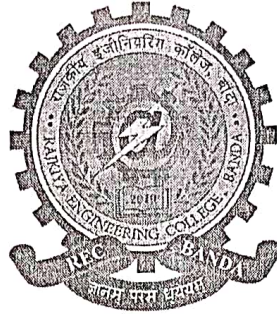
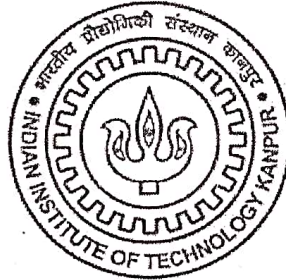


MEMORANDUM OF UNDERSTANDING BETWEEN



Rajkiya Engineering College Banda

AND



Indian Institute of Technology Kanpur

For

**Virtual Lab development on
Basics of Physics Lab-II
and
Basics of Electrical Engineering Lab**

Apr. 2023

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April 17, 2023

Memorandum of Understanding (MoU)

Between

Indian Institute of Technology Kanpur (IITK)

And

Rajkiya Engineering College Banda (REC Banda)

as of April 17, 2023

This Memorandum of Understanding ("MoU") is effective as of April 17, 2023 ("Effective Date") by and between

Indian Institute of Technology Kanpur, a research and educational institution of national importance, established under the Institute of Technology Act, 1961, having its office at P.O. IIT Kanpur, Kalyanpur, Kanpur, U.P.- 208016, India, (hereinafter referred to as "IITK"), of the FIRST PART.

and

Rajkiya Engineering College Banda (Formerly Dr. Bhim Rao Ambedkar Engineering College of Information Technology) was established by the Government of Uttar Pradesh in the year 2010, (hereinafter referred to as REC Banda) of the SECOND PART

The aforesaid institutions are hereinafter referred to individually as "Party" and collectively as the "Parties".

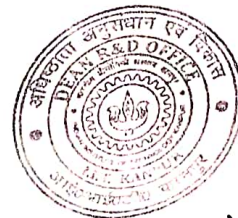
Whereas IITK is one of the premier institutes to provide meaningful education, to conduct original research of the highest standard and to provide leadership in technological innovation for the industrial growth of the country. IITK imparts and undertakes cutting-edge research in various areas of science, engineering, design, management, and humanities.

Whereas Rajkiya Engineering College Banda is engaged in providing UG and PG education and encourages entrepreneurship via start-ups in IoT and agriculture through its Incubation centre. With language lab, central workshop and audio-visual aids, the institute is marching ahead with high speed wi-fi connectivity and state of the art infrastructure.

Whereas Prof. Kantesh Balani (PI), Department of Materials Science and Engineering, IIT Kanpur (hereinafter referred to as "IITK Principal Investigator") will initiate the Project. He and his research team at IITK will execute the obligations of non-disclosure of Confidential Information received from REC Banda.



and



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Dr Ashutosh Tiwari (Co-PI), Department of Applied Science and Humanities, REC Banda (hereinafter referred to as Co Principal Investigator) will execute Virtual Lab development on: (i) *Basics of Physics Lab-II* and (ii) *Basics of Electrical Engineering Lab*. Hereinafter referred to as the "Project".

Whereas the Parties desire to record the broad terms and conditions that are jointly accepted and agreed to in this MoU as contained hereunder.

1. Definition:

(a) REC Banda know-how shall mean and include all know-how of methods, material, software, designs, patterns, formats, proprietary technical literature, and information developed, owned and provided by REC Banda, which are required for the Project.

(b) IITK know-how shall mean and include all know-how of methods, material, software, designs, patterns, formats, proprietary technical literature, and information developed, published or otherwise owned and provided by IITK, which are required for the Project.

(c) REC Banda Personnel shall mean the Dr Ashutosh Tiwari(Co-PI) and Students/Faculty members/Staff members of the REC Banda deputed for the Project.

(d) Principal Investigator Research Team shall comprise the Prof Kantesh Balani (PI) and Students/Faculty members/Staff members of the IIT Kanpur participating in the Project(s) under this MoU.

2. Items/areas of collaboration/deliverables:

Technical specifications of the Project are given in Annexure A to this MoU.

