

In light of these benefits, we are actively seeking a VR software solution (100-150 modules) that align with our institute's specific educational objectives and requirements. The key features we are looking for include:

- Intuitive interface and user-friendly controls to facilitate seamless integration into existing courses and curricula.
- Customization options that allow instructors to create tailored VR experiences that align with their teaching goals and objectives.
- Compatibility with a wide range of VR hardware devices and WebGL to ensure accessibility for all students and faculty members.
- Comprehensive support and training resources to assist faculty members in effectively incorporating VR technology into their teaching practices.
- Scalability and flexibility to accommodate the diverse needs and disciplines within our university community.

We are eager to explore various VR software options and would welcome the opportunity to engage in further discussions with your team to learn more about your offerings. Additionally, we are interested in exploring potential partnerships or collaborations to co-develop customized solutions in the future. Note that in this EoI, we are mostly interested in modules that have either already been developed or are close to completion. Each module is a VR world that takes at least 10-15 minutes to traverse and covers most concepts of theoretical and practical importance. The theoretical rigor, aesthetics and real-life details should be of the highest quality.

Thank you for considering our expression of interest. We are excited about the possibilities that VR technology presents for enhancing education and look forward to the opportunity to work together to bring this vision to life.

Ms. Nisha Jha (Production Manager)

Prof. Smruti R. Sarangi (Head)

Educational Technology Services Center (ETSC), IIT Delhi

Name of Organization	Indian Institute of Technology Delhi
Tender Type (Open/Limited/EOI/Auction/Single/Global)	EOI
Tender Category (Services/Goods/works)	Services
Type/Form of Contract (Work/Supply/ Auction/ Service/ Buy/ Empanelment/ Sell)	Supply
Product Category (Civil Works/Electrical Works/Fleet Management/ Computer Systems)	Others
Date of Issue/Publishing	27/05/2024 (15:00 Hrs)
Document Download/Sale Start Date	27/05/2024 (15:00 Hrs)
Document Download/Sale End Date	17/06/2024 (15:00 Hrs)
Date for Pre-Bid Conference	---
Venue of Pre-Bid Conference	---
Last Date and Time for Uploading of Bids	17/06/2024 (15:00 Hrs)
Date and Time of Opening of Technical Bids	18/06/2024 (15:00 Hrs)



# Virtual Reality Modules

VR Lab, ETSC, IIT Delhi



# KEY OBJECTIVES

1. The aim is to procure perpetual licenses of virtual reality modules for various streams of engineering and sciences. Each module is a VR world where the user can navigate herself and learn engg./science concepts (IIT Delhi UG and PG level).
2. To develop a virtual reality lab that enables users to experience a three-dimensional environment using a web browser or a VR headset.
3. To design a web portal that complements the VR modules, enriching the educational ecosystem with accessibility and comprehensiveness. The VR modules should be available to IIT Delhi students via WebGL.
4. 100-150 Virtual Reality modules must be present in the full offering -- each containing educational content lasting at least 15 minutes. These modules will encompass topics such as machines, industrial tours, and experiments spanning across almost all Engineering and Sciences disciplines.
5. The bidder is required to offer technical support for a duration of five years, along with software updates for three years.

# SCOPE OF WORK

## 1. Virtual Reality Software

We wish to directly procure VR modules that have either already been developed or are in the final stages of development. The user should be able to perceive a 3-dimensional environment. The VR modules should be compatible with 6DOF virtual reality headsets, which are readily available in the market. 360 (degree) videos are not acceptable; the learning modules should allow the user to interact with elements and manipulate them with controllers, similar to a real life setting. All of these features should also be available on web browsers (using WebGL).

### **Machine Modules:**

The VR modules dedicated to machines should provide users with an immersive experience, enabling them to delve into intricate details and gain a thorough understanding. Users should have the ability to interact with individual machine parts, facilitating a deeper comprehension of their functions. These modules will visually depict machine components within a spatial environment, offering a comprehensive view conducive to detailed analysis. Moreover, users will have the opportunity to explore the inner mechanisms of these machines, grasp scientific principles, and observe all the operations firsthand, all within a virtual setting designed to augment learning and understanding.

### **Experiment Simulations:**

The VR modules designed for scientific experiments shall offer users a unique opportunity to engage in a variety of experiments within a simulated environment. Users can perform a wide range of scientific tasks and experiments without the need for external equipment, thus providing a safe and controlled setting. These modules shall enable users to connect and auto-assemble apparatus, receive guided instructions to conduct experiments and see “virtual” screens that display theoretical concepts (equations, etc.).

