



### 3.7.1 MoUs Supporting Documents Index Sheet

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## RV College of Engineering®

Mysore Road, RV Vidyaniketan Post,  
Bengaluru - 560059, Karnataka, India

Autonomous Institution  
Affiliated to Visvesvaraya  
Technological University,  
Belagavi

Approved by AICTE,  
New Delhi

principal@rvceedu.in

www.rvceedu.in

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+91-80-68188111

+91-80-68188112

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29	2020	WIPRO & IISc, Bengaluru	301
30	2020	NASSCOM Foundation, New Delhi	346
31	2020	Greaves Cotton Ltd	434
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43	2018	Mercedes Benz India Ltd., Pune	485
44	2018	Happy Mongo Online Solution Pvt. Ltd.	496





RV College of  
Engineering®

*Go, change the world*

**RV College of Engineering®, Bengaluru - 59**

*(Autonomous Institution Affiliated to VTU, Belagavi)*



*Has great pleasure in inviting you for  
the inauguration of*



# **Indian Women in 3D Printing**

## **Student Chapter & Signing of MoU**

**On 9<sup>th</sup> March 2023, Thursday at 10.00 am**

**Venue: IEM Seminar Hall**

**Dr. Kavya Shree Kumar**

*Founding Chairwoman, Indian Women in 3D Printing*

*Will be the Guest of Honour*

**Dr. L Jyothish Kumar**

*President - Additive Manufacturing Society of India & Founder, RAPITECH Solutions Inc*

*Has consented to be the Chief Guest*

**Dr. K N Subramanya**

*Principal, RVCE*

*Will preside*

**All departments Heads, Deans and Faculty are invited  
for the function.**

**Prof. Shruthi M N**

**Assistant Professor, Dept. of IEM, RVCE**

**Dr. C K Nagendra Guptha**

**Associate Prof. & Head, Dept. of IEM, RVCE**



# Inauguration of Indian Women in 3D Printing Student Chapter & Signing of MoU

**Date: 9<sup>th</sup> March 2023**
**Time: 10.00 – 11.00 am**

## Agenda

09.50 am	Assembly	
10.00 am	Lighting the lamp	<b>Guests</b>
10.05 am	Welcome Address	<b>Dr. C K Nagendra Guptha</b> <i>Associate Professor and Head, Dept. of Industrial Engineering &amp; Management, RVCE</i>
10.10 am	Chief Guest's Address	<b>Dr. L Jyothish Kumar</b> <i>President - Additive Manufacturing Society of India &amp; Founder, RAPITECH Solutions Inc</i>
10.25 am	Guest of Honour	<b>Dr. Kavya Shree Kumar</b> <i>Founding Chairwoman, Indian Women in 3D Printing</i>
10.40 am	Principal Address	<b>Dr. K N Subramanya</b> <i>Principal, RVCE</i>
10.50 am		<b>Signing of MoU</b> <i>By Dignitaries</i>
10.55 am	Vote of Thanks	<b>Prof. Shruthi M N</b> <i>Assistant Professor, Dept. of Industrial Engineering &amp; Management, RVCE</i>
<b>MOC – Ms. Vaishanvi Yadav, III Semester, Dept. of IEM, RVCE</b>		



एसएमपीएस इलेक्ट्रिक कंट्रोल प्राइवेट लिमिटेड  
SMPS ELECTRIC CONTROL PRIVATE LIMITED  
(Startup India Regd. No: DIPP80506 & Startup Odisha Regd. No: OSP/SP/01094)

CIN: U31909OR2021PTC035471 PAN: ABFCS3539R TAN: BBNS10777E GST IN: 21ABFCS3539R1ZW

Ref: SMPS/R&D/PO/02/2023/004

Dt.- 06.02.2023

To,

The Dean (R&D)

M/s. R.V. College of Engineering

8<sup>th</sup> Mile, Mysore Road, RVV Post, Bengaluru- 560059

GST IN: 29AAATR0758A1ZP

Contact: +91-9901745089 / Email: [narasimhamurthyhn@rvce.edu.in](mailto:narasimhamurthyhn@rvce.edu.in)

### **Purchase Order: R&D -2**

Kind Attn. to: Prof. H N Narasimha Murthy, PhD

Sub: Purchase order for R&D and Consultancy Project.

Ref.: Your Budgetary Offer vide email, Date. 04.02.2023

Dear Sir,

With reference to above subject and reference, we are herewith placing a purchase order on your esteemed institution to carryout research, design and detailed engineering activities with following details.

Sl. No	Schedule of item	Qty.	Price per unit (in INR)	Total Amount (in INR)
1	Design, detailed engineering, schematic development, PCB designs, industrial IOT development, firmware development and hardware implementation support, including local travel overheads and contingencies. Title: Automation for Telecom Tower Infrastructure Control and Monitoring (TTIM) System -- iIOT Project.	1	90,000	90,000
GST @ 18%				16,200
Total payable amount incl. all taxes (In words One Lakh Six Thousands and Two Hundreds only)		G. Total Amount		1,06,200/-

The detailed about the project is given bellow.

(A Unit of Green & Smart Power Electronics Innovative Manufacturing hub in India)

Regd. Office: LP-110, 2<sup>nd</sup> Floor, Prasanti Vihar, KIIT Post, Bhubaneswar, odisha – 751024, (India)

Factory: No- 1381/6976, Mahaveer Colony, Adhalia, PO- Phulnakhara, Dist.- Cuttack, Odisha – 754001, (India)

Email: [smpselectric@gmail.com](mailto:smpselectric@gmail.com) / [info@smpselectric.com](mailto:info@smpselectric.com) ([www.smpselectric.com](http://www.smpselectric.com))

Contact: +91 – 8763334953 / 9437124972 / 7077880478 / 7008231400/ 9178531088/ 8072566791

## Automation for Telecom Tower Infrastructure Control and Monitoring (TTIM)

### **Problem Statement:**

Development of an industrial IoT based platform for live control and monitoring of Telecom tower Infrastructure.

### **Proposed solution:**

It is proposed to develop an iIoT based telecom tower infrastructure control and monitoring system involving the following activities:

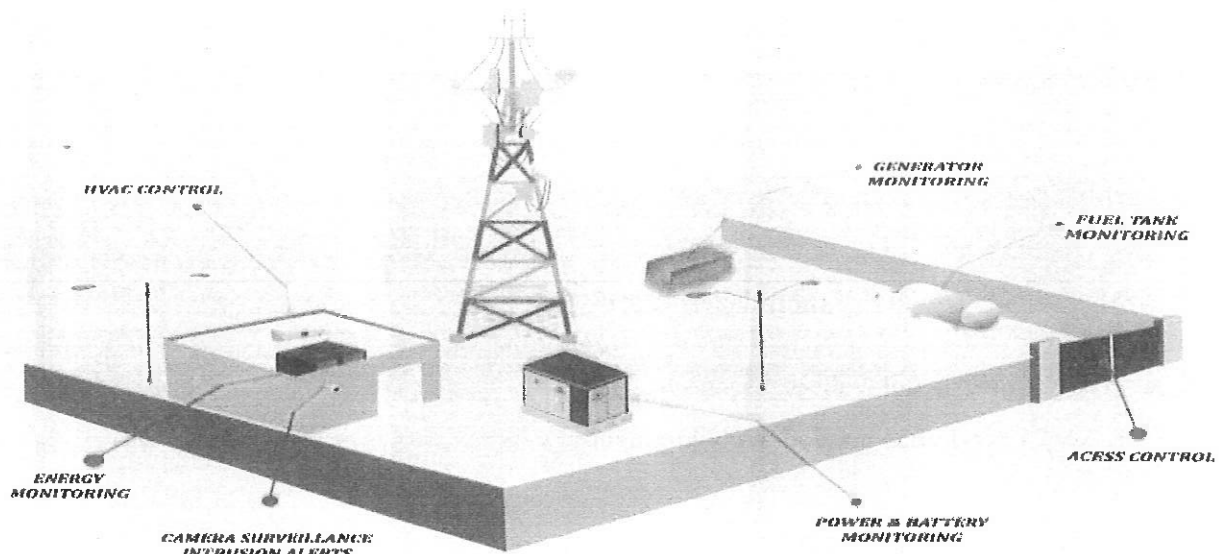
- Phase 1: Identification of the infrastructure units and their parameters (including their range and type) to be monitored. Selection of appropriate sensors and development boards for the parameters to be monitored.
- Phase 2: Design and implementation of interfacing / signal conditioning circuits.
- Phase 3: Development of appropriate Firmware for data acquisition and publishing the data over MQTT along with Proof of Concept.
- Phase 4: IoT integration and platform development
- Phase 5: Field testing of iIoT based Remote monitoring of Telecom tower infrastructure
- Phase 6: Performing Phase 1 – 6 for geographically distributed remote telecom tower monitoring.

### **Project Methodology:**

The architecture of the Telecom Tower Infrastructure is presented as below:

*Space kept intentionally blank*





**DG Set and Fuel Tank Monitoring:**  
Fuel level, Vibration, Noise, Temperature, consumption, hours of operation · per day, speed, voltage, current, Power Factor, Kilowatt hour, frequency.

**Li-ion / LFP Battery Monitoring:**  
DC current, DC Voltage, Temperature.

**Automation for TTIM System**

**SMPS based CCU Monitoring\*:**  
DC and AC Voltage, current, Kilowatt hour, frequency  
• RS 485 interface from the SMPS module is available. The list of register mapping shall be carried out mutually along with SMPS team and IOT team.

**Power Grid Monitoring:**  
Voltage, current, Frequency, Power Factor, Kilowatt hour.

**Surveillance System Monitoring:**  
Video stream from three IP cameras, Movement monitoring only.



Work involves	Responsibility of RVCE	Responsibility of SMPS Electric
	<ol style="list-style-type: none"> <li>1. Identification of sensors and development boards</li> <li>2. Interfacing of sensors and development board for data acquisition</li> <li>3. Firmware development for data acquisition, signal conditioning, conversions and processing</li> <li>4. Publishing acquired data over MQTT</li> <li>5. Power subsystem and PCB Design</li> <li>6. IoT integration and platform development</li> <li>7. Field testing of IoT based Remote monitoring of Telecom tower infrastructure</li> <li>8. Cloud Infrastructure development for geographically distributed tower monitoring</li> <li>9. Integration of surveillance system</li> <li>10. Hardware PCB design, BOM list preparation, Firmware development and necessary detailed engineering required to interface with the existing electrical systems in BTS to take real-time data from field.</li> </ol>	<ol style="list-style-type: none"> <li>1. Specifications of Telecom tower infrastructure units</li> <li>2. Procurement of required sensors and development boards (including redundancy for testing)</li> <li>3. Providing available data sets</li> <li>4. Review and approval of firmware and system</li> <li>5. Finalization of cloud deployment strategy</li> <li>6. storing or monitoring camera stream to be finalized</li> <li>7. Module fabrication, Component procurement, Prototype Model Preparation, Lab Testing and site validation, Piloting.</li> </ol>

#### General Terms & Condition:

- 1). This PO is valid for payment on: to deliver R&D and consultancy services.
- 2). **The delivery Address:**  
Ms. SAGARIKA KHATUA,  
SMPS ELECTRIC CONTROL PRIVATE LIMITED  
**2<sup>nd</sup> Floor, LP-110, Prasanti Vihar, KIIT Post, Bhubaneswar, Patia, Odisha-751024, India**
- 3). 50% advance payment will made upon acceptance of this PO. And rest 50% shall be paid on successfully completion of the project.
- 4). The institution needs to send the original invoice, all the source design files, test reports, operational procedure.



5). The Billing invoice to be generated on the name and address given bellow.

SMPS ELECTRIC CONTROL PRIVATE LIMITED

Address: 2<sup>nd</sup> Floor, LP-110, PRASANTI VIHAR, KIIT POST PATIA,  
BHUBANESWAR, ODISHA- 751024, INDIA

6). The delivery of the project design should be completed within 60 days from the date of issue of this PO. However, during hardware implementation and integration work to be carried out by SMPS Electric at site and necessary support needs to be extended by M/s. RVCE. Further M/s. RVCE is slowly responsible for successful commissioning of this project along with SMPS Electric Control Private Limited. If at any stage, M/s. RVCE could not able to perform upto the industry standard then the said PO will get cancelled automatically and payment needs to be refunded.


7). All the design, patent and copy rights etc. IPs shall belongs to M/s. SMPS Electric Control Pvt. Ltd only, hence the RVCE need to handover all the design blue prints/ source files to the purchaser. And the same design cannot be resold to anyone.

We are expecting a better service and for a long term relationship with your esteemed institution. The institute is herewith requested to sign in all pages with seal and send to us on same as the proof of acceptance of this PO.

Thanking You

Yours Sincerely,

**For SMPS ELECTRIC CONTROL PRIVATE LIMITED.**

  
**[SAGARIKA KHATUSA]**  
**Chief Executive Officer**



**Acceptance of PO:**

I am (Name) \_\_\_\_\_, (Designation) \_\_\_\_\_, on  
behave of M/s. R.V. College of Engineering, Bangalore is herewith accepting this purchase order  
along with all the terms & conditions and is herewith committing to execute the work within schedule  
of time.

Date:

Signature with Seal



एसएमपीएस इलेक्ट्रिक कंट्रोल प्राइवेट लिमिटेड  
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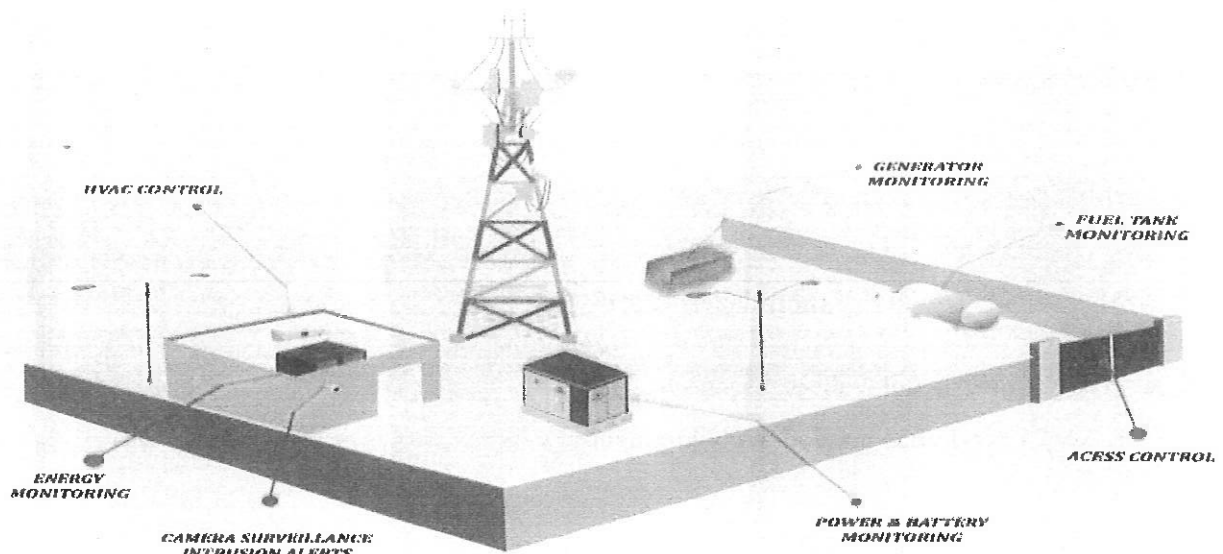
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Thanking You

Yours Sincerely,

**For SMPS ELECTRIC CONTROL PRIVATE LIMITED.**

  
**[SAGARIKA KHATUSA]**  
**Chief Executive Officer**



**Acceptance of PO:**

I am (Name) \_\_\_\_\_, (Designation) \_\_\_\_\_, on  
behave of M/s. R.V. College of Engineering, Bangalore is herewith accepting this purchase order  
along with all the terms & conditions and is herewith committing to execute the work within schedule  
of time.

Date:

Signature with Seal



RV College of  
Engineering®

Placement RVCE <placement@rvce.edu.in>

---

## Date for Aeromodelling finals - 29th April 2023

---

Mummaneni, Sampathkumar <sampathkumar.mummaneni@boeing.com>

Mon, Mar 27, 2023 at 4:14  
PM

To: Placement RVCE <placement@rvce.edu.in>, Pavan Ponnaganti <pavan@playtolabs.com>

Cc: "Sharma, Ritu" <ritu.sharma@boeing.com>, "Anganakurussi, Rajesh" <rajesh.anganakurussi@boeing.com>, "Aroor, Nanditha" <nanditha.aroor@boeing.com>, "Kumar, Anubhav" <anubhav.kumar@boeing.com>, "Vashist, Parikshit" <parikshit.vashist@boeing.com>

Dear Dr.Ranganath and Pavan,

Kindly lock 29<sup>th</sup> April as the date for Aeromodelling finals.

Thank You,

**Sampath K Mummaneni**  
Project Management Spec  
+91-9502284749





RV College of  
Engineering®

Placement RVCE <placement@rvce.edu.in>

## RVCE Aeromodelling funds - \$12000

Mummaneni, Sampathkumar <sampathkumar.mummaneni@boeing.com>

Fri, May 19, 2023 at 5:48 PM

To: Placement RVCE <placement@rvce.edu.in>

Cc: "Sharma, Ritu" <ritu.sharma@boeing.com>, "Anganakurussi, Rajesh" <rajesh.anganakurussi@boeing.com>

Dear Dr.Ranganath,

As mentioned below in the funding plan, \$12000 was reserved for recently concluded 8<sup>th</sup> edition of Aeromodelling finals.

Kindly use this amount to close the bills for the event.

If any amount of grants remain post settlement, kindly reserve them for next edition of finals.

Regards,

Sampath

**From:** Mummaneni, Sampathkumar  
**Sent:** Friday, September 16, 2022 1:08 PM  
**To:** 'placement@rvce.edu.in' <placement@rvce.edu.in>  
**Cc:** Aroor, Nanditha <nanditha.aroor@boeing.com>  
**Subject:** RE: 2022 Boeing HER funding for RVCE

Dear Prof.D.Ranganath,

Corrected the total amount. Apologies.

Here is a much more elaborated funding plan. I've also attached this for you to upload along with the application.