3. Activities and Obligations:

(a) IITK shall be responsible for providing the funds required for the Project, as identified in Annexure B. IITK may depute appropriate IITK personnel to participate in the Project, as per mutual agreement. IITK will provide its facilities and resources for the execution of the Project.

(b) REC Banda will provide REC Banda know-how, which may be deemed necessary for the Project.

(c) REC Banda shall take reasonable steps to prevent IITK know-how, which are meant only for the purpose of conducting the Project, from unauthorized usage or falling into unauthorized hands.

4. Intellectual Property Rights:

Ownership of any intellectual property (including but not limited to confidential information, know-how, patents, copyrights, design rights, rights relating to computer software, and any other industrial or intellectual property rights) developed jointly during the course of this MOU shall be vested in both parties to this MoU.

For commercialization of any intellectual property, the Parties agree to reach a separate agreement covering issues such as exploitation rights and revenue sharing.



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Any publication regarding such intellectual property shall only be possible with the prior notice to the other Parties.

IITK shall be free to use the intellectual property developed during the Project for its own internal teaching, further research, educational and publication.

5. Effective date, duration, termination of the MoU:

The MoU shall be effective from the Effective Date, upon signatures of the Parties and shall remain in force till March 31, 2026). The Parties may extend the term by written agreement signed by both the Parties.

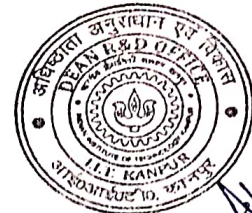
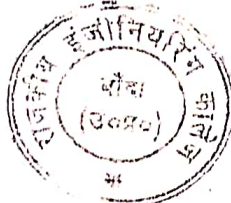
The project work may be terminated by either Party by giving the other Party a written notice of 60 days. However, both parties will ensure that the provisions of this MoU shall continue to apply to all activities in progress until their completion. Clauses relating to Intellectual Property Rights, Governing Laws shall survive the termination or expiration of this MoU.

6. Payment:

Financial specifications are given in Annexure B to this MoU. All cheques will be drawn in favour of the Director, Rajkiya Engineering College Banda.

7. Confidentiality:

- a. Confidential information includes all communication of information disclosed in documentary or tangible form between the Parties, including oral, written and machine-readable form, pertaining to the above which is indicated as confidential. In the case of such information disclosed orally or visually, the disclosing party shall confirm in writing the fact and general nature of each disclosure within (30) days after it is made.
- b. Confidential Information includes information:
 1. Disclosed by or on behalf of the disclosing party to the receiving parties,
 2. Otherwise learned or ascertained by the receiving party from inspection and/or evaluation of sample(s) identified by the disclosing party as confidential and provided to the receiving party by or on behalf of the disclosing party (sample(s)) and/or,
 3. Otherwise learned or ascertained by the receiving party from the disclosing party.
- c. The Receiving Party will not disclose confidential information of Disclosing Party to any other person and use at least the same degree of care to maintain the Information confidential as Receiving Party uses in maintaining as confidential its own confidential Information, but always at least a reasonable degree of care; due diligence will be taken by both Parties in maintenance of Confidential Information.



Signature

- d. The Receiving Party will use the Confidential Information only for the above mentioned purpose.
- e. The Receiving Party will restrict disclosure of the Confidential Information of the Disclosing Party solely to those employees, subsidiaries, parent and affiliated companies of Receiving Party having a need to know such Information in order to accomplish the purpose stated above.
- f. This MoU imposes no obligations on Receiving Party with respect to any portion of the Confidential Information received from Disclosing Party which:
 1. was known to Receiving Party prior to disclosure by Disclosing Party,
 2. is lawfully obtained by Receiving Party from a third party under no obligation of confidentiality,
 3. is or becomes generally known or publicly available other than by unauthorized disclosure,
 4. is independently developed by Receiving Party or
 5. is disclosed by Disclosing Party to a third party without a duty of confidentiality on the third party.
 6. is required by law or decree.
- g. The Confidential Information shall remain the sole property of Disclosing Party.
- h. The obligation of non-disclosure of confidential information shall survive for 3 years after expiry/termination of this agreement.