# SCOPE OF WORK - II

## **Industrial Environments (Shop Floors):**

The Industrial Simulation VR modules shall aim to provide diverse virtual tours of industrial facilities, meticulously recreating 3D industrial landscapes to showcase important aspects of specific industries. Each module will feature a wide array of machinery utilized within the industry, ensuring comprehensive representation of operational equipment. Detailed explanations of operational processes unique to these industries will be incorporated, aiding users in understanding the intricate workings of industrial processes. The objective is to deliver an immersive and educational experience, enabling users to deeply engage with industrial environments and processes.

## **2. Web Portal**

A comprehensive 3D web platform will be developed to complement the range of VR modules, including machine modules, industrial simulations, and scientific experiments into a unified educational ecosystem. These modules will be hosted on IIT Delhi's intranet, the platform shall serve as a central hub for user lifecycle management, module management, and will also incorporate quizzes and progress bars.

The web platform will encompass all modules and shall be accessible through a laptop's web browser (via WebGL) with the following features:

1. **Academic Content:** Detailed exploration of modules providing a comprehensive understanding of applications, basic concepts, theoretical frameworks, and associated formulae.
2. **Assessments:**
  - Quiz feature enabling users to assess their understanding through MCQs on given topics.
  - Ability for students to review quizzes, access correct answers, and explanations to strengthen their grasp on covered subjects.
  - Educators can upload custom assignments.

# SCOPE OF WORK

## 3. Student Dashboard:

- Offers a comprehensive view of individual progress and engagement.
- Metrics: percentage of module completed, total time spent, performance indicator, and a dynamically updated student level based on completed modules, time spent, and quiz scores.

## 4. Teacher Dashboard:

- Real-time monitoring of student performance and engagement within specified timeframes.

## 5. Admin Dashboard:

- The platform shall provide comprehensive insights into performance across the board and user activity.
- Administrators can utilize graphical representations and branch-wise filtering to gain a detailed understanding of data trends and user engagement.

## 6. Inter-operability:

- This portal will seamlessly integrate with IIT Delhi's LDAP system.

## 3. Suggested/Representative List of Modules

Representative list of modules from Engineering and Sciences:

### Mechanical Engineering

S. No.	Module Type	Module Name
1	Machines	Automatic Recirculation Valve
2		Axial Piston Pump
3		Ball Valve
4		Blast Furnace
5		Butterfly Valve
6		Centrifugal Pump
7		Constant Mesh Gear Box
8		Controllable Pitch Propeller
9		Diesel IC Engine
10		Disc Brake
11		Drum Brake
12		Francis Turbine
13		Hydraulic Steering System
14		Jet Engine
15		Manual Steering System
16		Multistage Centrifugal Pump
17		Pelton Wheel

18		Petrol IC Engine
19		Progressive Cavity Pump
20		Ramjet Engine
21		Turbofan Engine
22		Rotary Vane Pump
23		Scramjet Engine
24		Steam Turbine
25		Three Lobe Pump
26		Turbocharger Air Intake
27		Two Lobe Pump
28		Air Compressor
29		Aircraft Landing Gear
30		Fire Tube Boiler
31		Kaplan Turbine
32		Reactor Cooling Pump
33		Shell And Tube Heat Exchanger
34		Water Tube Boiler
35		Liquid Fuel Rocket Engine
36		Condenser
37		Crossflow Turbine
38		Francis Turbine Blade Design
39		Impeller Design
40		Propeller Turbine
41		Control Rod
42		Cooling Tower
43		Nuclear Reactor Core
44		Fine on Tube Refrigerant to Air Heat Exchanger
45		Scroll Compressor
46		Screw Compressor
47		Rolling Piston Rotary Compressor
48		Thermostatic Expansion Valve
49		Electronic Expansion Valve
50		Forward Curved Centrifugal Fan
51		Backward Curved Centrifugal Fan
52		Evaporative Cooler
53		Hermetic Compressor
54		Semi Hermetic compressor
55		Capillary for refrigeration
56		Refrigerator
57		Split Air Conditioner
58		CNC Machine
59		Electric Vehicle Drivetrain
60		Hydraulic Automatic Transmission
61	Industrial Tours	Central AC Unit
62		Thermal Power Plant
63		Oil Refinery
64		Nuclear Power Plant
65	Experiments	Absorption Chiller
66		Performance Characteristics of Francis Turbine



67		Universal Testing Machine
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## Electrical Engineering

S. No.	Module Type	Module Name
1	Machines	Step-Down Transformer
2		DC Generator Alternator
3		Induction Motor
4		Synchronous Generator
5		SF6 Circuit Breaker
6		Windmill Turbine
7		Lead-Acid Battery
8		Switch Yard
9		Electric Vehicle
10	Industrial Tours	Solar Power Plant
11		Substation
12		Thermal Power Plant
13		Hydro Power Plant
14		Nuclear Reactor
15		Wind Power Plant