Funding Category	Dollar Amount (USD)	Approximate # of individuals reached	Short Description
	Scholarships - Engineering	4,800	2-4 University will use the funds to provide scholarships to at least two (2) deserving students that wish to pursue career in the Aerospace industry. University will choose the students and distribute the money directly. University shall share with Boeing the



Grand Total		600+			details of the students receiving the scholarship.
	Student Projects		12,000	100+	University will use funds to plan and conduct workshops to inculcate critical “design to build” experience which will positively impact students' exposure to practical engineering problems.  Workshops should broaden & deepen student outreach and engagement to engineering student community from other colleges and schools also, especially those from the “interiors/hinterland” of India who are otherwise not reached through conventional programs. Funds will also be used to award prizes to top teams in the national finals.
	Outreach & Retention Programs		5,200	500+	University will use the funds to organize outreach events and regional workshops that will benefit the student community.
	22,000				

Regards,

Sampath

---

**From:** Mummaneni, Sampathkumar  
**Sent:** Thursday, September 15, 2022 3:57 PM  
**To:** 'placement@rvce.edu.in' <placement@rvce.edu.in>  
**Cc:** Aroor, Nanditha <nanditha.aroor@boeing.com>  
**Subject:** 2022 Boeing HER funding for RVCE

Dear Prof.D.Ranganath,

Thanks for your time today.

As mentioned in the meeting, here are the 2022 Boeing HER funding details for RVCE:

<b>Scholarships</b>	<b>\$4800</b>
---------------------	---------------



Connect.  
Protect.  
Explore.  
Inspire.

# University Outreach & Internship Proposal

## 2018-19





## COMMERCIAL AIRPLANES

Boeing 7-series family of airplanes leads the industry



## DEFENSE, SPACE & SECURITY

World's largest manufacturer of military aircraft and satellites and major service provider to NASA

Large-scale systems integration, networking technology and solutions provider



## GLOBAL SERVICES

A dedicated services business focused on the needs of global defense, space and commercial customers



## BOEING CAPITAL CORPORATION

Financing solutions focused on customer requirements



Connect and protect people globally



**\$94.6  
BILLION**

in 2016 revenues

Products and services support  
to customers in more than  
**150 COUNTRIES**



Manufacturing, service and  
technology partnerships  
with companies around  
the world

Contracts with more than  
**20,000**  
suppliers and  
partners globally

More than  
**140,000  
BOEING  
EMPLOYEES**



across the  
United States and  
in more than  
**65 COUNTRIES**

Research, design  
and technology-  
development  
centers and  
programs in  
multiple countries



of commercial  
airplane revenue  
historically  
from  
customers  
outside the  
United States



Partnering worldwide for mutual growth and prosperity

# Boeing in India



**1,500+**

Direct employees



**7,000+**

Employed through partners



**\$1+<sup>BN</sup>**

Annual spend



**Five IITs + IISc**

Academic partners



**12**

Research & Development partners



**160+**

Supplier partners



**1**

Manufacturing Joint Venture



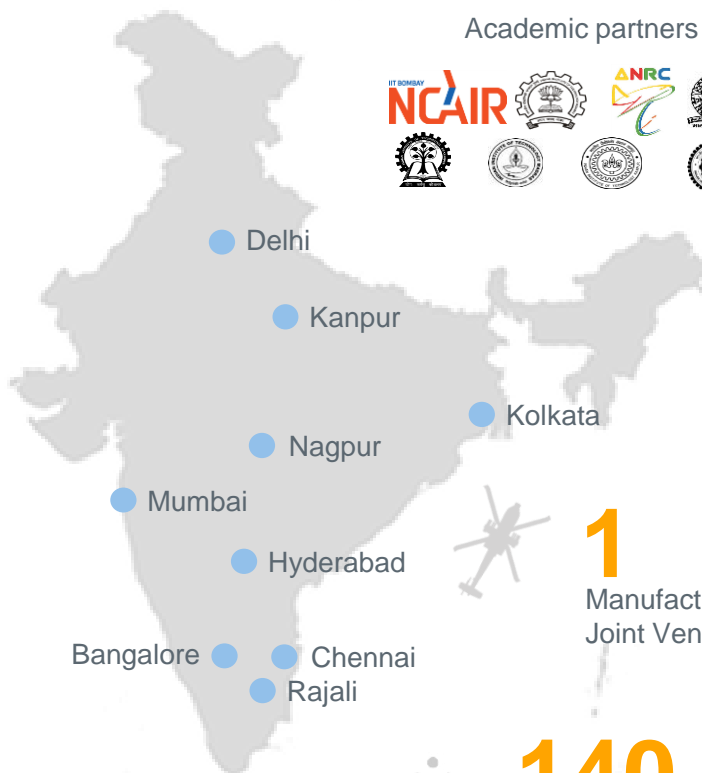
**140,000+** Lives improved

**100+** Workers skilled

**650** Toilets built pan-India

**280+** STEM scholarships

**5,000+** Aero modelers encouraged



# University Outreach & Internship Proposal

## Objectives

1. Expose students to Aerospace & to Boeing
2. Mentor students interested in career in Aerospace
3. Provide internship opportunities to interested students to work on exciting projects at Boeing's Engineering & Technology Center

## Responsibility of Colleges

- Organize sessions – invite students, faculty, industry experts etc.
- Provide facilities at the campus
- Branding of the event
- Other support

## Support from Boeing

- \$3K grant per year
- Visit by Boeing leaders
- Stipend for internships paid by Boeing to Universities

\* Based on business requirements

## Outreach Events : Oct to May

- **Interactive sessions by Boeing Leaders (1 per year)**
  - Aerospace Industry
  - Boeing
  - Boeing in India
- **Overview of innovation at Boeing (1 per year)**
  - Overview of research @ Boeing's Engineering & Technology Center
  - Workshops/Seminar/Talks
- **Promotion for women engineers (1 per year)**
  - Talk by Women Leaders at Boeing to encourage women to enter the Aerospace industry

## Internships at BIETC : June - Aug

- **~4 internships per year**
  - Stream : Mech./Elec./Computer/Aero/IT
  - BTech & MTech (Split To Be Decided)
- **Interviews in March/April**
  - Virtual (VTC/ Telecon)
- **Opportunity for Pre Placement Offers\***
  - Based on performance during internship



# Ground Rules & Next Steps

## Selection Criteria for Universities

1. Student talent pool
2. Non-Profit Organization
3. Operational excellence in conducting the outreach events

## Operational Rules

1. Stipend for internship will be paid by Boeing to Universities, which can be distributed to the students.
2. Boeing reserves the right to add/drop new Universities every year
3. Information on funds utilization and data on student groups and start-ups to be submitted to Boeing
4. Boeing will assign a focal to work with each Incubator
5. No escalation of grant year on year

## Next Steps

1. Please confirm your participation by email no later than 20<sup>th</sup> July 2018
2. Fill the paperwork that Boeing will share
3. Assign a focal to work with Boeing

**Thank You!**

20.3.2023	Wizergos Software Solutions Private Limited	Low code developer training	Curriculum & content creation, deliver training on regular basis, joint certification by both the parties for trainees	2 Years
-----------	---	-----------------------------	--	---------



## Involvement of students in consultancy

*Go, change the world<sup>®</sup>*

**Industry : JP Morgan Chase Pvt. Ltd.**

**PI : Dr. Sagar BM**

**Co-PI : 1. Dr. Padmashree T  
2. Prof. Rekha BS**

**Students Involved: 1. Sanjana Patwari  
2. Krishna Dwaipayan  
3. Akshat Gada  
4. Adarsh U**

**Time Duration: 12-Months**

### Proposed Work

1. Use ZK-Proof to detect malicious transactions.
2. Authenticating the source of transaction
3. End-to- end Blockchain based Secure prototype development for transaction processing.



MoU with  
JPMC



Phase-1 Demonstration  
@ ISE, RVCE



Innovation Conference  
@JPMC





RV Educational Institutions  
RV College of Engineering

Autonomous  
Institution Affiliated  
to Visvesvaraya  
Technological  
University, Bengaluru

Approved by AICTE,  
New Delhi

## STATEMENT OF WORK

### Research and Consultancy services

This Statement of Work has been made and entered into on 15th of November 2023 as per the MoU, dated 15<sup>th</sup> of November 2023.

#### BETWEEN

- (1) **Greeneria Renewable Technologies Pvt. Ltd.** whose registered office is at #1875, 28th C Main, 9th Block Jayanagar East End, Bangalore South, Bangalore – 560069 ("**Greeneria**")
- and
- (2) **R V College of Engineering**, Mysuru Road, Bengaluru- 560059, India ("**RVCE**").

#### BACKGROUND:

- A. This SOW is issued pursuant to the Memorandum of Understanding dated November 15, 2023 ("**MoU**") between **Greeneria** and the **RVCE** and incorporates all the terms and conditions therein.
- B. Pursuant to clause 2(c) of the **MoU**, **RVCE** has agreed to execute the Research Consultancy services set out in this SOW.

#### THE PARTIES HEREBY AGREE AS FOLLOWS:

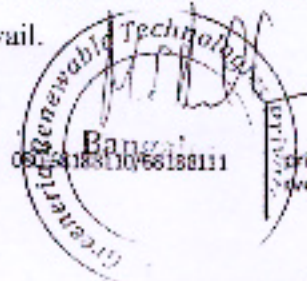
##### 1. Term

- 1.1. This SOW will be deemed to have commenced on the Effective Date and will continue until the completion of Services, unless terminated earlier pursuant to clause 8 of the **MoU**.

##### 2. Incorporation by Reference and Conflict:

- 2.1. The provisions of the **MoU** are hereby incorporated by reference and will govern the performance of the Parties under this SOW. In the event of any inconsistency or conflict between the terms and conditions of this SOW and those of the **MoU**, the terms of this SOW will prevail.

Mysore Road, RV Vidyaniketan  
Post, Bengaluru - 560059,  
Karnataka, India



principal@rvce.edu.in  
rvce.edu.in

Sreeharshav.k

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Institution Affiliated  
to Vellore Institute of  
Technology  
University, Vellore

Approved by AICTE,  
New Delhi

- 2.2. Where the MoU terminates before this SOW for whatever reason, the general provisions of the MoU shall still have full legal effect in relation to this SOW until the termination of this SOW occurs.

3. **Key Personnel and team details :**

- 3.1. The Parties appoint the following individuals (as amended) to perform the Services:

**Greeneria - Key Personnel**

M.S.R Kumar  
Managing Director  
director@greeneria.in  
8861921167

**RVCE - Key Personnel**

Dr. Vinutha Moses  
Assistant Professor  
Department of Chemical  
Engineering  
vinuthamoses@rvce.edu.in  
+91 90085 05123

3.2. **Team details:**

Sl No	Name	Role
1.	Dr. Vinutha Moses Assistant Professor Department of Chemical Engineering RV College of Engineering	Expert - Technology development Waste segregation and Enzyme Hydrolysis
2.	Dr. Vidya C Assistant Professor Department of Chemical Engineering RV College of Engineering	Expert - Technology development
3.	Anupama V Joshi Assistant Professor Department of Chemical Engineering RV College of Engineering	Project coordination, Process design, Technology development
4.	Dr. Saraswathi K Associate Professor Department of Electronics and Telecommunications RV College of Engineering	Expert - Process Automation and sensor-based technologies



Sreeharshini





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Technological  
University, Bengaluru

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New Delhi

#### 4. Scope of Work/Services

- 4.1. RVCE shall undertake the following Research consultancy Services and/or produce the following deliverables pertaining to design and development of Automatic waste segregation of Municipal Solid Waste for 0.5 TPH – 1 TPH capacity.
- 4.1.1. RVCE shall develop the necessary references related to municipal solid waste segregation.
- 4.1.2. RVCE shall identify components for procurement and inhouse manufacturing and provide design suggestions accordingly.
- 4.1.3. RVCE shall provide process flow diagram, component sizing, suggest automation.
- 4.1.4. RVCE shall provide necessary inputs for the fabrication drawings and review the drawings.
- 4.1.5. RVCE shall identify suitable vendors for procurement/fabrication of components that are identified for outsourcing.
- 4.1.6. RVCE shall provide ongoing feedback and reports on developments as they proceed.

#### 5. Arising Intellectual Property Rights

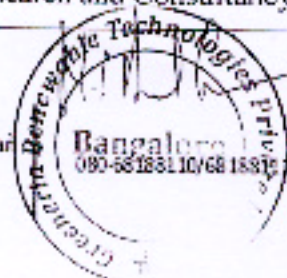
For the avoidance of doubt, the assignment of Arising Intellectual Property Rights subsisting in the Deliverables pursuant to clause 5 of the MoU shall take effect from the date on which the relevant Deliverable(s) is or were created, developed and/or produced in favour of the recipient of the Services under this SOW.

#### 6. Payment:

- 6.1. In consideration for the Services provided under this SOW, Greeneria agrees to bear the cost of Research consultancy work for the development of an Automatic Waste Segregation Unit.

Description	Payment (Indian Rupees)
Conduction of preliminary studies	Rs.2,00,000(Received)
Cost of components of Automatic Waste segregator unit	Rs. 35,00,000
Research and Consultancy Charges	Rs. 10,00,000/-

Mysore Road, RV Vidyaniketan  
Post, Bengaluru - 560059,  
Karnataka, India



principal@rvce.edu.in  
rvce.edu.in

Sreeharshuk

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Technological  
University, Bengaluru

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New Delhi

The total cost of the project may come to Rs, 50,00,000/- approximately and the same may vary depending on the cost of components that are to be procured. The project cost is based on the estimations discussed in Annexure-I to this document.

- 6.2. For the avoidance of doubt, RVCE shall not incur or book any expenses over and above quoted value whatsoever with the prior consent of Greeneria. Such expenditure shall be supported by original receipts, tickets (or other evidence verifying such expenditure to the reasonable satisfaction of Greeneria).

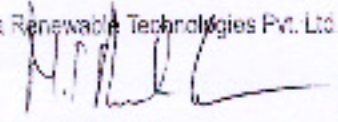
**THIS STATEMENT OF WORK IS AGREED** by the Parties through their duly authorized representatives.

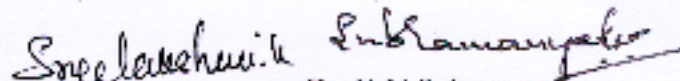
Signed for and on behalf of:

For Greeneria Renewable Technologies Pvt. Ltd.

For RV College of Engineering

For Greeneria Renewable Technologies Pvt. Ltd.

  
M. S. R. Kumar  
Managing Director

  
Dr. K. N. Subramanya  
Principal  
PRINCIPAL  
RV COLLEGE OF ENGINEERING  
BENGALURU - 560 059



RV Educational Institutions<sup>®</sup>  
RV College of Engineering<sup>®</sup>

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Technological  
University, Bengaluru

Approved by AICTE,  
New Delhi

## ANNEXURE-I

Details of estimated cost of Automatic Waste Segregation Unit (AWSU) for Municipal Solid Waste

Table 1: Cost of components of AWSU

Sl No	Name of the component	Fabrication plan	Quantity	Approximate cost, Rs in Lakh
1	Belt Conveyors	In-house	5	10
2	Collection bin + Bag opener and Fabric catcher	In-house	1	5
3	Magnetic drum	Procurement	1	3
4	Eddy Current Separator	Procurement	1	6
5	Vacuum Hood + Fly nozzle+ Compressor	Procurement	1	3
6	Vibrating screen + water spray wash	Procurement	1	3
7	Frames Covers- Motors	In-house/ procurement	Not finalized yet	5
	Total			35



*Sreeharshuk Subramanyam*

PRINCIPAL  
RV COLLEGE OF ENGINEERING  
BENGALURU - 560 059





RV College of  
Engineering®

Placement RVCE <placement@rvce.edu.in>

---

## Fwd: Project Proposal and Assistance

---

**Narasimha Murthy H.N.** <narasimhamurthyhn@rvce.edu.in>  
To: Placement RVCE <placement@rvce.edu.in>

Tue, May 28, 2024 at 2:13 PM

----- Forwarded message -----

From: <sridevibs@eaplindia.com>  
Date: Tue, Jun 13, 2023 at 10:15 AM  
Subject: RE: Project Proposal and Assistance  
To: Narasimha Murthy H.N. <narasimhamurthyhn@rvce.edu.in>

Dear sir,

Thank you for your proposal on three projects discussed during your visit.

We shall discuss with our management and mail you the details.

Regards

Sridevi B.S.

---

**From:** Narasimha Murthy H.N. <narasimhamurthyhn@rvce.edu.in>  
**Sent:** 10 June 2023 12:12  
**To:** sridevibs@eaplindia.com  
**Cc:** Ashok Gadavi <aggadavi@gmail.com>; Renuka Prasad B. <renukaprasadb@rvce.edu.in>; ashokshanbhag@eaplindiamail.com; Nagaraj R <nagarajr@eaplindia.com>; Ravishankar Holla <ravishankarholla@rvce.edu.in>; Deepika Kripanithi <deepikak@rvce.edu.in>  
**Subject:** Re: Project Proposal and Assistance

Submission of proposals

Dear Sir / Madam

Many thanks for providing opportunities to our faculty to work on industry based projects.

As per our discussion and your mail, we are here submitting three project proposals for your perusal.

Kindly scrutinise the proposals and edit the same as per your requirement. We are open to modifying the proposals in all respects.

Regarding the tool design, assembly automation projects and patent support, we shall schedule our visit after 15 June as per the advice of the Managing Director - EAPL., Mr. Ashok Shanbhag

Looking forward to hearing from you.

Thanking you with regards

Yours sincerely,

Dr. H N Narasimha Murthy

Professor and Dean R&D

Mechanical Engineering

RV College of Engineering

Bengaluru -59

On Sat, Jun 3, 2023 at 5:48 PM <[sridevibs@eaplindia.com](mailto:sridevibs@eaplindia.com)> wrote:

Dear Sir,

Greetings from EAPL.

Thank you for visiting us and providing your valuable suggestions. We are currently finalizing the EMS- IOT and Time switch projects, and the validation process is underway.

As previously discussed, we are interested in your support for the development of the following projects.

1. Ethernet connectivity for Annunciators and Energy Meters.
2. EAPL app on Android.
3. Temperature controller design with 4-20 mA output.

Please send us your proposal for these projects.

Additionally, we would appreciate your assistance in the following areas.

1. Tooling
2. Patenting
3. PCB's for the Textile segment
4. Automation for Production process

EAPL will provide the Sample Products and the necessary documents for the development mentioned above.

Regards,

Sridevi B.S

Design

**Electronic Automation Private Limited**

SAP/MMD/PO

# 20, K H B Industrial Area, Yelahanka,  
Bangalore-560064 Karnataka  
India

Tel: 080-42802345

E-Mail: mmd@eaplindiamail.com

An ISO 9001 Company. Certified by U.L.

**PURCHASE ORDER**

PO No. : 5182

Date : 01/09/2022

GSTIN : 29AAACE3143M1ZJ

**Supplier: M/S**

R V COLLEGE OF ENGINEERING

8th Mile, Mysore Road, RV Vidyaniketan Port,  
Bangalore-560054 Karnataka  
India

Tel No.