8. Limitation of Liability:

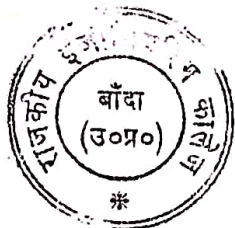
Neither Party, nor any of their affiliates nor their or their affiliates respective directors, officers, employees, subcontractors or agents shall be liable to the other Party for any special, incidental, indirect or consequential damages (including, but not limited to, contract, negligence and tort liability) in connection with or arising out of this MoU.

9. Publicity:

Neither Party shall use the name of the other Party or its employees in any advertisement, press release or publicity with reference to this MoU without prior written approval of the other Party, except for necessary governmental disclosures.

10. Independent Contractors:

For the purposes of this MoU, the Parties hereto are independent contractors and nothing contained in this MoU shall be construed to place them in the relationship of partners, principal and agent, employer/employee or joint ventures.



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11. Amendment:

Any amendment or variation to this MoU shall be made by a written MoU between the Parties.

12. Governing Laws & Conflict Resolution:

This MoU is subject to Indian law. The Parties will try to settle all disputes concerning this MoU in an amicable way. In case of any dispute, the same shall be referred to the Director, Rajkiya Engineering College Banda or his nominee and the Director, IITK or his nominee for arbitration. In case an amicable settlement of any disputes arising out of or relating to this MoU is not achieved then such dispute shall be referred to arbitration in accordance with the provisions of the Arbitration and Conciliation Act, 1996 or any statutory modification/re-enactment thereof and rules made there under. The award of the arbitrator shall be binding on both the Parties. In case, however, the arbitrators are unable to come to a conclusion, then they will appoint an umpire whose decision shall be final and binding on both the Parties. The seat of the arbitration shall be Kanpur. The arbitration shall be conducted in the English language and the award shall be final and binding upon the Parties. Each Party shall bear its own costs of the arbitration unless the arbitrator otherwise directs.

13. Force Majeure:

Each Party shall be excused from performance of the MoU only to the extent that the performance is prevented by conditions beyond reasonable control of the affected Party. The Party claiming excuse for the delayed performance will promptly notify the other Party and will resume its performance as soon as performance is possible.

14. Any Information, Products, Materials, Services, Intellectual Property, Other Property or Rights, granted or provided or generated by IITK pursuant to this MOU are on an As Is Where Is basis.

15. IITK makes no warranties of any kind either express or implied, to REC Banda or any third party, as to any matter including, but not limited to, warranty of fitness for particular purpose, or merchantability, exclusivity or results obtained from use.



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Seal of the parties

In witness thereof, the Parties hereto have signed this MoU on the date, month and year mentioned hereinbefore.

For and on behalf of REC Banda

Signature

Name

Prof. SP Shukla

Designation

Director (Prof. S. P. Shukla)

Date

May 09, 2023

Director
Rajkiya Engineering College
Banda (U.P.)

In the presence of

(S. Chandra Singh)
HOD ME

Witness

For and on behalf of IITK

Signature

Name: Prof. A. R. Harish

Designation: Dean R & D

Date: May 04, 2023

अधिष्ठाता
DEAN
अनुसंधान एवं विकास
Research & Development
आई० आई० टी० कानपुर
I. I. T. KANPUR

In the presence of

Balaram

Witness

Annexure A
Technical specifications

1. Introduction:

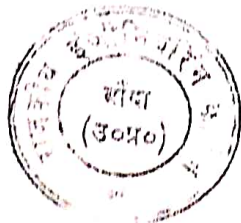
The current work is directed towards development of Virtual Labs for Basics of the Physics Lab. The list of 20 experiments proposed under the Basics of Physics Lab-II and Basics of Electrical Engineering Lab is as follows:

A) Basics of Physics Lab-II:

1. To determine the wavelength of sodium light by Newton's ring experiment.
2. To determine the wavelength of different spectral lines of mercury light using plane transmission grating
3. To determine the wavelength of He-Ne laser light using single slit diffraction
4. To determine the value of acceleration due to gravity (g) using compound pendulum
5. To study Hall effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall effect setup.
6. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil
7. To determine the electrochemical equivalent (ECE) of copper
8. To calibrate the given ammeter and voltmeter by potentiometer.
9. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss
10. To study the resonance condition of a series LCR circuit.

