A Proposal for Virtual Reality Lab

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I. Objectives of the Virtual Lab:

The objective of this course is to provide a detailed understanding of the concepts of Virtual Reality and its applications in such a way that the user can bridge a gap virtual world which has a real aspect (virtual realism) with the real sound (auditive realism), and the user feels like part of that environment (haptic realism). This lab will

List of experiments

1. An introduction to the VR system framework and development tools.
2. Basic concept, principles and multidisciplinary features of virtual reality
3. Understanding of microscope and its types using VR.
4. Representation of components of Optical microscope and working principle using VR.
5. Characterization of material (metal, ceramics) using optical microscope.
6. Sample preparation for testing in optical microscope using VR.
7. Observation of Microstructures in a Light-Optical Microscope.
8. Quantitative Microscopy: (i) perform volume fraction analysis manually on a multi-phase sample.
9. Quantitative Microscopy: (ii) manually estimate the grain size and grain boundary surface area per unit volume of a single-phase polycrystal.
10. Quantitative Microscopy: (iii) perform measurements in (i) and (ii) using the image analysis system.

Note: Please list all related experiments available on the web (vlab.co.in) and compare your proposed experiments with them. Please justify why the proposed experiments are needed and exactly what gaps they fill.

II. Target group of users

a. UG (1st Year/ 2nd Year) [highest priority for development]

III. Mapping of proposed lab with AICTE courses as per attached list of potential labs

a. Virtual Reality

IV. Mapping of proposed lab with universities (minimum 3 universities)

- Lingaya's Vidyapeeth- Haryana, Course: B. Tech in Computer Science and Engineering (Virtual and Augmented Reality),

- The NorthCap University- Gurgoan; Course: B. Tech in Computer Science and Engineering (Gaming, AR and VR)
- Poornima University- Rajasthan, Course: B.Sc. (Gaming, Augmented and Virtual Reality)
- Periyar University- Salem Course: B.Voc. in Augmented Reality/ Virtual Reality
- Maya Academy of Advanced Cinematics- Mumbai, Kolkata, Bhopal, Course: VAR Plus (program in Virtual and Augmented Reality)
- School of Design, Sushant Univerisity- Gurgoan, Course: Diploma in AR/VR/MR

V. Expected timelines

Presentation of proposal to domain experts' committee – 31st March 2022
Demo of First 3 Expts and Review – 30th June 2022
Demo of 5-6 Expts and review – 31st August 2022
Demo of 7-10 Expts and review – 31st October 2022
Final demo of 7-10 Expts – 15th November 2022
Hosting of lab (7-10 Expts) – 30th November 2022

Note 1: The LDC will coordinate the reviews and hosting

Note 2: The lab is supposed to be developed and hosted within 6 - 9 months from the date of approval

VI. Budget (Max. Rs 2 Lakhs per experiment with a ceiling of Rs 20 Lakhs per Lab)

Table I. Budget for < Virtual Reality Lab>

S. No.	Equipment/Activity	Budget # (In Rupees)
1	Laptop / Machine High-end computer/laptop/Mobile)	3.0
2	Manpower(*project engineer/scientist*)	6.0
3	Consumables (64 GB VR, high speed internet connection, sensors, camera, recorder, VR 3D Design software etc.)	4.0
4	Contingency	3
5	Honorarium for Lab Developer (Rs 20k per experiment; Ceiling of Rs 2 Lakhs per lab)	2.0
6	Miscellaneous	2.0
TOTAL		**20 Lakhs**

To be released based on the recommendation of the review committee
Note: Institute overheads not to be included in the budget

VII. Justification of the budget requirements

(a) Details of Laptop/Machine
Computer with 16Gb or more RAM, 512 SSD, 1 TB storage, 12GB graphic card /laptop/Mobile

(b) Details of Manpower (number, cost per man-months etc.)

i. Total man-months required

1 project staff

ii. No. of project staff, cost per man-months

1 project engineer/scientist (~Rs. 40k per month)

iii. Honoraria for other staff associated with the project

Honoraria for Faculty developing the Virtual Lab: (A maximum of Rs. 2 lakhs honorarium for the developers & Rs. 25k for reviews)

Honoraria for Other staff associated with the project

Rs. 25k honorarium for the associated staff

(c) Details of Consumables

Procurement of 64 GB VR, high speed internet connection, sensors, camera etc.

(d) Details of Miscellaneous cost

i. Internal Review (Optional, Rs 1000 per experiment)

ii. Field Trials - N.A.-

iii. Others - N.A.-

VIII. Student Feedback and Learning

a. How will you collect feedback and use them?

i. We will collect feedback through feedback (online/offline) form and workshops

ii. There is also an associated email id for providing feedback

iii. An expansion or additional explanation will be added if the need arises.

b. What is the actual learning component provided by the Virtual Lab?

At the end of the course, the students will be able to:

- Understand basics of virtual reality, Generic VR system: and Virtual environment.
- Study about Virtual Hardware (Head-coupled displays, Acoustic hardware, Integrated VR systems) and Software (Modelling virtual world, Physical simulation, VR toolkits, Introduction to VRML) used in the detailed study of virtual reality lab
- Develop different applications (specially focused on innovation in virtual reality) on Virtual Reality.

c. After the Virtual Lab experience, would the student be able to perform the experiment in the real lab?

Yes, after the Virtual Lab experience, the student can perform the experiment in the real lab

ANNEXURE-I

Important information for the development of Virtual Labs

(A Virtual Lab consists of 7-10 experiments)

IX. Link to some sample virtual labs

https://python-iitk.vlabs.ac.in/ https://cs-iitd.vlabs.ac.in/ https://plchla-coep.vlabs.ac.in/

X. Technology Used

a. We will use HTML, CSS and Java Script for front-end design (free and open source)
b. For Back-end we will use JSON (Free and open-source Software)

XI. Required Components for virtual experiments

a. Step by step procedure similar to a physical lab will be drafted for the virtual lab
b. Online manual with aim/objective and underlying theory
c. Pre-test for understanding current status of user
d. Simulator for learning the concept of food technology
e. Post-test questions to check the understanding of student after using virtual lab
f. Related resources (web & NPTEL lectures)
g. Additional help/feedback