PAN : GSTIN : 29AAATR0758A12P

**Qtn. Ref:**

Act No: 21041 / RVCE/CSE/R&amp;D/4/2022-23

**ORD REC.NO.**

Activity No:29892

30% Advance payment, 2nd payment:50% & Final  
payment 30%

Sl.N o	Item code	Description	Del. Dt.	Qty	Price	Value
1	OTHR00001	PURCHASE-OTHERS Software Development for Time Switch		1	INR 50,000.00	INR 50,000.00

Discount	HC & F	SGST @9%	CGST @9%	Total GST	Order Value	INR 59,000.00
0.00		4,500.00	4,500.00	9,000.00		

MODE OF DISPATCH	:	Road Transport
PRICE TERMS	:	As per Quotation / Earlier supply
PAYMENT TERMS	:	Net-30
INSURANCE TERMS	:	Covered under Marine Policy
PACKING TERMS	:	Standard Sealed Packing
WARRANTY	:	ON ANY MANUFACTURING DEFECTS

**Special Instructions :****Delivery Schedule :**

30/09/2022

**Our Bankers:**AXIS BANK LTD, IFS CODE[UTI  
B0000094]No.688, III A Cross Opp:  
Seshadripuram College, New  
Town Yelahanka B'lore-64

GSTIN :- 29AAACE3143M1ZJ

PPD:

CHKD:

FOR ELECTRONIC AUTOMATION PVT.LTD.,

AUTHORISED SIGNATORY / IES

Approval status: Without



**Electronic Automation Private Limited**

# 20, K H B Industrial Area, Yelahanka,  
Bangalore-560064 Karnataka  
India

Tel: 080-42802345

E-Mail: mmd@eaplindiamail.com

An ISO 9001 Company. Certified by U.L.

SAP/MMD/PO

**PURCHASE ORDER**

PO No. : 5182

Date : 01/09/2022

GSTIN : 29AAACE3143M1ZJ

**Supplier: M/S**

R V COLLEGE OF ENGINEERING  
8th Mile, Mysore Road, RV Vidyaniketan Port,  
Bangalore-560054 Karnataka  
India

Tel No.

PAN : GSTIN : 29AAATR0758A12P

**Qtn. Ref:**

Act No: 21041 /

ORD REC.NO.

Activity No:29892

30% Advance payment, 2nd payment 50% & Final  
payment 30%

Sl.N o	Item code	Description	Del. Dt.	Qty	Price	Value
1	OTHR00001	PURCHASE-OTHERS IoT Integration for EAPL Multi Function Meter		1	INR 250,000.00	INR 250,000.00

Discount	HC & F	SGST @9%	CGST @9%	Total GST	Order Value	INR 295,000.00
0.00		22,500.00	22,500.00	45,000.00		

MODE OF DISPATCH : Road Transport  
PRICE TERMS : As per Quotation / Earlier supply  
PAYMENT TERMS : Net-30  
INSURANCE TERMS : Covered under Marine Policy  
PACKING TERMS : Standard Sealed Packing  
WARRANTY : ON ANY MANUFACTURING DEFECTS

**Special Instructions :****Delivery Schedule :**

31/10/2022

Our Bankers:  
AXIS BANK LTD, IFS CODE [UTI  
B0000094]  
No.688, III A Cross Opp:  
Seshadripuram College, New  
Town Yelahanka B'lore-64

GSTIN :- 29AAACE3143M1ZJ

PPD:

CHKD:

FOR ELECTRONIC AUTOMATION PVT.LTD.,

AUTHORISED SIGNATORY / IES

Approval status: Without



## Electronic Automation Private Limited

Regd. Off: #20, K.H.B. Industrial Area, Yelahanka, Bangalore 560 064, India.

Ref :MMD 25/22-23

Date :01.09.2022

M/S. R V COLLEGE OF ENGINEERING  
8th Mile, Mysore Road, RV Vidyaniketan Post,  
Bangalore-560054 Karnataka  
India

Dear Sir,

We are here by enclosing the Memorandum of understanding originals two sets along with copy of Purchase orders for both the projects.

Kindly send us the duly signed copies of the MOU.

Payment of 30% will be released o receipt of the MOU copy.

With regards

For ELECTRONIC AUTOMATION PVT. LTD

*B. S. Sml*

AUTHORISED SIGNATORY

1

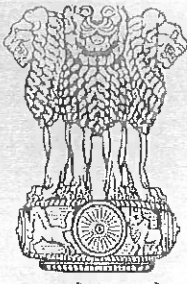


ELECTRONIC AUTOMATION PRIVATE LIMITED

Phone No. : 0091-080-42802345

E-mail : [info@eaplindiamail.com](mailto:info@eaplindiamail.com) URL : [www.eaplindia.com](http://www.eaplindia.com)

GST No. 29AAACE3143M1ZJ, CIN No. U31905KA1983PTC005747



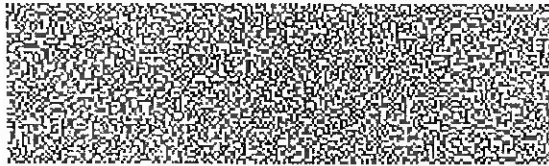
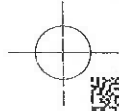
सत्यमेव जयते

INDIA NON JUDICIAL

## Government of Karnataka

### e-Stamp

Certificate No.	: IN-KA08935137262430U
Certificate Issued Date	: 22-Aug-2022 02:07 PM
Account Reference	: NONACC (FI)/ kagcs108/ RAJARAJESHWARI NAGAR/ KA-JY
Unique Doc. Reference	: SUBIN-KAKAGCSL0833152349329662U
Purchased by	: PRINCIPAL R V C E
Description of Document	: Article 37 Note or Memorandum
Description	: MOU
Consideration Price (Rs.)	: 0 (Zero)
First Party	: PRINCIPAL R V C E
Second Party	: ELECTRONIC AUTOMATION PVT LTD
Stamp Duty Paid By	: PRINCIPAL R V C E
Stamp Duty Amount(Rs.)	: 200 (Two Hundred only)



### Memorandum of Understanding (MOU)

This Memorandum of Understanding ("MOU") is entered into on the 23<sup>rd</sup> Day of August, 2022 ("Effective Date") at Bangalore, by and between

R.V.College of Engineering, (hereinafter referred to as "RVCE") having its campus at Mysore Road, Bengaluru.-560059, represented by The Principal, R.V. College of Engineering, an Autonomous Institute Under VTU, Belagavi, Karnataka-India, hereafter called the first party.

and

Electronic Automation Private Limited (EAPL) (hereinafter referred to as EAPL), having its registered office at Electronic Automation Private Limited, No. 20, KHB Industrial Area, Yelahanka New Town, Bengaluru, Karnataka 560064, represented by Senior Manager, R&D hereafter called the second party.

#### Statutory Alert:

1. The authenticity of this Stamp Certificate should be verified at 'www.sholestamp.com' or using e-Stamp Mobile App or Quick Holding.
2. Any discrepancy in the details on this Certificate and as available on the website / Mobile App renders it invalid.
3. The onus of checking the legitimacy is on the users of the certificate.
3. In case of any discrepancy please inform the Competent Authority



In this course of the MOU, both the parties mentioned above have been individually referred to as "Party" and jointly as "Parties."

**Whereas**, EAPL is original manufacturers of different electrical meters with a purpose to serve the electrical and allied automation industry.

And **Whereas** RVCE strives to impart quality higher engineering education, envisioning to be leaders in quality technical education. RVCE is engaged in research, consultancy and training assigned by industries and sponsoring agencies.

The Parties intend to enter into this MOU to jointly engage in research and consultancy to arrive at technological solutions in mutually agreed and assigned projects as per the below Clauses to establish the collaboration between them and define certain rights and obligations between the Parties.

**1. RESPONSIBILITIES OF EAPL:**

EAPL agrees to undertake as follows:

- a. Identify areas for joint research relevant to EAPL, define problem, objectives, research methodology, validation and deliverables, in consultation with the identified team of RVCE
- b. Take responsibility of the review and coordination of each project, seek timely interventions as and when required, from RVCE.
- c. Provide the instruments, meters and data related to the specific projects assigned to RVCE team

**2. RESPONSIBILITIES OF RVCE :**

RVCE agrees to undertake as follows:

- a. Identify project team (Principal Investigator and co-investigators) for specific projects assigned by EAPL.
- b. Facilitate interactions between RVCE team and EAPL for finalising the project areas, project objectives, methodology, deliverables and project budget
- c. Provide the support of faculty, laboratory infrastructure for executing the projects assigned by EAPL

**3. INTELLECTUAL PROPERTY RIGHTS**

- 3.1. Each party shall continue to own the intellectual property developed prior to or independently of this Memorandum of Understanding. Except as otherwise agreed to by the Parties in writing, all rights, title and interests in and to the material and data created or extended by either Party in pursuance of this MOU shall exclusively belong to EAPL.



A handwritten signature in black ink, appearing to be "E. S. S." or similar, with a horizontal line underneath.



## Memorandum of Understanding (MOU)

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and

Electronic Automation Private Limited (EAPL) (hereinafter referred to as EAPL), having its registered office at Electronic Automation Private Limited, #20, KHB Industrial Area, Yelahanka New Town, Bengaluru, Karnataka 560064, represented by Senior Manager, R&D hereafter called the second party.

In this course of the MOU, both the parties mentioned above have been individually referred to as "Party" and jointly as "Parties."

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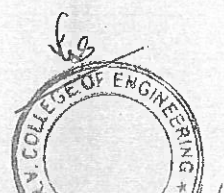
And Whereas RVCE strives to impart quality higher engineering education, envisioning to be leaders in quality technical education. RVCE is engaged in research, consultancy and training assigned by industries and sponsoring agencies.

The Parties intend to enter into this MOU to jointly engage in research and consultancy to arrive at technological solutions in mutually agreed and assigned projects as per the below Clauses to establish the collaboration between them and define certain rights and obligations between the Parties.

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EAPL agrees to undertake as follows:

- a. Identify areas for joint research relevant to EAPL, define problem, objectives, research methodology, validation and deliverables, in consultation with the identified team of RVCE
- b. Take responsibility of the review and coordination of each project, seek timely interventions as and when required, from RVCE.
- c. Provide the instruments, meters and data related to the specific projects assigned to RVCE team





## 2. RESPONSIBILITIES OF RVCE :

RVCE agrees to undertake as follows:

- a. Identify project team (Principal Investigator and co-investigators) for specific projects assigned by EAPL.
- b. Facilitate interactions between RVCE team and EAPL for finalising the project areas, project objectives, methodology, deliverables and project budget
- c. Provide the support of faculty, laboratory infrastructure for executing the projects assigned by EAPL

## 3. INTELLECTUAL PROPERTY RIGHTS

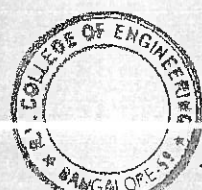
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## 4. CONFIDENTIALITY

- 4.1. During the term of this MOU, each Party may disclose to the other its Confidential Information. Confidential Information shall mean all information marked "Confidential" or under any similar legend indicating the confidentiality of the information.
- 4.2. The receiving party shall hold such Confidential Information in strict confidence perpetually for the disclosing party and shall not use it except in furtherance of the relationship set forth in this MOU, or except as it may be authorized by the disclosing party in writing. The receiving party shall further be responsible for the compliance of the foregoing by its employees or agents.
- 4.3. Upon the disclosing party's written request at any time, or following the completion or termination of this MOU, the receiving party shall promptly return to the disclosing party, or destroy, all Confidential Information of the disclosing party provided under or in connection with this Agreement including all copies, portions and summaries thereof.

## 5. COMMERCIAL TERMS

- 5.1. EAPL shall issue letter for each project assigned by EAPL mentioning the Principal Investigator, co-investigator/s, project title, objectives, methodology, deliverables, milestones and budget approved for the project. EAPL shall also specify the release of funds mapping to milestones of the project.
- 5.2. EAPL shall release the funds by way of Bank transfer or through cheque issued in favour of The Principal, RV College of Engineering.



6. TERM & TERMINATION

- 6.1. This MOU shall be valid from the Effective Date and shall remain in force for 2 (two) years from the Effective date, unless terminated earlier by either Party as provided herein below.
- 6.2. Either Party may terminate this MOU by giving thirty 30 days' notice to the other party. On termination, each party shall return to the other Party all such confidential and proprietary information, documents, and reference material of the other party in its possession.
- 6.3. All such obligations and terms of this MOU that are required to survive the termination of this MOU shall survive such termination.

7. RELATIONSHIP OF THE PARTIES

- 7.1. Neither this MOU, nor any activities described herein, shall be construed as creating a partnership, joint venture, franchise, agency or other such relationship between RVCE and EAPL.

8. NOTICES AND CONTACTS

All notices, requests, demands and other communications under this MOU or in connection herewith shall be given to or made upon in writing by letter or email to the respective Parties as follows:

To EAPL: B.S. Sridevi, Head, R&D, EAPL, (M) 9886855634, [sridevibs@eaplandia.com](mailto:sridevibs@eaplandia.com)

To RVCE: The Principal, RV College of Engineering, Bengaluru – 59, (M) 9663699299, [principal@rvce.edu.in](mailto:principal@rvce.edu.in)

9. LIMITATION OF LIABILITY

Neither Party shall be liable for any indirect, incidental, special or consequential damages, or damages for loss of profits, revenue, data or use, incurred by either Party or any third party in connection with this MOU or the subject matter of this MOU, whether in an action in contract or tort or any other legal theory.

10. JURISDICTION

The laws of India shall govern this MOU. Any disputes between the Parties shall be resolved by mutual discussions. Unresolved disputes, if any shall be subject to resolution by arbitration in accordance with the Arbitration and Conciliation Act, 1996 (as amended from time to time), The language of the arbitration shall be English and the decision of the arbitrators shall be final and binding on the Parties. The seat and venue shall be Bangalore.

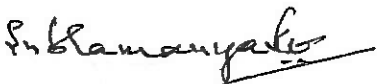



Subject to the foregoing, Parties irrevocably submit to the exclusive jurisdiction of the Courts in Bangalore, for any action or proceeding regarding this MOU.

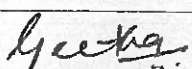
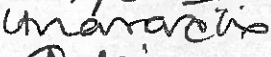
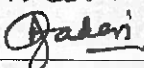
# 11. MISCELLANEOUS

- 11.1. Neither Party shall transfer / assign any rights or obligation to a third party without written acceptance of the other Party, and any amendment or modification to this MOU shall be in writing and duly executed by both Parties;
- 11.2. If any part of this MOU is rendered void, or unenforceable in any aspect under law, the remaining provisions shall not in any way be affected and shall continue to be in force.
- 11.3. This MOU may be executed in 2 (two) counterparts. The Parties shall retain 1 (one) counterpart each. Each of which shall be an original and all of which, taken together, shall constitute one and the same instrument.
- 11.4. Each Party shall ensure best efforts to give effect to the terms of this MOU.

IN WITNESS WHEREOF, each of the Parties hereto have caused this MOU to be duly executed by a duly authorized representative of such Party as of the date specified above, in Bangalore.

For R.V. College of Engineering	For EAPL
	
PRINCIPAL	
RV COLLEGE OF ENGINEERING	Ashok Shanbhag
RVCE BENGALURU - 560 059	Managing Director, EAPL
	Sridevi B. S.
	Senior Manager, R&D, EAPL
	Prashanth P Mantri
	General Manager, Finance, EAPL

## WITNESSES

1. Dr. K S Geetha	
2. Dr. H. N Narasimha Murthy	
3. Ashok G Gadavi	
RVCE	

# **Aadhaar based Smart Water Monitoring System**

**R.V. College Of Engineering**

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# Introduction

## Purpose

The purpose of this document is to present a detailed description of a smart water metering system made using esp32 as hardware processor, svelteKit as full stack framework and PostgreSQL as database and flutter as the app development framework. It will explain the purpose and features of the software and hardware and their integration, the interfaces of the software, what the software and hardware will do and the constraints under which it must operate.

## Document Conventions

This Document was created based on the IEEE template for System Requirement Specification Documents.

## Intended Audience and Reading Suggestions

Typical Users, everyone who gets a water connection to their residences can use this application to monitor their water usage.

Admin Users, these include some selected specific people from government and water board and analysts who can view the complete data , analyze upon it and make inferences.

## Product Scope

The purpose of making this complete end to end system is to provide a method for the people to know their water usage remotely on their preferred internet connected devices and estimating the future usage and handle related bill payments

This also acts as an organized, centralized water management system for the municipal bodies.

This also gives the water board with necessary data required to make better decisions regarding water management and distribution and deal with illegal tampering of connection

# Overall Description

## Product Perspective

The water monitoring application is a software application that acts as a single central solution for monitoring water usage , and future estimation based on analysis, also enable users to pay bill and change their connections

This application uses the https GET, POST, methods to modify the view of water usage at a particular time and pay bills updating their connection links.

Overall, this app is an invaluable resource for everyone who wants to monitor water usage and especially it's a very useful tool for water boards to make better informed decisions using the data from the smart water meter.

## Product Functions

**Login** : The user will arrive at this screen in the app first after installation of the mobile application, the user should provide a mobile number that is associated with the smart meter and authenticated via OTP verification code for the first time, then the user can see their consumption patterns in the Dashboard.

**Dashboard** : This is the main screen of the app, where you can see the overall water consumption details displayed with a time-series graph . The dashboard displays a series of cards, displaying the average consumption of the user, city average consumption, estimated bill based on past three days etc. The user can see their previous consumption patterns and choose like weekly usage, monthly usage by clicking on the drop bar above the Graph widget.

**Profile**: Your profile displays your phone no and associated meter id to which connected. You can change the meter id if linking with other meter under the phone

**Payments** : You can recharge the meter directly here using various methods like UPI, Netbanking etc.

## User Classes and Characteristics

For the Smart Water Metering System described above, there are likely two main user classes:

### End users (consumers)

Characteristics: They are the individuals who use the system to monitor their water consumption and view their bills. They may want to track their usage to save on costs or become more conscious of their water usage. They may also want to access their data on the go through the mobile app.

### Water boards

Characteristics: They are responsible for managing the water supply and distribution in a certain area. They may use the system to monitor water usage patterns in a particular area, detect illegal connections, and generate bills. They may also use the data for analysis and decision-making purposes.

Both classes of users may have different levels of technical expertise, and the system should be designed to be accessible and user-friendly for all.

## Operating Environment

For a smart water monitoring system, some possible aspects of the operating environment include:

**Hardware:** The system should be compatible with a variety of hardware devices, such as computers, smartphones, and tablets.

**Software:** The system should be compatible with a variety of operating systems, such as Windows, MacOS, Linux. It may also require specific software or browser plugins to be installed on the user's device.