## Civil Engineering

S. No.	Module Type	Module Name
1	Machines	Theodolite
2		A Frame Tower Crane
3		Asphalt Paver
4		Bagger 293/Takraf Bagger 293 Bucket-Wheel Excavator
5		Ball Mill
6		Chain Trencher
7		Concrete Mixer
8		Cone Crusher
9		Continuous Miner
10		Crawler Excavator
11		Dragline Excavator
12		Electric Rope Shovel
13		Gravel Pump
14		Gyratory Crusher
15		Jaw Crusher
16		Mobile Crusher
17		Motor Grader
18		Off-Highway Truck
19		Pile Driller Machine/Pile Driver
20		Rebound Hammer
21		Road Header Machine
22		Rockwheel Trencher Cutter
23		Rotary Drilling Rig

24		Total Station
25		Auto Level
26		Survey Level
27		Canal Cross Section
28		Dam Cross Section
29		Grinding Mill
30		Road Roller
31		Concrete Placer Boom
32	Industrial Tours	Water Treatment Plant
33		Road Construction
34		Metro Bridge Construction
35		Bridge Construction
36	Experiments	Nuclear Gauge Density Moisture Soil Testing

### Sciences

S. N o.	Module Type	Branch	Topic
1	Experiments	Physics	Michelson's interferometer
2			Newton's Rings
3			Diffraction Grating
4			Cathode Ray Oscilloscope (CRO)
5			Millikan Oil Drop Experiment
6			Flywheel
7			The Prism
8			Diffraction Grating with He-Ne Laser
9			Quinck's Tube Method
10			Hysteresis Loop
11		Hall Coefficient	
12		Zoology	Dissection of Rat
13			Mitosis
14			Blood Group Test
15			Estimation of Haemoglobin
16			Meiosis
17		SDS page	
18		Chemistry	Titration
19			Thin Layer Chromatography
20			Beer-Lambert Law
21			UV, IR and NMR Spectroscopy
22		Paper Chromatography	
23		Botany	Micropropagation
24			Culture Media
25			Extraction of DNA
26			Bacterial Staining

# EVALUATION CRITERIA

- The vendor should have adequate expertise in developing customized Virtual Reality applications. We need ready-made modules (either 100% ready or at least 90% ready). All the modules need to be ready by the time the tender is floated. The vendor cannot request for exemptions in this regard. Promises regarding developing the modules in the future will not be entertained.
- Vendors must be prepared to deliver a presentation to a technical committee outlining their approach to fulfilling the requirements of IIT Delhi.
- Interested vendors need to submit a proposal with a few links to their VR worlds/videos (maximum 4 pages in the pdf format with hyperlinks enabled). Only shortlisted vendors will be invited to present their VR modules and technology to an IIT Delhi committee sometime between June 1st to August 31st, 2024. Each vendor should be ready with at least 20-30 modules and also prepare a PowerPoint presentation (details to be sent later).
- A committee will evaluate each product and have a subsequent discussion. Note that the committee has full discretion in such matters. It will evaluate the suitability of the product keeping the institution's educational requirements in mind. If it feels that the product is not suitable, then the period of discussion will be very short.
- It should be possible to add third-party user-created modules to the system. Open-XR based technologies are preferred. This will be a key point in the discussion phase.

**Important Dates:**

It is requested that your expression of interest, along with the requested information be submitted latest by 17.06.2024 AT 15.00 Hrs. via e-mail ([jhanisha01@etsc.iitd.ac.in](mailto:jhanisha01@etsc.iitd.ac.in)) along with the self-declaration form in Annexure 1. IIT Delhi reserves the right to reject an EOI.

**Disclaimer:**

*This Eoi is not an agreement and is neither an offer nor an invitation by the Authority to the prospective applicants or any other person. The purpose of this Eoi is to provide interested parties with information that may be useful to them in the formulation of a tender document pursuant to this Eoi. This Eoi includes statements that reflect various assumptions and assessments arrived at in relation to the said activity that may not be entirely accurate. The Authority may, in its absolute discretion, but without being under any obligation to do so, update, amend, or supplement the provided information, assessment, or assumptions contained in this Eoi. The Authority reserves the right to recall the Eoi in its entirety or in part.*

# ANNEXURE I

## Self-Declaration Format

Ref. No.:

To,

The Head

ETSC

Indian Institute of Technology Delhi-110016

Date:

With reference to my/our expression of interest to IIT Delhi, it is hereby declared that no government agency has deemed me/our (name of firm) ineligible for corrupt and fraudulent practices, either permanently or for a specific amount of time (between June 1<sup>st</sup> and August 31<sup>st</sup>, 2024).

I (name of the firm) also declare that all of the information and statements provided herein are accurate, and that there are no contractual constraints, legal disqualifications, or other obligations that would prevent me/us from placing participating in this EoI.

Signature of the Applicant Date:

Place:

Seal