B) Basics of Electrical Engineering Lab:

1. Measurement of power and power factor in a single-phase ac series inductive circuit and study improvement of power factor using capacitor
2. Connection and measurement of power consumption of a fluorescent lamp (tube light).
3. To study running and speed reversal of a three-phase induction motor and record speed in both directions.
4. Demonstration of cut-out sections of machines: dc machine, three phase induction machine, single-phase induction machine and synchronous machine.



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5. Measurement of Operational Amplifier Parameters: Common Mode Gain, Differential Mode Gain, CMRR, Slew Rate.
6. Study of Instrumentation Amplifier.
7. To plot V-I characteristics of SCR.
8. To plot V-I characteristics of TRIAC.
9. Calibration of AC voltmeter and AC ammeter.
10. Verification of Superposition and Thevenin Theorem.

Objectives of Project:-

For each experiment following 07 tabs will be developed:

1. Aim
2. Theory
3. Procedure
4. Pre test
5. Simulator
6. Post Test
7. References

Scope of Work:

- Document Preparation(Round 01 and Round 02 documents will be prepared by REC Banda)
- Simulator codes will be prepared by REC Banda as per the Round 01 and Round 02 documents
- Round 01 document, Round 02 document and Simulator codes for all the 10 proposed experiments will be handed over by REC Banda to IIT Kanpur.
- IIT Kanpur will upload these documents and the codes in the Git repository of the virtual labs for review
- Comments obtained after the review will be shared by IIT Kanpur to REC Banda
- REC Banda will improve the documents and the codes as per the review comments
- Improved document and codes will be again handed over by REC Banda to IIT Kanpur



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- IIT Kanpur will upload these improved documents and the codes in the Git repository of the virtual labs for further review
 - This process will continue till the developed experiment is accepted and hosted on the virtual lab portal

PERIOD OF MoU AND ITS EXTENSION

This MoU comes into effect from the date of its signing and will remain in force till 31st March 2026 . Its validity can be extended by mutual agreement between both the parties.

Deliverables:

- Round 01 Document of the proposed 10 virtual lab experiments for the Basics of Physics Lab
- Round 02 Document of the proposed 10 virtual lab experiments for the Basics of Physics Lab
- Simulator codes of the proposed 10 virtual lab experiments for the Basics of Physics Lab

Role of the REC Banda:

To Create Virtual Labs for 20 experiments proposed under the Basics of Physics Lab-II and Basics of Electrical Engineering Lab is as follows:

A) Basics of Physics Lab-II:

1. To determine the wavelength of sodium light by Newton's ring experiment.
2. To determine the wavelength of different spectral lines of mercury light using plane transmission grating
3. To determine the wavelength of He-Ne laser light using single slit diffraction
4. To determine the value of acceleration due to gravity (g) using compound pendulum
5. To study Hall effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall effect setup.
6. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil
7. To determine the electrochemical equivalent (ECE) of copper
8. To calibrate the given ammeter and voltmeter by potentiometer.



Signature

- 9. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss
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- 1. Measurement of power and power factor in a single-phase ac series inductive circuit and study improvement of power factor using capacitor
- 2. Connection and measurement of power consumption of a fluorescent lamp (tube light).
- 3. To study running and speed reversal of a three-phase induction motor and record speed in both directions.
- 4. Demonstration of cut-out sections of machines: dc machine, three phase induction machine, single-phase induction machine and synchronous machine.
- 5. Measurement of Operational Amplifier Parameters: Common Mode Gain, Differential Mode Gain, CMRR, Slew Rate.
- 6. Study of Instrumentation Amplifier.
- 7. To plot V-I characteristics of SCR.
- 8. To plot V-I characteristics of TRIAC.
- 9. Calibration of AC voltmeter and AC ammeter.
- 10. Verification of Superposition and Thevenin Theorem.

Role of IIT Kanpur:

IIT Kanpur will provide necessary funds for the development of the virtual labs as mentioned in the Annexure B.



Adhikari