**Network:** The system relies on a stable and reliable internet connection for creating and viewing blogs, the system should be designed to handle varying network conditions, such as low bandwidth or high latency.

**Storage:** The system should be designed to store all the data posted by the meter, user profile information, and other data on the user's device or on a remote server, this storage should be designed to be efficient and scalable.



## **Design and Implementation Constraints**

Here are some possible constraints for the system:

### **Technical constraints:**

- The system should be designed to handle a large number of users concurrently.
- The system should be able to scale and handle a large amount of data and messages.
- The system should be designed to be fault-tolerant, meaning it should be able to continue functioning even if a component fails.
- The system should be designed to be secure, and should include end-to-end encryption and other security features.

### **User interface constraints:**

- The system should be designed to be easy to use, with a simple and intuitive interface.
- The system should be designed to be accessible, meaning it should be usable by people with a variety of physical and cognitive abilities.
- The system should be designed to be compatible with different devices and screen sizes.

### **Legal constraints:**

- The system should be designed to comply with relevant laws and regulations related to data privacy, security, and user data management.

### **Performance constraints:**

- The system should be designed to have minimal latency, meaning messages should be delivered and received as quickly as possible.
- The system should be designed to have a high availability and low downtime.

### **Development constraints:**

- The system should be designed to be developed using industry-standard tools and technologies, meaning it can be developed by a large number of developers with the necessary skills.
- The system should be designed to be testable, meaning it should be easy to test different components of the system to ensure they are working correctly.
- The system should be designed to be maintainable, meaning it should be easy to update and fix bugs.

# User Documentation

User documentation for smart water monitoring applications typically includes detailed instructions on how to use the system, including how to login in order to use the app, enter and manage data, and access different features and functions, and to be able to answer different questions. It may also include information on system requirements, installation instructions, and troubleshooting guidelines.

Types of information that might be included in user documentation for a real estate management system

**Overview**- A general overview of the system and its main features and functions.

**Getting started**- Instructions on how to login/register to the system and create/view posts.

**Feedback management** - Detailed information on how to let the users give feedback on whether they liked the app.

**System requirements**- Information on the hardware and software requirements for running the system, including any necessary updates or upgrades.

**Troubleshooting**- Common issues that users may encounter when using the system and guidelines for troubleshooting and resolving those issues.

## Assumptions and Dependencies

Here are some possible assumptions and dependencies for the system:

### Assumptions:

- Users have a basic understanding of how to use a computer or mobile device
- Users have a stable and reliable internet connection.
- Users have a device that can run the smart water monitoring application, such as a computer or a smartphone.

### Dependencies:

- A stable and reliable internet connection for sending and receiving data.
- A web server or cloud infrastructure to host the application and store data.
- A database to store user data, water meter data
- An encryption library or similar for secure data communication and storage.
- Compliance with relevant laws and regulations related to data privacy, security, and user data management.

## External Interface Requirements

### User Interfaces

- The entire application is built using SvelteKit ( Full Stack Framework ) and PostgreSQL ( Database ).
- The first page contains the login page. Through the login page users can login using mobile No and OTP
- There is a Dashboard page where user can see their water usage history and future estimates of their water usage and bill
- The Profile page lets users view and edit the water meter to which they are linked to
- It also has a recharge section where users can recharge their Water Meters

## Hardware Interfaces

**Network interface:** The app will need to be able to connect to the internet in order to access water usage data and show them.

**Display:** The app will need to be able to display water usage history and other content to the user on their device's screen.

**Input:** The app will need to be able to accept input from the user, such as when they want to enter an amount for recharge.

**Storage:** The app may need to store data locally on the user's device, such as water usage history

**Processor:** The app will need to use the device's processor to execute code and perform various tasks, such as rendering the user interface and processing user input.

**Memory:** The app will need to use the device's memory to store data and execute code

## Software Interfaces

**User authentication:** The app should support user authentication, allowing users to create accounts and log in to access their personalized news feed.

**Sorting functionality:** The app should allow users to view water usage history according to the month , year and past given days

## Communications Interfaces

The software requires an internet connection to provide the requested month's water usage history to the user in real-time.

## **System Features**

Following are the prominent features of this software:

### **Water Consumption Data Visualization**

#### **Monthly, weekly and daily usage data**

The users can see their monthly, weekly and daily usage of water in the app's dashboard in graphical format where they can switch between to get their required format.

#### **Overall bill prediction**

It gives the predicted bill for the month based on the past three days data projected over the month

#### **Average Consumption Data**

It shows the average consumption of water by the user.

Also the users can compare their average with the city average which will be shown on the dashboard

### **Payments**

The app has razorpay api integration through which the users can pay their water bills directly through the app via online payment facility.

### **Linking the water meter**

#### **4.3.1 OTP based verification**

The user will be able to login to his/her account securely with the help of OTP based verification both in website and app.

#### **4.3.2 Linking to verified mobile number**

The user will be linked to the water meter using a unique id at the time of installment. This cannot be changed.

## **Other Nonfunctional Requirements**

### **Performance Requirement:**

The app should have good performance, with fast load times and responsive user interactions. This may involve optimizing the app's code and design, and using efficient algorithms and data



structures to minimize the use of resources such as CPU, memory, and network bandwidth.

**Security Requirement:**

The app should be secure, with measures in place to protect against threats such as data breaches, identity theft, and unauthorized access. This may involve implementing security best practices such as encryption, authentication, and authorization, and following guidelines for secure coding and data handling.

**Safety Requirement:**

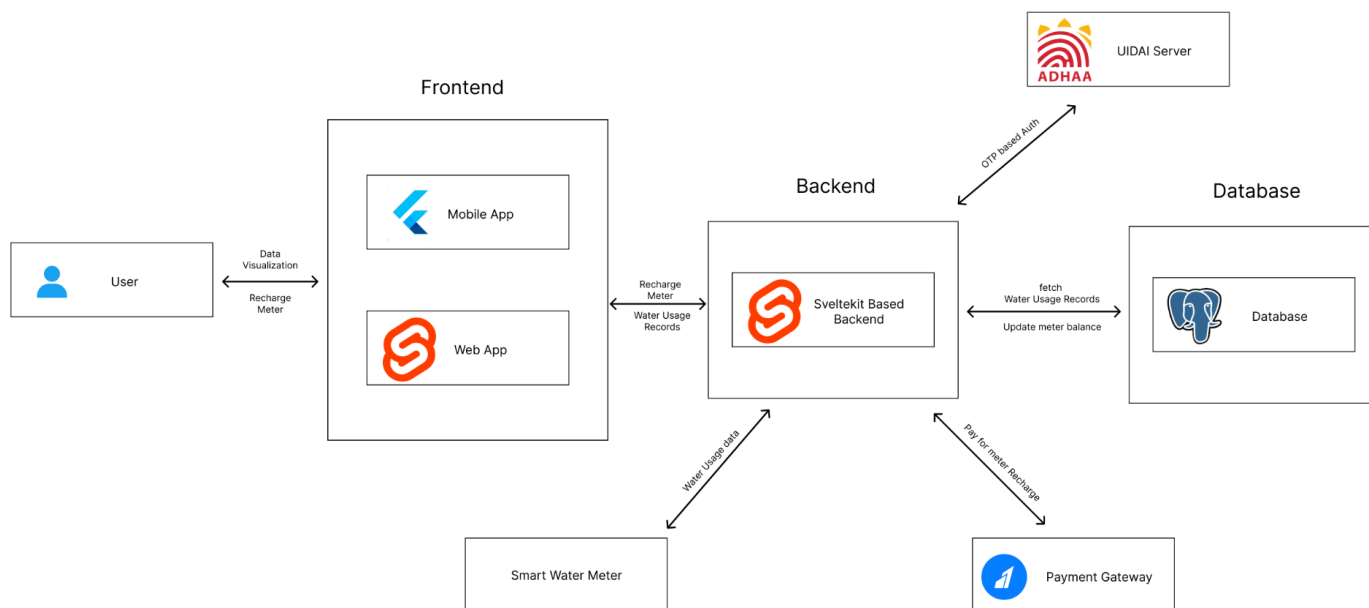
The app should be safe to use, with measures in place to protect against risks such as data loss, corruption, and system failures. This may involve implementing backup and recovery strategies, and designing the app to be resilient to errors and unexpected events.

**Software quality Requirement :**

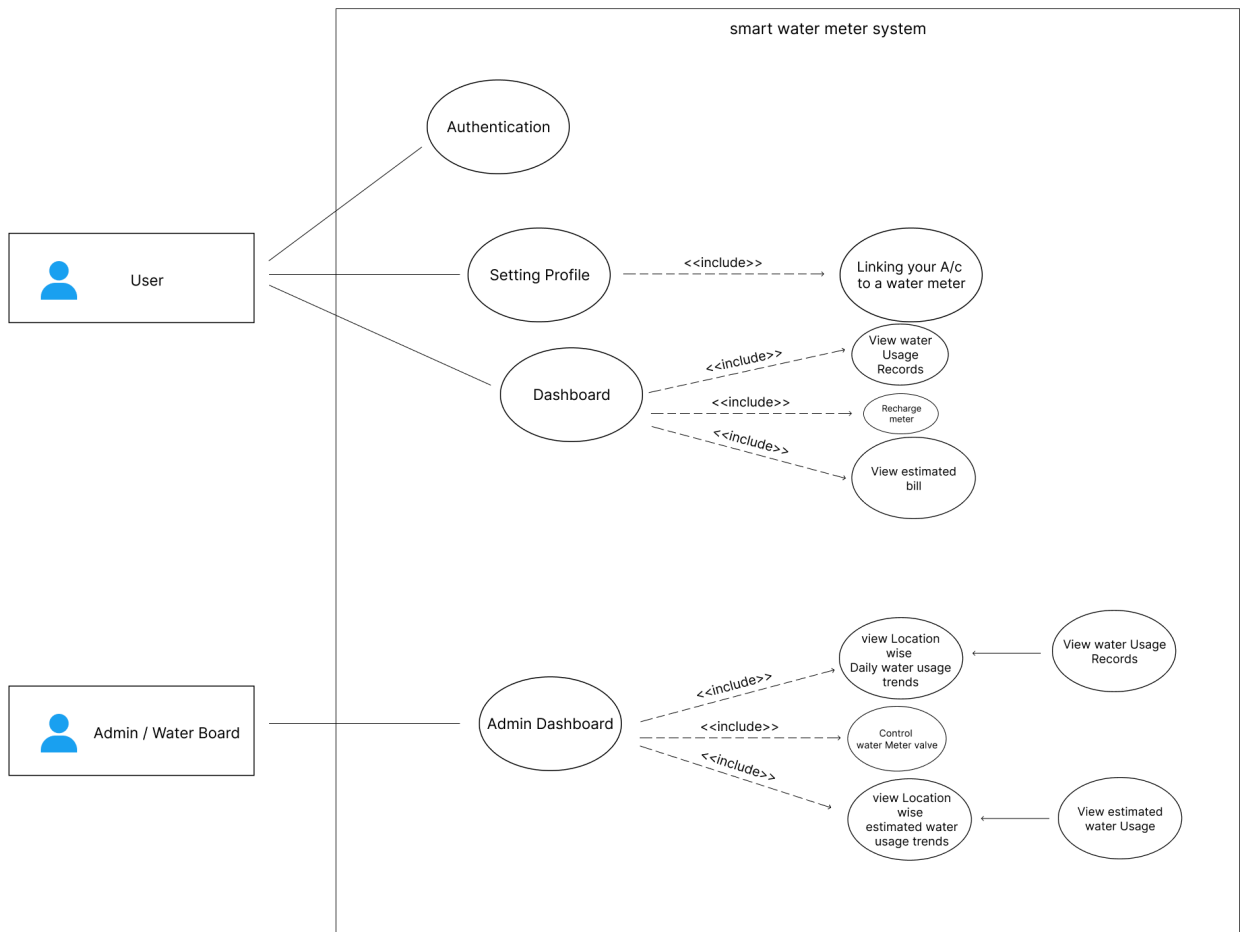
The app should have high software quality, with a well designed and tested codebase, good documentation, and a robust testing and debugging process. This may involve following software development best practices such as code review, continuous integration, and automated testing.

**Business rules:** The app should follow any relevant business rules or regulations, such as those related to data privacy, advertising, and content standards.

**System Architecture:**

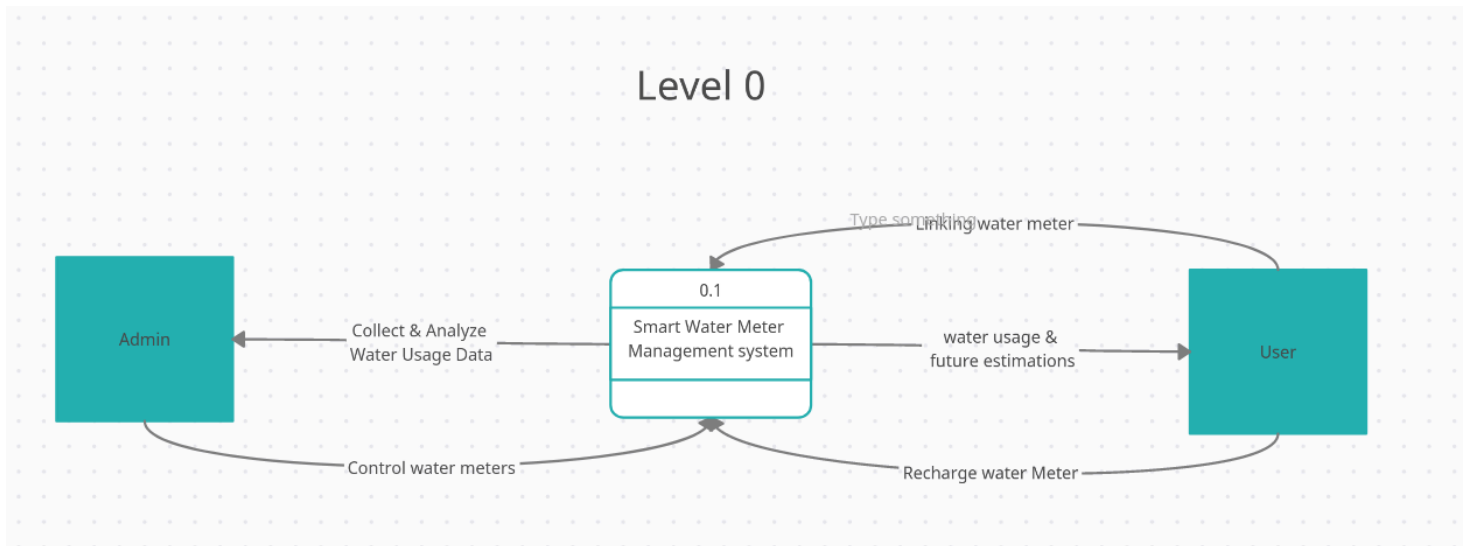


**Use-case diagram:**

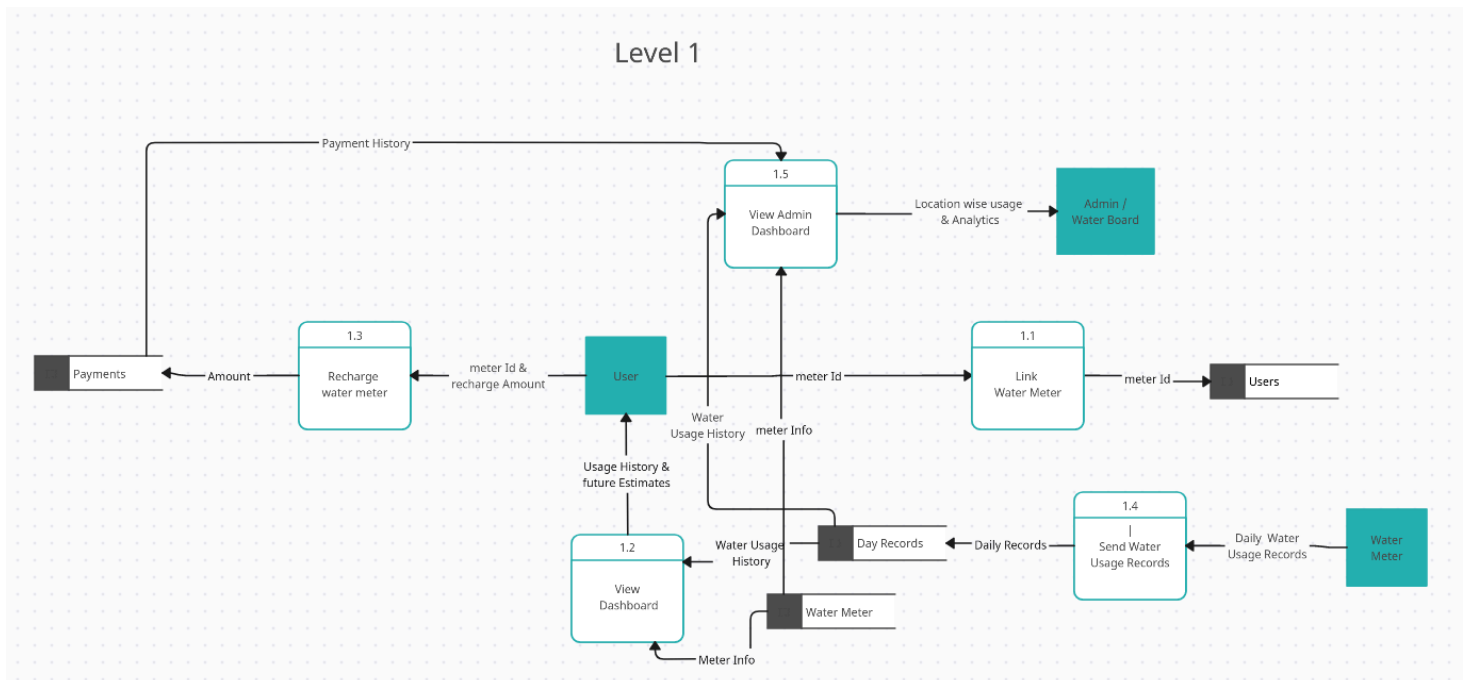


## Data Flow diagram:

### Level - 0 :



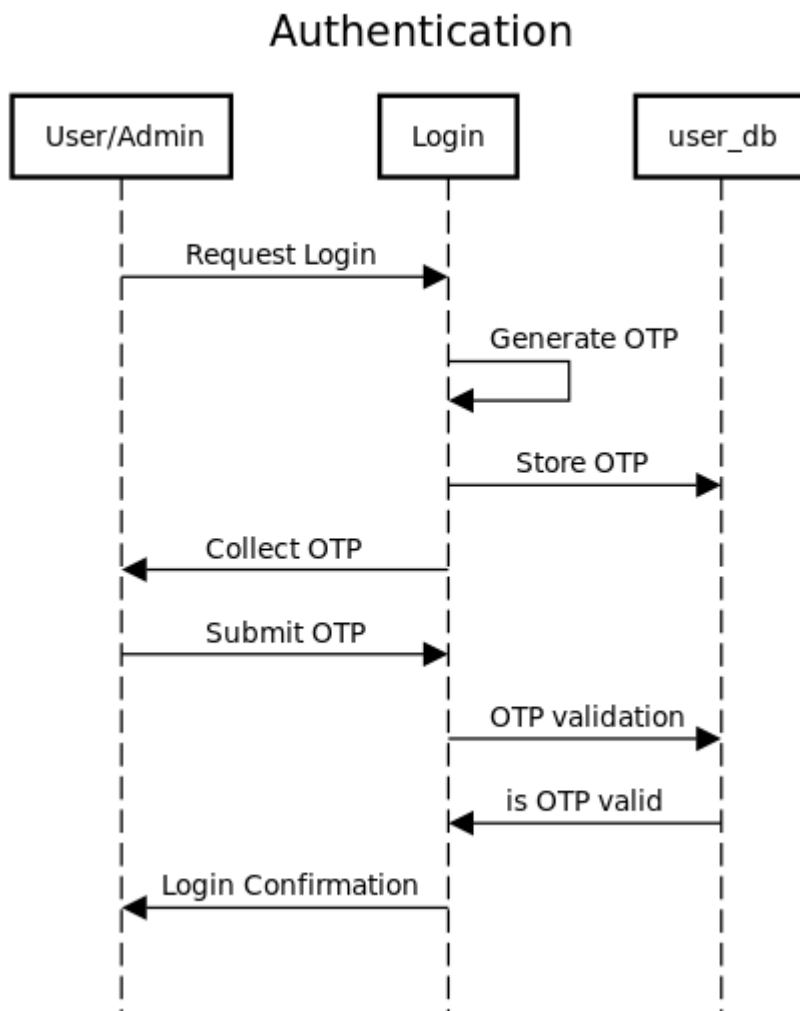
### Level - 1 :





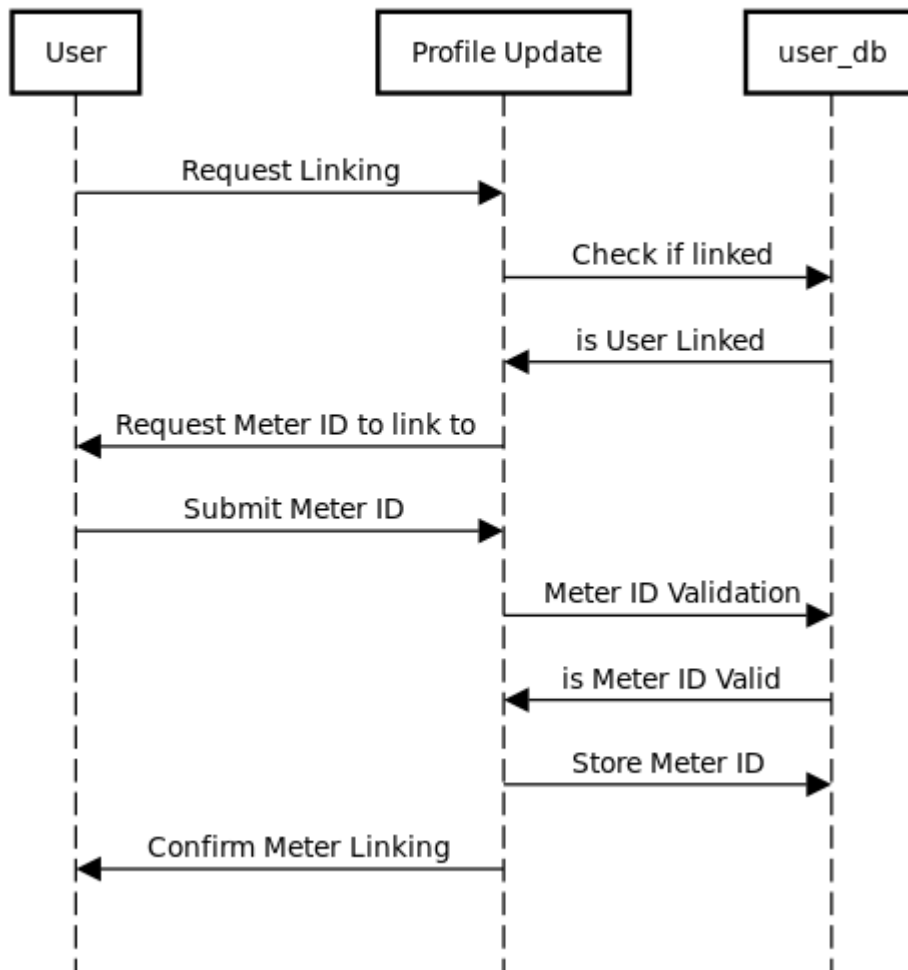
## Sequence Diagram:

### Authentication



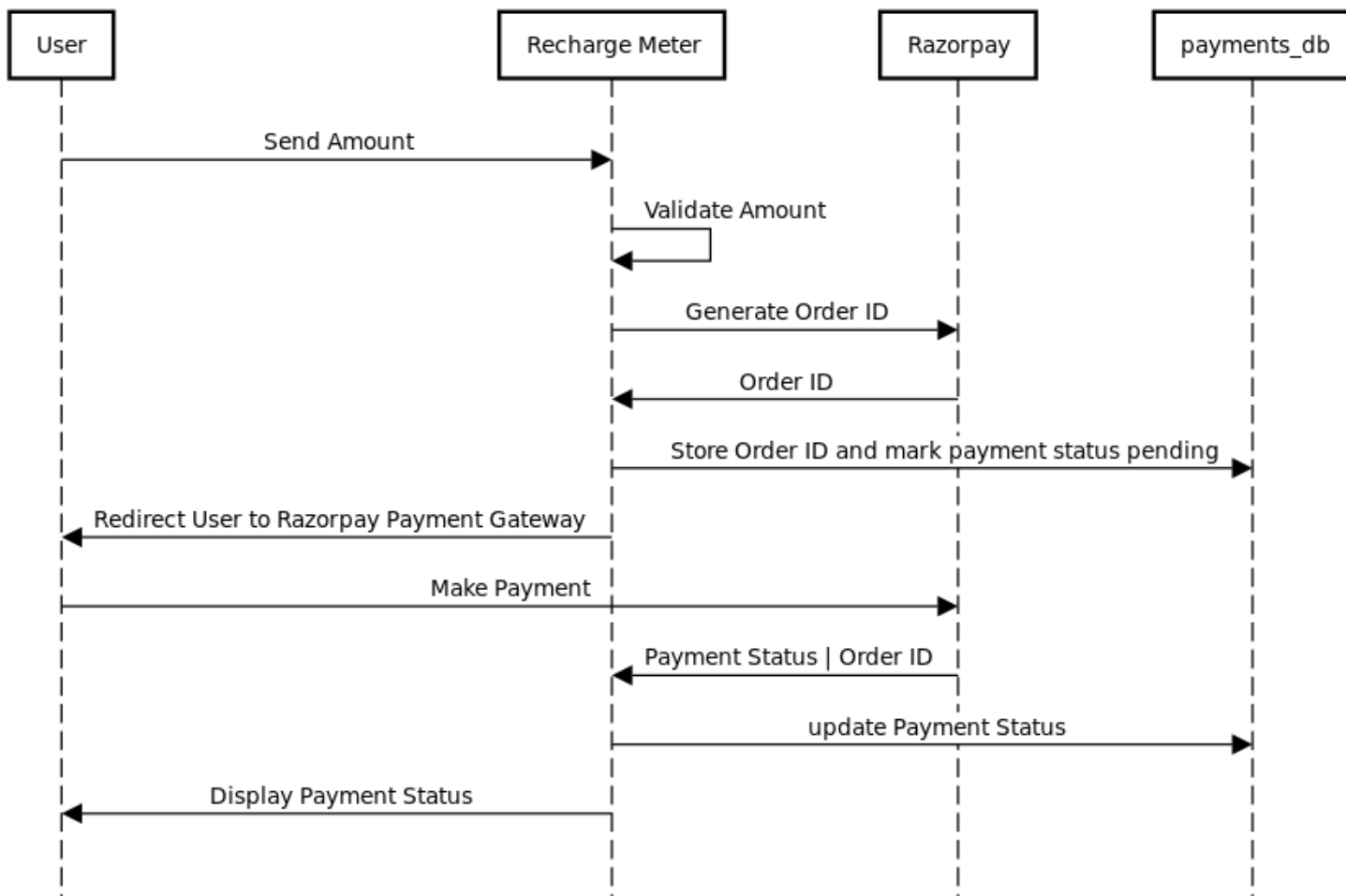
## Linking Meter

### Link Water Meter



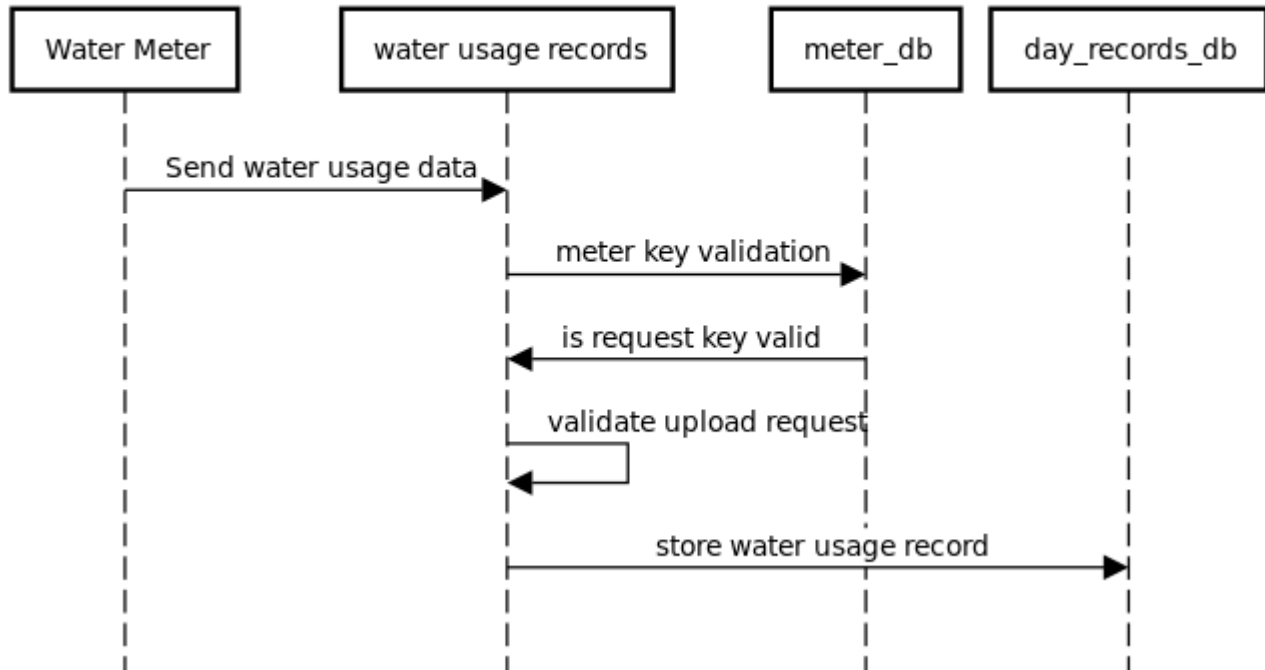
## Recharge Meter

### Recharge Water Meter



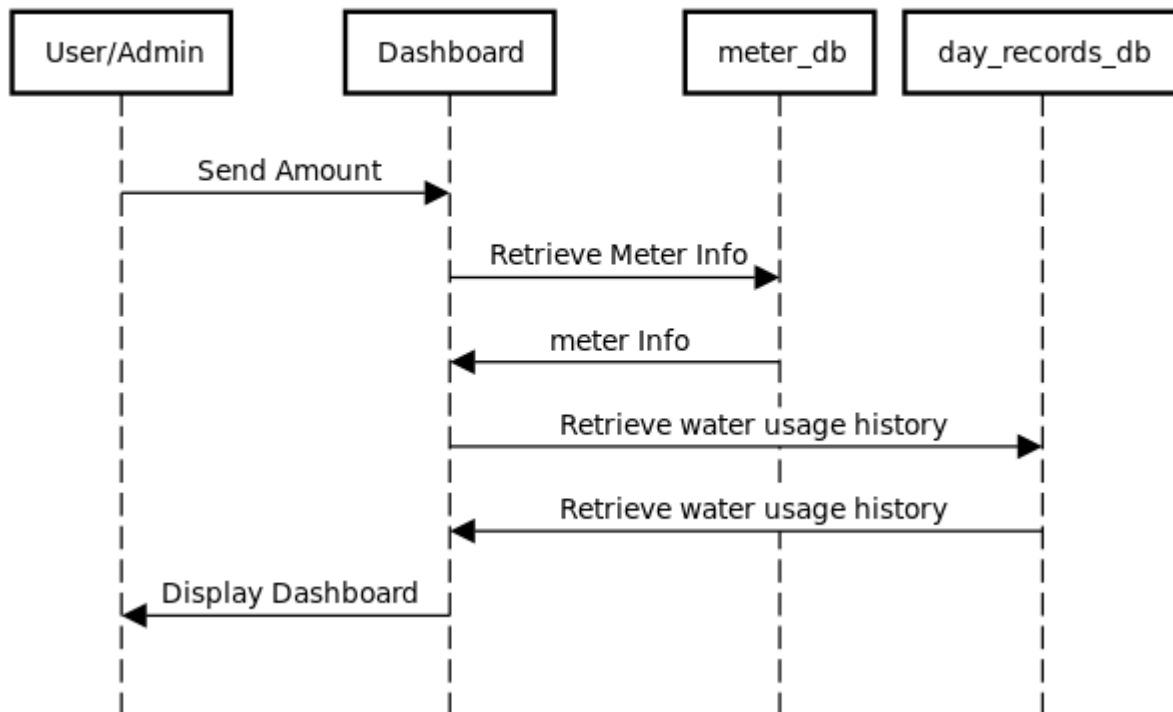
## Upload records

### Upload water usage records



## View Dashboard

### View Dashboard





# Results

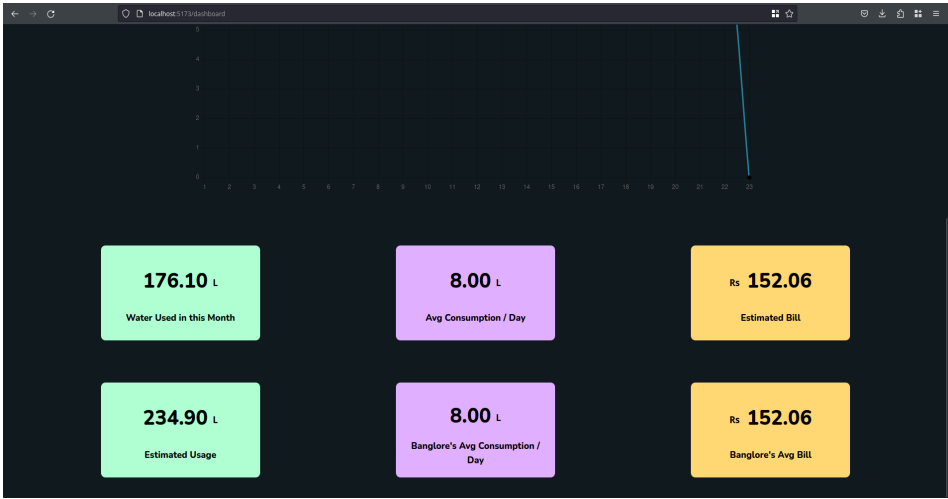
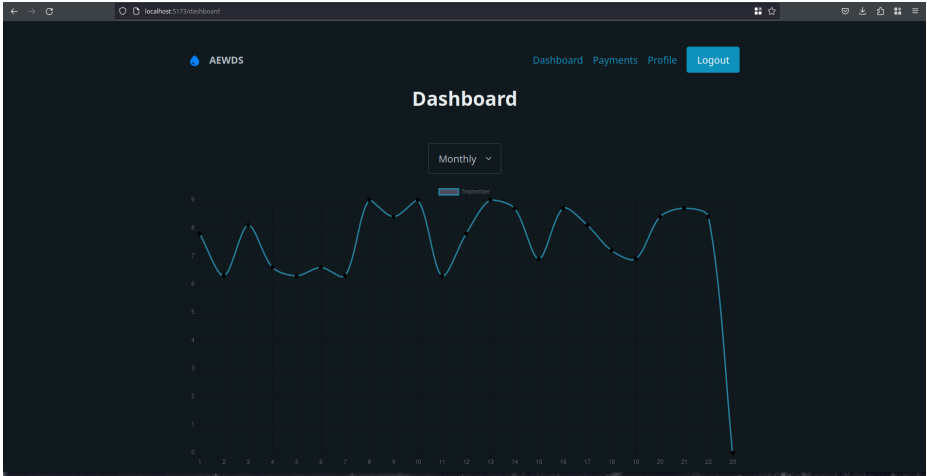
**Flow Sensor Installed in House**



**Smart Water Meter Board**



# Dashboard





Rashtriya Sikshana Samithi Trust

**R V College of Engineering**

Autonomous Institution affiliated to Visvesvaraya Technological University, Belagavi  
Approved By AICTE, New Delhi, Accredited By NBA, New Delhi

Since 1963



## REPORT ON VKES (Vidyuth Kanti Engineering Services) Industrial Visit, Conducted on 1<sup>st</sup> Feb 2024

ATTENDEND BY:- Faculty :- Dr. S G Srivani

PG Students:- Suhas Gowda S (1<sup>st</sup> sem MTech PE)  
Jayanth A Kanago (1<sup>st</sup> sem MTech PE)  
V Sharon (1<sup>st</sup> sem MTech PE)  
Jhansi Priya R (1<sup>st</sup> sem MTech PE)

### ABOUT VKES

VKES is a Electrical Consulting firm started in 2017, registered with MSME, DGFT, SERB, GST Government of India. They do Power system studies using ETAP, PSCAD SKM etc. Detailed design engineering and sizing calculation, preparation of electrical Layouts, Preparation of Single line diagram , Schematics, Logic diagrams, technical bid evaluation of Transformer, Electrical Switchgear, UPS, etc, vendor drawing.

### TOPICS COVERED

Preparation of Single line diagram , Schematics, Logic diagrams:

- General SLD of a typical sub-station,
- Details on various components and equipments,
- Symbolic representation of each equipment,
- Bus Configurations,
- Switchgear ratings,
- Short Circuit ratings.

**Power system studies:**

- Load flow studies on a SLD,
- Short circuit study,
- Motor starting study,
- Relay Coordination,
- Arc flash analysis,
- Harmonics analysis,
- Transient stability study.

**Detailed design engineering and sizing calculation:**

- Generator size and rating,
- Transformer size and rating,
- UPS Battery charger sizing,
- Load list,
- Earthing lightning calculations.

**Preparation of electrical Layouts:**

- Earthing,
- Lighting,
- Cable routing,
- Equipment placement.

**Software's:**

- PSCAD, PSIM, SKM, ETAP etc.,.

**CONCLUSION:**

The overall working environment of VKES enabled us to gain industrial exposure to the practical power system design and analysis of a simple SLD with specifications, ratings, size, location, protections and mainly the consumer requirements.

**THANK YOU**



# Greening Young Minds

India's energy demand is significantly increasing due to economic growth, urbanization, purchase parity, industrial activity, etc. At present, fossil fuels dominate India's power sector. Efforts are being made to reduce carbon footprints and dependency on energy imports. Hon'ble Prime Minister of India Shri. Narendra Modi has pledged to add 500 GW of non-fossil-fuel-based power-generating resources by 2030. This translates to 50% electricity generation from renewables by 2030 creating employment of around 10 lakh by 2030. Karnataka is spearheading renewable energy development and is largely contributing to meeting these targets.

In line with the ingenuities of the Government of India, **RV College of Engineering** in association with **Karnataka Renewable Energy Development Limited (KREDL)** and **Indian Wind Power Association (IWPA)** – Karnataka chapter has taken the initiative to provide industry-relevant skill training titled “Greening Young Minds” to engineering students. This internship will enhance the brand value of the interns as renewable energy professionals and help them to get placed in the renewable energy sector.





## Greening Young Minds – Student Internship

- Internships for UG students
- Consists of 8 modules spread across four years
- To train the students in the RE sector
- Open to all engineering disciplines
- First batch of fifteen students started today

Module	Title
1	Introduction to Renewable Energy, Indian Power Sector and Asset Management
2	Wind measurement, analysis & Mico-sitting
3	Evacuation planning of RE projects using load flow studies
4	Wind Turbine Technology
5	Heavy materials handling and foundations in Wind and Solar forms
6	SCADA Remote monitoring and appliction of power electronics in RE projects
7	RE Hybrid Projects and Hydrogen Technology
8	Operation and Maintanance of RE projects

## Greening Young Minds – Student Internship





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University, Belagavi)

Approved by AICTE, New Delhi,  
Accredited by NAAC, Bengaluru.

## DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

in

Association with DEPARTMENT OF CIVIL  
ENGINEERING in collaboration with BHORUKA  
POWER CORPORATION LIMITED.,

**A Report on**

*“Jal Urja Mitra Skill Development Programme”*

*on*

*“Operation and Maintenance of Small Hydro Power  
Plant”*

**2023-2024**

**Sponsored by**

Sponsored by HRED, IIT Roorkee under MNRE ,  
Government of India (GOI).



**Jal Urja Mitra Programme**  
Ministry of New and Renewable Energy  
Government of India



**175** YEARS OF  
**IIT ROORKEE**  
Estd. 1847

**Selection of our institute to conduct Jal Urja Mitra Skill Development Programme**



डा० अरुण कुमार  
प्रोफेसर  
**Dr. ARUN KUMAR**  
Professor

**भारतीय प्रौद्योगिकी संस्थान, रुड़की**

जल एवं नवीकरणीय ऊर्जा विभाग  
(पूर्व वैकल्पिक जल ऊर्जा केंद्र)  
रुड़की-247 667 (उत्तराखण्ड), भारत

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No. HRED/R-290/

Dated: Dec 28, 2022

**Dr. S G Srivani**  
Prof. and Hod, EEE Dept  
RV College of Engineering  
EEE Department, RV college of Engineering  
Mysore Road, **Bengaluru - 560059**  
Mob: 9964234659  
Email: [madhubr@rvce.edu.in](mailto:madhubr@rvce.edu.in)

Dear Sir,

Based on your expression of interest (EOI) and visit undertaken by our expert, we are happy to inform you that your training centre has been selected for conducting the Jal Urja Mitra training as per EOI.

Trainers may be deputed for training of trainers and Jal Urja mitra training programme be planned as per the terms of EOI.

Yours faithfully

(ARUN KUMAR)

**RV COLLEGE OF ENGINEERING®**  
**Autonomous Institution affiliated to VTU**  
**Department of Electrical & Electronics Engineering**  
**Jal Urja Mitra Skill Development Programme**

**Report**

Title of the Program	Jal Urja Mitra Skill Development Program
Objectives	(Mentioned below)
Duration	3 Months (600 Hrs)
Target Participants	10+2 passed, ITI/Diploma holders
Contents of the Programme	(Given Below)
Photos	(Attached Below and Certificates)
Sponsoring Agency	HRED, IIT Roorkee under MNRE , Government of India (GOI).
Financial Amount Received(Total)	
Total No. of Batches trained	1 <sup>st</sup> batch is on Going
Total No. of Candidates Trained	
No. of Candidates placed	
Any other information	---

## Introduction

***Jal Urja Mitra Skill Development Programme*** for Small Hydro Power Projects sponsored by Ministry of New and Renewable Energy (MNRE), Government of India is offered to develop 1680 Jal Urja Mitras by FY 2025-26 for the country. Under the skill development initiatives, Ministry of New and Renewable Energy has mandated Department of Hydro and Renewable Energy (HRED) (formerly AHEC), IIT Roorkee as the nodal agency for implementation of Jal Urja Mitra Skill Development Programme (JSDP) during year 2022 – 26. The preference shall be given for the states where maximum unexploited SHP potential exists i.e. J&K, Ladakh, HP, Uttarakhand, Sikkim, Arunachal Pradesh, Kerala, Meghalaya, Jharkhand, Karnataka, Andhra Pradesh, Orissa, Tamil Nadu, Punjab and Maharashtra etc..

## Mission & Goals

The ***Jal Urja Mitra Skill Development Programme*** is designed with the objective to develop skilled and employable workforce (Jal Urja Mitras) catering to the needs of Small Hydro Projects as below:

1. The Jal Urja Mitras should be able to perform the jobs related to Operation and maintenance of a small hydro projects of all type (Run of River, Canal fall based and Dam toe)
2. The Jal Urja Mitras should be capable to take positions as SHP technicians as well as other supervisory and managerial posts at later stage.
3. Jal Urja Mitras should be capable of taking assignments as entrepreneurs for self-employment with small units.

## Admission:

The essential and preferable qualification is prescribed as following:

- Essential Qualification- Class 12<sup>th</sup> with science with 1-year relevant work experience or ITI after class 10<sup>th</sup> (in Electrical/Mechanical/Civil/Instrumentation and related trades) with one year of relevant work experience or govt. recognized 3 years Diploma.
- Preferable Qualification- Candidates with Mechanical/Electrical certificate and experience shall be preferred. Special emphasis to be given to the person coming from rural background, unemployed youth, Women, SC/ST candidates.

## Fees:

Jal Urja Mitra Skill Development Programme is sponsored by the Ministry of New and Renewable Energy, Government of India. This training is being provided free of cost. To ensure that candidates selected for the training programmes are undertaking the training with seriousness, and also to reduce the drop-out rates during the course of training, Training Providers shall charge a refundable security deposit of Rs. 500/- (for NSQF Levels 3 & 4) at the commencement of the training. The amount would be refunded to every candidate who completes the training programme and is successfully certified.

## Programme Duration:

The duration of Jal Urja Mitra Skill Development programme is three months consisting of 600 hours / 90 days including classroom training, lab practical, SHP plant exposure, On the Job Training (OJT), soft skills and entrepreneurship skills.

## Course Module:

### Jal Urja Mitra (Breakup of Schedule)

NOS and Module Details	Theory Duration (hrs)	Practical Duration (hrs)	On-the-Job Training Duration (Mandatory)	On-the-Job Training Duration (Recommended)	Total Duration (hrs)
Role and Responsibilities of a Jal Urja Mitra Module 1 (Bridge Module)	08		—	—	8



SGJ/N1205– Study components and layout of Small Hydro Power (SHP) Plant NOS Version No. 1.0 NSQF Level 4	60	80	–	–	140
Module 2: Components and Layout of Small Hydro Power (SHP) Plant	60	80	–	–	140
SGJ/N0701 – Inspect different components of Small Hydro Power (SHP) Plant NOS Version No. 1.0 NSQF Level 4	40	80	–	–	120
Module 3: SHP Plant Components Inspection	40	80	–	–	120
SGJ/N0610 – Start and shut Small Hydro Power (SHP) Plant NOS Version No. 1.0 NSQF Level 4	24	28	–	–	52
Module 4: Start and shut down SHP Plant	24	28	–	–	52
SGJ/N0106 – Maintain health, safety and hygiene at workplace NOS Version No. 1.0 NSQF Level 4	16	24	–	–	40
Module 5: Workplace Safety, health and Hygiene	16	24	–	–	40

SGJ/N0120 – Work effectively with others NOS Version No. 1.0 NSQF Level 4	16	24	–	–	40
Module 6: Effective and Efficient Working Practices	16	24	–	–	40
<b>Total Duration</b>	164	236	–	–	400

### **Elective Modules:**

The table lists the elective modules, their duration and mode of delivery.

#### **Elective 1:**

<b>NOS and Module Details</b>	<b>Theory Duration (hrs)</b>	<b>Practical Duration (hrs)</b>	<b>On-the-Job Training Duration (Mandatory)</b>	<b>On-the-Job Training Duration (Recommended)</b>	<b>Total Duration (hrs)</b>
SGJ/N0611 - Study electro-mechanical system of Small hydro plant NOS Version No. 1 NSQF Level 4	<b>80</b>	<b>120</b>			<b>200</b>
Module 7: Operate the Electro-Mechanical System in a Small Hydro Plant	40	80			120
Module 8: Maintain the Electro-Mechanical System	40	40			80
<b>Total Duration</b>	<b>80</b>	<b>120</b>			<b>200</b>

**Elective 2:**

<b>NOS and Module Details</b>	<b>Theory Duration</b>	<b>Practical Duration</b>	<b>On-the-Job Training Duration (Mandatory)</b>	<b>On-the-Job Training Duration (Recommended)</b>	<b>Total Duration</b>
SGJ/N0612 - Study Hydro-mechanical and Civil system of Small hydro plant NOS Version No. 1 NSQF Level 4	<b>80</b>	<b>120</b>			<b>200</b>
Module 9: Operate the Hydro-mechanical and Civil Systems in a Small Hydro Plant	40	80			120
Module 10: Maintain the Hydro-mechanical and Civil Systems	40	40			80
<b>Total Duration</b>	<b>80</b>	<b>120</b>			<b>200</b>

Our Institution is the only training center in Karnataka has been selected for this programme to give skill based training for unemployed youth and rural background candidates to facilitate job opportunities at Renewable sector. Also our Training centre is affiliated from National Skill Development Corporation and Skill Council for Green Jobs to conduct this programme in SMART INDIA Portal.



# Accreditation Certificate

This is to certify that  
The RV COLLEGE OF ENGINEERING of R.V. College of Engineering at BENGALURU URBAN, KARNATAKA  
having SMART TC ID TC135628  
is accorded as Accredited for  
Small Hydro Power Plant Technician-(Jal Urja Mitra) (SGJ/Q0604)



5mozbaqr7bhuooibd



SKILL COUNCIL FOR  
GREEN JOBS

SCGJ

Date of Accreditation: 22nd August 2022  
Valid upto: 21st August 2023  
Certification Number:  
SGJ/Q0604/220822/TC135628

Ved Mani Tiwari

Ved Mani Tiwari  
COO & (Officiating) CEO  
National Skill Development Corporation

\*Subject to the process compliances as per the Guidelines for Accreditation, Affiliation and Continuous Monitoring of Training Centres for the Skill Ecosystem \*

The duration of this course is 600 hours of which 300 hours are for practicals at SHP plants. To conduct practical sessions our institution has signed a MoU with Bhoruka Power Corporation Limited. They are leader in Small Hydro Plants in the country, having implemented 110 MW consisting of 15 Hydro stations around Karnataka.



MoU with Bhoruka Power Corporation Limited signed on 23<sup>rd</sup> November 2023

After successful completion of this training programme an amount of Rs.19.7225 Lakhs will be released from IIT Roorkee to our institution.

For the same publicity was given in Karnataka leading newspaper as below:

**ವಿಜಯವಾಣಿ** ಸಂ 1

**SKILL BASED TRAINING PROGRAM**

**on**  
**"Jal Urja Mitra Skill Development Training Program"**

RV College of Engineering\*, Mysuru Road, Bangalore - 59 is conducting 90 days training program in association with IIT Roorkee under MNRE, Government of India (GOI).

The training program is to provide skills on **"Operation and Maintenance of Small Hydro Power Plant"** In collaboration with Bhoruka Power Corporation Limited.

**Eligibility:** Diploma or ITI in Electrical/Civil/Mechanical/Electronics/Fitter /Instrumentation.

Selected trainees will be provided free accommodation and food by the institution.

**Age Limit:** 18 years and above  
For further details,

Visit our website:  
[www.rvce.edu.in](http://www.rvce.edu.in) or  
Scan QR code for Application.

Apply Within 7 days of this advertisement.

**Note:** Limited seats only 30 candidates per batch along with Placement assistance.

Contact :

**HOD EEE (080-68188192/93)**  
**Dr. Madhu B R (9964234659)**  
**Dr. Adinath Jain (8618222687)**  
**Dr. Lokeshwari M (9741214628)**  
**Mr. Mruthyunjaya B (9972274975)**

Bengaluru Edition  
 Feb 22, 2023 Page No. 3  
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Advertisement Published on 22.2.2023



Deputed two trainers Dr.Madhu B R (Assistant Professor) and Dr. Lokeshwari M (Associate Professor) to attend Training of Trainers (ToT) organized by Hydro and Renewable Energy Department (HRED), IIT Roorkee from 18<sup>th</sup> Jan 2023 to 28<sup>th</sup> Jan 2023.



**TOT at HRED, IIT Roorkee**



**Training Sessions and visit to SHP at IIT, Roorkee**





TOT certificates of trainer Dr. Madhu B R and Dr.Lokeshwari M

The Jal Urja Mitra Skill Development Programme of Batch 1 has started on 15.03.2023 with 30 candidates. And the Inaugural function took place on 20.03.2023 at 10 AM, ECE Seminar Hall accompanied by Chief Guest Sri. Chandrasekhar S, Managing Director, Bhoruka Power Corporation Limited, Sri. M. S. Sreenivas Sr. Vice President HR & Finance ,Bhoruka Power Corporation Limited and Presided by Dr. K. N. Subramanya Principal , RVCE.

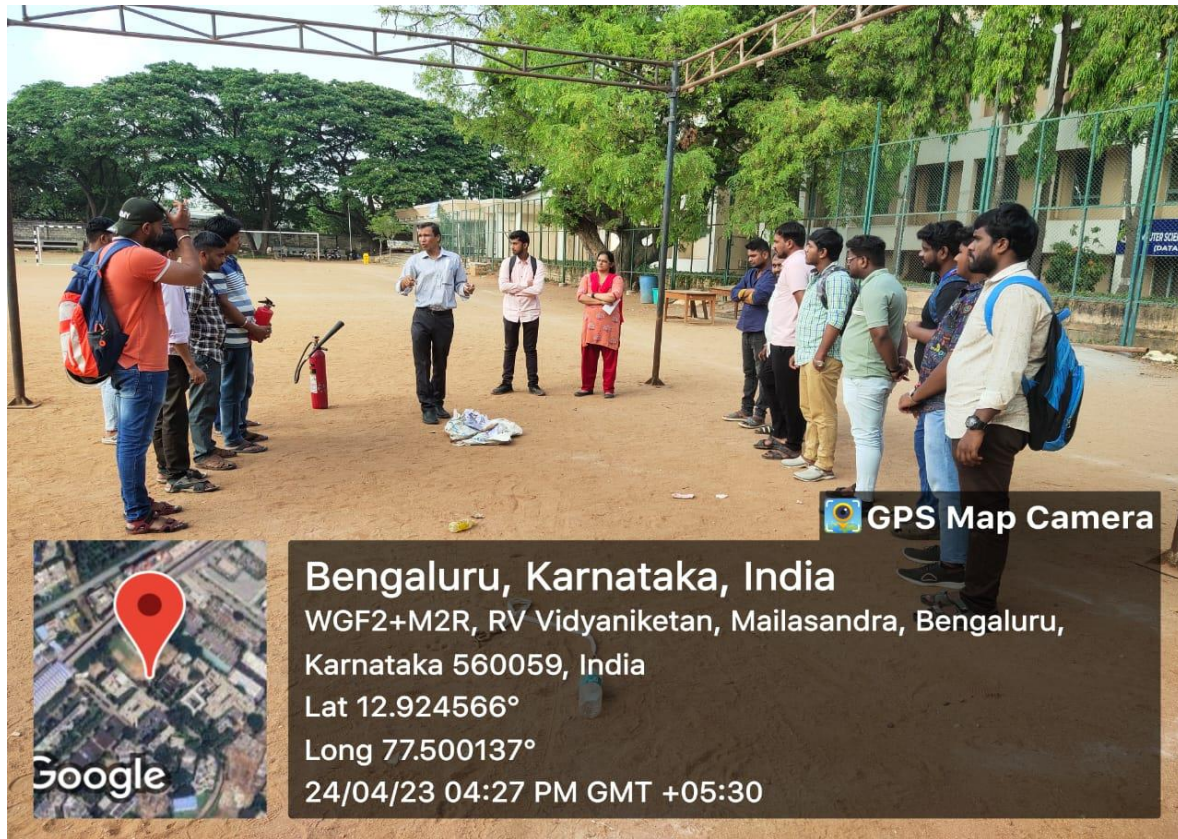


**Inaugural Function on 20.03.2023**

Theory Session at RVCE







**Demonstration of Fire Extinguisher by Mr. Rajib Borah from Reliance Fire**



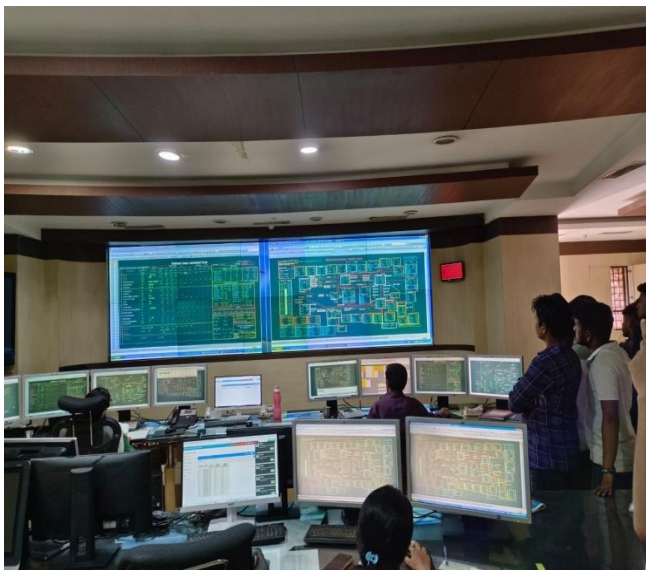
**Technical Talk on Effective and Efficient Working Practices**



## INDUSTRIAL VISITS



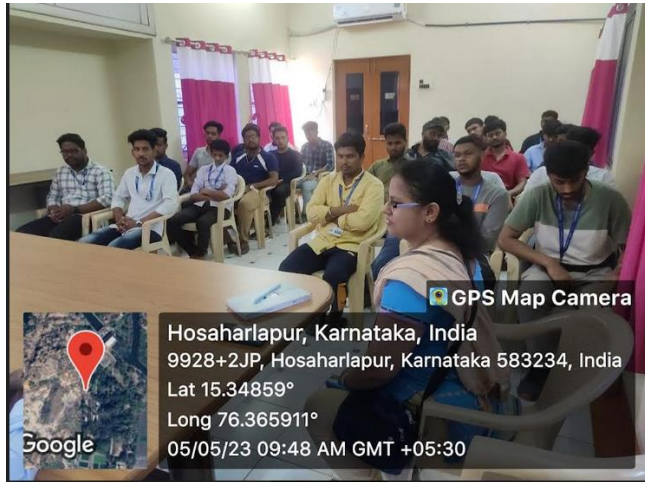
**Hydel Power Plant visit to Madhavmantri , Bhorka Power Corporation Limited at T Narasipura on 1<sup>st</sup> April 2023**







**Visit to SCADA and STATE LOAD DESPATCH CENTRE (SLDC) ON 28-04-2023**



**Practical Sessions at Shivpura Hydel Power Plant, Hospet**

## **Placement Activities**



**Interview conducted for selected Trainees by Bhoruka Power Corporation Ltd. on 27.04.2023**



**MG-RVCE Centre of Excellence in Electric Vehicle Technology**  
**Department of Mechanical Engineering**

**2023-24 (Odd): 5<sup>th</sup> Semester**

**Industry Based Special Skill Training**

Organised by

*IQAC - RVCE in association with Dept. of Mechanical Engineering*

**MG-RVCE Centre of Excellence in Electric Vehicle Technology**

Date: 06/02/2024

**Daywise Report – Day 2**

05/02/2024, Monday – 10/02/2024, Saturday

**Day 2: 06/02/2024, Tuesday**



Fig 1 Student participants with Faculty member on Day-2



Fig 2 Faculty briefing about the activities of the Day-2



Fig 3 Briefing about Two Pole Post Lift



Fig 4 Students setting the support points to lift the vehicle



Fig 5 Students operating the lift and lifting the vehicle



**MG-RVCE Centre of Excellence in Electric Vehicle Technology**  
**Department of Mechanical Engineering**



Fig 6 Observing the Auxiliary battery in the vehicle



Fig 7 Students dismantling the Auxiliary battery



Fig. 8 Charging the Auxiliary battery using DC Charger



Fig. 9 Charger Specifications – BOSCH 12V DC Charger



Fig. 10 Available charge after charging for 3 Hrs



Fig 11 Students arranging back the Auxiliary battery



Fig 12 Students referring the Manuals for various details of aggregates and their connections



Fig 13 Students preparing the schematic of connectivity of aggregates

**MG-RVCE Centre of Excellence in Electric Vehicle Technology**  
**Department of Mechanical Engineering**

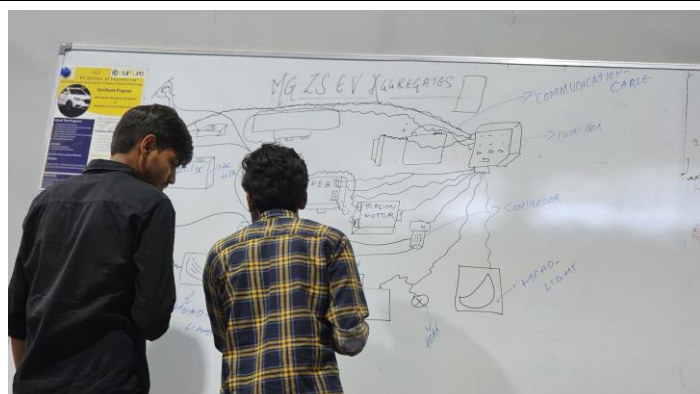


Fig 14 Students sketching the schematic diagram of connectivity of aggregates

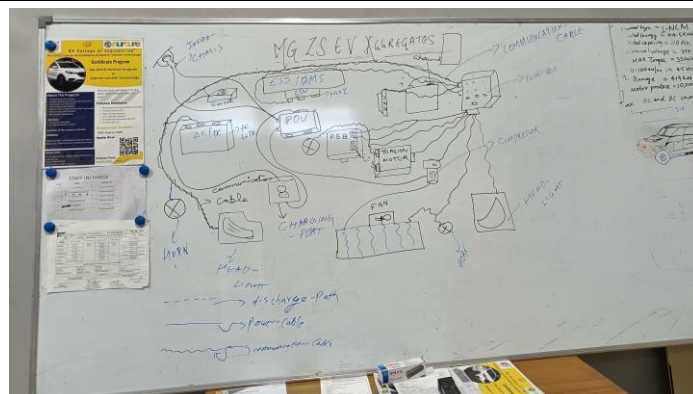


Fig 15 Schematic of Charging and Discharging path, Communication in EV prepared by students

**Activities of the day:**

- Operation of Two Pole Post Lift with vehicle
- Auxiliary battery disassembly, charging and assembling
- Identify the manuals for aggregates and referring for details on them
- Study of the aggregates and their connectivity
- Preparation of the schematic diagram of the connectivity of various aggregates starting of charging to discharging, communication in EV.


<b>Faculty In-Charge:</b>	Dr. V L Jagannatha Guptha, Assistant Professor, Dept. of Mech. Engg.
<b>Signature with date:</b>	

\*\*\*\*\*



Decibels Lab Pvt Ltd, KOKARYA Business Synergy Center, Nagananda commercial complex, Jaynagar, Bangalore South, KA - 560041 | Email - contact@decibelslab.com  
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### TAX INVOICE


Bill to Party				Invoice Details				
Name	Veda Nanapur			Invoice No: 2211BC80				
Address	Bangalore Karnataka			Invoice Date: 09-11-2022				
Sl.	Goods / Service	Quantity	Taxable value (INR)	CGST		SGST		Total Amount (INR)
No.	Description			Rate	Amount	Rate	Amount	
1	BMS Micro Specilisation	1	25,000	9%	2,250	9%	2,250	29,500
Total			25,000		2,250		2,250	29,500
PREFERRED MODE OF PAYMNT: BANK TRANSFER NEFT/RTGS/IMPS made payable to “Decibels Lab Pvt Ltd”		Point of contact:			 Suraj S D			
Bank Account details Account number: 50200043328406 IFSC Code: HDFC0000833 Bank Name/Branch: HDFC Bank/HSR Layout SWIFT code: HDFCINBB		Sushmitha S D, Finance & Accounting Head Email ID: admin@decibelslab.com						
		Naveen C S, Head of Customer relationship Email ID: naveen@decibelslab.com / +91 89515 03455			Authorised signatory & Sign			





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CIN: U80904KA2019PTC126675 | GSTIN: 29AAHCD3638H1ZG


### TAX INVOICE

Bill to Party				Invoice Details				
Name	Chiluveru Manishankar			Invoice No: 2211BC85				
Address	Bangalore Karnataka			Invoice Date: 08-11-2022				
Sl.	Goods / Service	Quantity	Taxable value (INR)	CGST		SGST		Total Amount (INR)
No.	Description			Rate	Amount	Rate	Amount	
1	EV Powertrain Master Course	1	75,000	9%	6,750	9%	6,750	88,500
Total			75,000		6,750		6,750	88,500
PREFERRED MODE OF PAYMNT: BANK TRANSFER NEFT/RTGS/IMPS made payable to “Decibels Lab Pvt Ltd”		Point of contact:			 Suraj S D			
Bank Account details Account number: 50200043328406 IFSC Code: HDFC0000833 Bank Name/Branch: HDFC Bank/HSR Layout SWIFT code: HDFCINBB		Sushmitha S D, Finance & Accounting Head Email ID: admin@decibelslab.com						
		Naveen C S, Head of Customer relationship Email ID: naveen@decibelslab.com / +91 89515 03455			Authorised signatory & Sign			



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CIN: U80904KA2019PTC126675 | GSTIN: 29AAHCD3638H1ZG

### TAX INVOICE


Bill to Party				Invoice Details				
Name	Sachin Patel			Invoice No: 2211BC86				
Address	Bangalore Karnataka			Invoice Date: 09-11-2022				
Sl.	Goods / Service	Quantity	Taxable value (INR)	CGST		SGST		Total Amount (INR)
No.	Description			Rate	Amount	Rate	Amount	
1	BMS Micro Specilisation	1	25,000	9%	2,250	9%	2,250	29,500
Total			25,000		2,250		2,250	29,500
PREFERRED MODE OF PAYMNT: BANK TRANSFER NEFT/RTGS/IMPS made payable to “Decibels Lab Pvt Ltd”		Point of contact:			 Suraj S D			
Bank Account details Account number: 50200043328406 IFSC Code: HDFC0000833 Bank Name/Branch: HDFC Bank/HSR Layout SWIFT code: HDFCINBB		Sushmitha S D, Finance & Accounting Head Email ID: admin@decibelslab.com						
		Naveen C S, Head of Customer relationship Email ID: naveen@decibelslab.com / +91 89515 03455			Authorised signatory & Sign			

Working details for the profit sharing to RVCE Decibels RVCE EV COC					65% of the course cost	Course fee-Net basici expese	35% of the profit
SI No	Name	Course	Date	Course Fee excl of GST	Net basic expense	Course profit	Service fee to RVCE
1	Joyal Isac	BMS Micro Specilisation	14/11/22	25000	16250	8750	3062.5
2	Prasad Sutar	BMS Micro Specilisation	12/11/22	25000	16250	8750	3062.5
3	Mirazul Bari	EV Powertrain Master Course	6/11/22	75000	48750	26250	9187.5
4	Prasad Bodireddi	EV Powertrain Micro Specilisation	10/12/22	25000	16250	8750	3062.5
5	Prajwal M R	EV Powertrain Micro Specilisation	12/12/22	25000	16250	8750	3062.5
6	M.N.Mohammed Imran	EV Powertrain Master Course	24/12/22	75000	48750	26250	9187.5
7	Tejas Kumar	EV Powertrain Master Course	31/12/22	75000	48750	26250	9187.5
8	Tushar Kumar	EV Powertrain Micro Specilisation	12/1/23	25000	16250	8750	3062.5
9	SNOWBEN MASCARENHAS.S	BMS Micro Specilisation	16/2/23	25000	16250	8750	3062.5
10	Bharath V G	BMS Micro Specilisation	24/2/23	25000	16250	8750	3062.5
11	Vijay Kadam	BMS Micro Specilisation	13/3/23	25000	16250	8750	3062.5
12	Veda Nanapur	BMS Micro Specilisation	8/11/22	25000	16250	8750	3062.5
13	Chiluveru Manishankar	EV Powertrain Master Course	8/11/22	75000	48750	26250	9187.5
14	Sachin Patel	BMS Micro Specilisation	9/11/22	25000	16250	8750	3062.5
15	Prakrithi H R	BMS Micro Specilisation	30/11/23	25000	16250	8750	3062.5
16	Akshay S	BMS Micro Specilisation	21/12/22	25000	16250	8750	3062.5
17	VIKAS KUMAR	BMS Micro Specilisation	4/1/23	25000	16250	8750	3062.5
18	Pradeep Chandrasekaran	BMS Master Course	18/1/23	75000	48750	26250	9187.5
19	Nilesh Sondarva	EV Powertrain Micro Specilisation	20/01/23	25000	16250	8750	3062.5
20	Deepak V	EV Powertrain Micro Specilisation	31/1/23	25000	16250	8750	3062.5
21	M.Siddharth	EV Powertrain Micro Specilisation	8/2/23	25000	16250	8750	3062.5
22	Samyak Patel	BMS Micro Specilisation	8/2/23	25000	16250	8750	3062.5
23	Sathish Kumar Sadasivam	BMS Micro Specilisation	20/2/23	25000	16250	8750	3062.5
24	Prathamesh Pravin Piwalkar	BMS Micro Specilisation	7/3/23	25000	16250	8750	3062.5
25	Paramesha R	BMS Micro Specilisation	14/3/23	25000	16250	8750	3062.5
26	Karthikeyan Ganesan	BMS Master Course	24/3/23	75000	48750	26250	9187.5
27	Balaji Ravidran	BMS Master Course	03/04/23	75000	48750	26250	9187.5
				1025000	666250	358750	125562.5

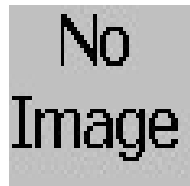


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CIN: U80904KA2019PTC126675 | GSTIN: 29AAHCD3638H1ZG

### TAX INVOICE

Bill to Party				Invoice Details				
Name	Mirazul Bari			Invoice No: 2211BC79				
Address	Bangalore Karnataka			Invoice Date: 08-11-2022				
SL	Goods / Service	Quantity	Taxable value (INR)	CGST		SGST		Total Amount (INR)
No.	Description			Rate	Amount	Rate	Amount	
1	EV Powertrain Master Course	1	75,000	9%	6,750	9%	6,750	88,500
Total			75,000		6,750		6,750	88,500
PREFERRED MODE OF PAYMNT: BANK TRANSFER NEFT/RTGS/IMPS made payable to “Decibels Lab Pvt Ltd”		Point of contact:			 Suraj S D			
Bank Account details Account number: 50200043328406 IFSC Code: HDFC0000833 Bank Name/Branch: HDFC Bank/HSR Layout SWIFT code: HDFCINBB		Sushmitha S D, Finance & Accounting Head Email ID: admin@decibelslab.com						
		Naveen C S, Head of Customer relationship Email ID: naveen@decibelslab.com / +91 89515 03455			Authorised signatory & Sign			





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MAIN ROAD , PEENYA 2ND STAGE, BANGALORE  
CIN : U25111KA2019PTC130613  
GSTIN : 29AAHCD5632R1ZX

Advice No. : 81  
:

Dated : 28-04-2023  
:

Party : RASHTREEYA SIKSHANA SAMITHI TRUST RV College of Engineering  
Mysore Road Bangalore-560010

Party GSTIN / UIN : 29AAATRO758A1ZP  
Place of Supply : Karnataka (29)

Amount (Rs.) : 1,50,000.00

Inst. Type : RTGS

Inst. No. : 317609

Ref No. \_\_\_\_\_  
10201802000690

Ref Date \_\_\_\_\_  
16-12-22

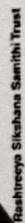
Amount \_\_\_\_\_  
1,50,000.00 Dr

Due Date \_\_\_\_\_  
16-12-22

Rs. 1,50,000.00  
Rupees One Lakh Fifty Thousand Only

For DHANYA PLASTICS AND FOAMS PVT LTD 23-24

Authorised Signatory



**RV College of  
Engineering**

Approved by AICTE,  
New Delhi

**Autonomous  
Institution Affiliated  
to Visvesvaraya  
Technological  
University, Belagavi**

**Original**

## TAX INVOICE

GSTIN : 29AAATR0758A1ZP PAN : AAATR0758A						Invoice No. : 10201802000690 Date : 16.12.2022										
<b>Billing Details (Bill To) :</b>						<b>Shipping Details (Ship To) :</b>										
Name : DHANYA PLASTICS & FOAMS PRIVATE LIMITED						Name : DHANYA PLASTICS & FOAMS PRIVATE LIMITED										
Address : ,No 49, 4th B cross,Nanda Gokula,Thigalarapalya Main Road,Industrial Estate Bangaluru-560058						Address : ,No 49, 4th B cross,Nanda Gokula,Thigalarapalya Main Road,Industrial Estate Bangaluru-560058										
GSTIN : 29AAATCD5632R1ZX						GSTIN : 29AAAHCD5632R1ZX										
PAN : AAHCD5632R						PAN : AAHCD5632R										
State Code : 29-Karnataka						State Code : 29-Karnataka										
SI.No		Description		HSN/SAC	Quantity	UOM	Rate / Item (Rs.)		Taxable Value (Rs.)		GST			Total Amount (Rs.)		
											SGST		CGST		IGST	
											Rate of Tax		Amount		Rate of Tax	
1		Institution Consultancy Projects Design & Development of static webpage for the Company ( EXP01 )		998393	0.000		0.00		2,00,000.00		9.000		18,000.00		0.000	
															0.00	
															2,36,000.00	

Mysore Road, RV Vidyamilitetan  
Post, Bengaluru - 560059,  
Karnataka India

090 - 68188100 / 8112

principal@rvce.edu.in  
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Subramanya  
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RV College of Engineering

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Bangalore - 560 05

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## Purchase Order



## AutoTEC Systems Pvt Ltd

No.177/6B, "Ashraya Ornate", Bilekahalli,  
Bannerghatta Road, Bengaluru - 560076 [Ph.: +91-80-40327600/7666]

QSF/PUR/07-ISSUE: C - REVISION: 01 - DATE: 27/11/2020

## Party Details :

RV College of Engineering  
Department of Electronics & Communication  
8th Mile, Mysore Road, RV Vidyaniketan Post  
Bangalore 560064

GSTIN / UIN : 29AAATR0758A1ZP  
Price Basis : N/A  
W.O. Number : ADE FDT 846  
Test Reports : N/A  
Freight & Ins. : N/A  
Remark :

Order No. : ATS/RM/PO-282/22-23  
Dated : 27-12-2022  
Quotation Ref. : MAIL  
Quotation Dated : 27.12.2022  
AMENDMENT No. : N/A  
Amendment Date : N/A  
Payment Terms : 25% Advance 75% PRIOR SHIPMENT  
Delivery : 13 WEEK  
COC : N/A  
Courier / Packi : N/A  
Warranty : 12 MONTHS

We are pleased to place the order for the following items :

S.N.	Part Number	WO Number	Package	Make	Qty.	Uni	Price	Amount(₹)
1.	SOFTWARE/FIRMWARE <i>Software/Firmware Development for Bidirectional Data Transfer Between Cloud/SD Card And ARINC/CAN Bus</i>	846			1.00	SET	2,00,000.00	2,00,000.00
								2,00,000.00
Add : CGST @ 9.00 %								18,000.00
Add : SGST @ 9.00 %								18,000.00
Grand Total 1.00 SET ₹								2,36,000.00

Tax Rate	Taxable Amt.	CGST	SGST	Total Tax
18%	2,00,000.00	18,000.00	18,000.00	36,000.00

Rupees Two Lakh Thirty Six Thousand Only

## Terms &amp; Conditions

\* General Terms & Conditions : Refer Overleaf  
\* Special Terms & Conditions: MANUFACTURE DATE  
SHOULD NOT BE OLDER THAN 2 YEARS  
& COMPONENT MUST BE OF SAME BATCH CODE  
GST IN: 29AACCA7689N1ZS  
CIN: U72200KA2000PTC026996 MSME Regn. No. 290201200293

Receiver's Signature :

for AutoTEC Systems Pvt Ltd

Authorised Signatory



RV College of  
Engineering®

Placement RVCE <placement@rvce.edu.in>

## Fwd: for RECORDS - consultancy details

Badarinath K B <badarinath.kb@rvce.edu.in>

Fri, May 24, 2024 at 5:22 PM

To: placement@rvce.edu.in, "Narasimha Murthy H.N." <narasimhamurthyhn@rvce.edu.in>

Sent from my iPhone

Begin forwarded message:

**From:** Badarinath K B <badarinath.kb@rvce.edu.in>

**Date:** 22 April 2024 at 3:51:08 PM IST

**To:** "Dr. Sindhu D V" <sindhudv@rvce.edu.in>

**Cc:** "HOD Dept. of CS, RVCE" <hod.cse@rvce.edu.in>

**Subject:** for RECORDS - consultancy details

### Software/Firmware Development for Bidirectional Data transfer between Cloud/SD card and ARINC/CAN bus

Company & Address: AutoTEC Systems Private Limited  
No.177/6B, 'Ashraya Ornate', Bilekahalli Bannerghatta Road,  
Bengaluru 560 076, Karnataka, India.

Ph: +91-80-40327600 | Mob: +91 98451 70664

**Work Order : 2,36,000/-** (Order No.ATS/RM/PO-282/22-23,dated 27-12-2022).

**Period: 2023-24**

Payment Details:

Invoice No. 10201802000737, dated 29-12-2022, Rs.59,000/-

Invoice No. 10201802000253, dated 04-07-2023, Rs.1,18,000/-

Invoice No. 10201802000001, dated 04-04-2024, Rs.59,000/-

Pay order issued Rs.54000/-, State Bank Of India, 5-01-2023, from Account no:00000010427840077

IMPS Mode, Rs.1,08,000/-, 31-03-2024, UTR No.409114973218, State Bank Of India

Status: Completed

Faculty Interns

Dr K Badari Nath

Dr. Sahana B

Dr. Ramakanth Kumar P

Dr. Ravish Aradhya H V

Student Interns

Devesh Joshi-EC Department,

Varikoti Siva Sai Dhanush -EC Department

Shishira M Iyar (1RV21CS154) – CS Department

Tavashi Kumar (1RV21CS178) – CS Department

Dr K Badari Nath

Associate Professor,

Dept. Of Computer Science & Engineering,

R.V. College of Engineering, Bangalore - 560059

M: 9945124747 EMail: [badarinath.kb@rvce.edu.in](mailto:badarinath.kb@rvce.edu.in)

Website: <https://rvce.edu.in/cs-Badrinath-new>





## RV College of Engineering®

Mysore Road, RV Vidyaniketan Post,  
Bengaluru - 560059, Karnataka, India

Autonomous Institution  
Affiliated to Visvesvaraya  
Technological University,  
Belagavi

Approved by AICTE, New Delhi,  
Accredited by NAAC, Bengaluru  
and NBA, New Delhi

principal@rvce.edu.in  
www.rvce.edu.in  
Tel: +91-80-68188110  
+91-80-68188111  
+91-80-68188112

Branch  
Address &  
IFSC  
R V College of Engineering Campus  
Mysore Road,,Bengaluru,10  
KKBK0008053

Amount in Words : Rupees Fifty Nine Thousand Only

### TERMS & CONDITIONS :-

- 1.Payment to be made at the earliest
- 2.Cheque in favour of Director/Principal/CEO/Head Mistress  
RV College of Engineering

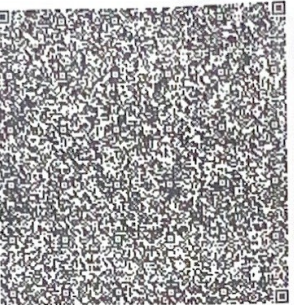
RV College of Engineering  
Principal  
HOU/Authorized Signatory  
RV College of Engineering  
Bengaluru - 560 059

IRN : aa49a121d29f68b28a9d841c29da2b7167f5e4e7d0beb7d100ac3ee8d7cb2836

Ack No : 112419830800735

Ack Date : 2024-04-04

e-Invoicing detail(s) generated from the Government's e-Invoicing system.







**RV College of Engineering®**  
Mysore Road, RV Vidyaniketan Post,  
Bengaluru - 560059, Karnataka, India

Autonomous Institution  
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and NBA, New Delhi

principal@rvce.edu.in  
www.rvce.edu.in  
Tel: +91-80-68188110  
+91-80-68188111  
+91-80-68188112

### TAX INVOICE

GSTIN : 29AAATR0758A1ZP  
PAN : AAATR0758A

Invoice No. : 10201802000001  
Date : 04.04.2024

#### Billing Details (Bill To) :

Name : AUTOTEC SYSTEMS PRIVATE LIMITED

Address : ,177/6B,ASHRAYA ORNATE,BILEKAHALLI ,BANNERGHATTA ROAD  
Bangaluru-560076

GSTIN : 29AACCA7689N1ZS

PAN : AACCA7689N

State Code : 29-Karnataka

#### Shipping Details (Ship To) :

Name : AUTOTEC SYSTEMS PRIVATE LIMITED

Address : ,177/6B,ASHRAYA ORNATE,BILEKAHALLI ,BANNERGHATTA ROAD  
Bangaluru-560076

GSTIN : 29AACCA7689N1ZS

PAN : AACCA7689N

State Code : 29-Karnataka

Sl.No	Description	HSN/SAC	Quantity	UOM	Rate / Item (Rs.)	Taxable Value (Rs.)	SGST			CGST			IGST			Total Amount (Rs.)
							Rate of Tax	Amount	Rate of Tax	Amount	Rate of Tax	Amount	Rate of Tax	Amount	Amount	
1	Training & Consultancy fee Software/Firmware Development for Bidirectional Data transfer between Cloud/SD card and ARINC/CAN Bus_Final Payment	998393	0.000		0.00	50,000.00	9.000	4,500.00	9.000	4,500.00	0.000	0.00				59,000.00
Beneficiary details for NEFT/RTGS																
TCS Rate of Tax																0.00
Discount																0.00
Round of Amount																0.00
Grand Total																59,000.00

Bank A/C  
Details  
RV College of Engineering  
136010112055  
Kotak Mahindra Bank

Rashtreeya Sikshana Samithi Trust®

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Letter No: Log9/2024/26/03/00371  
Date: 20<sup>th</sup> May 2024

To,

Suhas P Shetty  
S/O: Prakash RJ,  
Kadadakatte opp busstop,  
Kavalagundi post,  
bhadravathi

**Internship Letter**

**Dear Suhas,**

We are delighted to extend to you an Internship with **Log 9 Materials Scientific Pvt. Ltd.**, we would like to formally offer you the position of **Intern -BMS Hardware**. Your date of joining will be **22<sup>nd</sup> May 2024**, and duration of internship will be for 6 Months Your monthly stipend will be Rs. 20,000/- per month; in addition to this you will also be eligible for a variable pay of Rs. 5,000/- \*

\*Variable pay will be based on your performance and will be disbursed cumulatively upon the completion of your internship.

You will be based at **Log9 Materials (BLR1)** Survey # 9, Bellary Road, Off, Jakkuru Main Rd, next to Aditya Birla Nuvo Ltd, Jakkuru Layout, Byatarayanapura, Bengaluru, Karnataka 560092. Please report at this address at **10:30 AM** on **22<sup>nd</sup> May 2023**.

You are requested to mail self-attested copies of the following, on your date of joining.

1. Photo I.D. Proof
2. Residence Proof (Present/Permanent)
3. Aadhar Card & Pan Card
4. Mark sheets (X till latest)

Originals are required for:-

1. Passport size photographs (with name & address on the reverse of each photograph)
2. Resume

. The internship letter is issued to you based on the representations made by you. The internship letter is subject to:

- You providing the Company with self-attested copies of the documents in support of your qualifications/experience and other details provided by you.
- The payroll cut off date is 16th of each month. In-case you are joining us on or after the 17th of the month, then your stipend will be processed in the following month.
- Your notice period if for 1 week.
- Satisfactory results of verifications and reference checks that would be conducted. If the Company considers that your verification/reference checks are not up to the desired standards, internship shall automatically stand withdrawn. If you fail to join on the date specified hereinabove, the internship shall stand withdrawn.

During the internship program you are requested to follow the company's code of conduct, failure to do so will lead to discontinuation of internship.

I welcome you to our organization and look forward to your valuable contribution to the company. **Please confirm your acceptance by signing a copy of this letter and sending it back by 22<sup>nd</sup> May 2024.**

Yours Sincerely,  
For Log 9 Materials Scientific Pvt. Ltd.

Authorized Signatory

*I have read all the terms and conditions of the offer and would like to confirm my acceptance, I further understand that this letter of offer is conditional and my appointment is subject to successful completion of induction training and also satisfactory results of my verification and reference check. I further agree that I am bound by the contents of this letter, my undertaking and indemnities to the Company as well as by the service conditions of the Company. I have understood all such terms and conditions and my appointment shall be subject to the same.*

Signature



Date:

Log 9 Materials Scientific Pvt Ltd

Survey 9, Jakkuru Layout,

Bengaluru 560092, Karnataka

t +91 80 2343 4399 e contact@log9materials.com [www.log9materials.com](http://www.log9materials.com)

CIN U29253KA2015PTC126433

Place:

To

Dean, Placement & Training

R V College of Engineering, Bengaluru

Subject: Proposal Letter to Hire Tech Interns

Dear Sir,

Greetings from Birla Pivot !

Aditya Birla Group's flagship manufacturing conglomerate, Grasim has recently forayed into B2B e-commerce for SMEs that seeks to capitalize on the large and growing opportunity in the construction procurement industry (INR 7 lakh crore procurement market in India, with less than 2% digital penetration).

BirlaPivot is a pioneering B2B e-commerce platform dedicated to transforming the building and construction supply chain by taking a digital first approach. We connect industry professionals, streamline procurement processes, and empower businesses to thrive in the digital age.

We are writing to express our interest in participating for internship sessions for the final year students at your college from Computer Science and Information Technology streams.

Internship would be for 6 months at a stipend of 25,000/- and the selected intern would be responsible for developing tech design, building and testing system functionality and features and work closely with the product, support, QA, data and other teams.

Our goal is to transform this market through technology and process innovation across multiple workstreams like procurement, financing and fulfilment. Interns can contribute to and learn by solving complex industry first problems and enjoy working with a very competent and diverse team. Join us to build the best B2B commerce platform that is leveraging technology to unlock great business value.

We believe that the internship session would be mutually benefiting, and we look forward to discussing the proposal further and exploring the possibilities of a successful collaboration. Kindly confirm on the dates to visit the campus.

Please feel free to reach out to us at [anubhuti.kala@adityabirla.com](mailto:anubhuti.kala@adityabirla.com) or call on 8989005859.

Thanks and Regards

Hamsini Ramamurthy

Head Human Resources





RV College of  
Engineering®

Placement RVCE <placement@rvce.edu.in>

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## Internship Opportunity - Tektronix

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**Venkatachalam, Lakshmi** <lakshmi.venkatachalam@tektronix.com>

Mon, Dec 4, 2023 at 11:12 AM

To: "placement@rvce.edu.in" <placement@rvce.edu.in>

Cc: "Chhetry, Shweta" <shweta.chhetry@tektronix.com>

Hi Ranganathan sir,

Hope you're doing good.

As discussed in the call, could you please share the list of students who are available for internship opportunities from the 2024 batch BE/Btech (CSE, ISE,) & ME/Mtech (Computer Science branches).

Internship Duration Will Be 6 Months

Probable Start Date: Jan 2024

Stipend: RS 30,000/Month

Kindly Provide What % of Students have been placed for this year (2024 Batch) & Diversity Percentage Available

Kindly Note that this is only an internship opportunity & based on business needs/decisions we might or might not offer full-time offer.

Requesting to share the information ASAP

Thanks,

Lakshmi Narayanan V

Talent Acquisition Partner

**Tektronix®**



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*Please be advised that this email may contain confidential information. If you are not the intended recipient, please notify us by email by replying to the sender and delete this message.*



**Job Description Software Engineer RD.docx**

65K



RV College of  
Engineering®

Placement RVCE <placement@rvce.edu.in>

## [IMPORTANT & URGENT] - ATTEND MEGA EDUCATION FAIR BY IDP EDUCATION - TOMORROW, 13TH AUG 2022 AT TAJ MG ROAD, BANGALORE!!!!

Lakhan Rao <lakhan.rao@idp.com>

Fri, Aug 12, 2022 at 9:50 PM

To: "placement@rvce.edu.in" <placement@rvce.edu.in>

Dear Aspirant,

Greetings from IDP Education!

**IDP Education** is happy to invite you, your family, and friends to the India's largest educational fair at Taj Hotel, MG Road on **13th August 2022**, i.e., tomorrow!

Largest Education Fair in India organized by IDP Education!!!! **Meet Top Universities from AUSTRALIA | New Zealand | CANADA at Taj Hotel, MG Road, Bengaluru, Karnataka.**




**Register Now to avoid standing in the long queue tomorrow at the venue:**

<https://forms.gle/jdmuQdC6Wtxn7p8c9>

<b>Date:</b>	Sat, 13th Aug 2022
<b>Timings:</b>	<b>Virtual/Online:</b> 10:00 AM to 1:00 PM <b>In-Person:</b> 1:00 PM to 5:00 PM
<b>Address-</b>	No. 41/3, Mahatma Gandhi Rd, Yellappa Garden, Yellappa Chetty Layout, Sivanchetti Gardens, Bengaluru, Karnataka 560001
<b>GoogleMap Location:</b>	<a href="https://goo.gl/maps/sPbFBs9XJfy3bMbp7">https://goo.gl/maps/sPbFBs9XJfy3bMbp7</a>

Register Now to get an opportunity to discuss your study abroad plans and hit the ground running to kick-start your study abroad journey.

### Event highlights:

-  Know about programs, scholarships, and post-study work rights
-  Submit applications for 2022/23 intakes
-  1-on-1 face-to-face interaction with institution representatives and faculty members.



Discuss eligibility criteria, scholarships, and post-study work opportunities.



Avail application fee waivers\* and more

\*\*\*\*\*Register Now to avoid standing in the long queue tomorrow at the venue:\*\*\*\*\*

<https://forms.gle/jdmuQdC6Wtxn7p8c9>

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If you have the dream, we will show the way.

Meet **175+** world-class institutions from Australia, Canada and New Zealand

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Bangalore | Sat, 13th Aug

Virtual: 10:00am - 11:30am  
In-person: 12:00pm - 5:00pm  
Hotel Taj, MG Road

Powered by: **ICICI Bank** Education Loans, **CAMPUS POWER** For your study loans, **ICICI Bank** Cards

#### About IDP:

IDP Education is a global leader in International Education Services, headquartered in Melbourne, Australia. IDP has its strong presence in more than 40 countries. IDP also helps young students from high school, and college to advance their career with higher education in top study abroad destinations/countries.



Scan the QR Code to register now:

Best regards

**Lakhan Rao**

Regional Manager – Business Development

IDP Education, Bangalore

Mob: +91-73496-01763 | +91-96067-67707

[Lakhan.rao@idp.com](mailto:Lakhan.rao@idp.com)

#### 2 attachments



image002.jpg  
157K



image004.png  
3K





RV College of  
Engineering®

Placement RVCE <placement@rvce.edu.in>

## Recruitment Notice - Combined Defence Services Exam - 2023 - Govt of India

Rahul Sridhar <rahul\_sridhar2005@yahoo.co.in>

Sun, May 21, 2023 at 6:42 PM

To: "placement@rvce.edu.in" <placement@rvce.edu.in>, "drgrkrishna@gmail.com" <drgrkrishna@gmail.com>, "dr\_agri@aaau.ac.in" <dr\_agri@aaau.ac.in>, "dracademicknruhs@gmail.com" <dracademicknruhs@gmail.com>, "drbramc@yahoo.co.in" <drbramc@yahoo.co.in>, "drtariq@yogivemanauniversity.ac.in" <drtariq@yogivemanauniversity.ac.in>, "placement@mvjce.edu.in" <placement@mvjce.edu.in>, "info@ncetmail.com" <info@ncetmail.com>

Dear Faculty,

Please find attached the recruitment notice issued by the Govt of India for selecting candidates in the rank of officers in the Navy, Air Force & Army.

I request you to circulate this notice among all the students in your college as per the eligibility criterion and terms & conditions mentioned in this notice.

The question papers of the previous year exams are available on the website <http://www.upsc.gov.in> for reference purpose.

The last date to apply online is 6th-June-2023.

This notice can also be downloaded from the URL <https://upsc.gov.in/sites/default/files/Notif-CDS-II-23-engl-170523R.pdf> if you want to.

All the Best!!

Regards

Rahul Sridhar  
Career Counselor  
Chennai

Sent from [Outlook for Android](#)



Recruitment Notice - Combined Defence Services Exam - 2023 - Govt of India.pdf

811K



# UNION PUBLIC SERVICE COMMISSION

**EXAMINATION NOTICE NO.11/2023.CDS-II**

**DATED 17.05.2023**

**(Last Date for Submission of Applications: 06.06.2023)**

**COMBINED DEFENCE SERVICES EXAMINATION (II), 2023**

**[INCLUDING SSC WOMEN (NON-TECHNICAL) COURSE]**

**(Commission's Website <http://upsc.gov.in>)**

## **IMPORTANT**

### **1. CANDIDATES TO ENSURE THEIR ELIGIBILITY FOR THE EXAMINATION:**

The candidates applying for the examination should ensure that they fulfil all the eligibility conditions for admission to the Examination. Their admission at all the stages of the examination will be purely provisional subject to satisfying the prescribed eligibility conditions.

**Mere issue of Admission Certificate to the candidate will not imply that his candidature has been finally cleared by the Commission.**

Verification of eligibility conditions with reference to original documents will be taken up only after the candidate has qualified for interview/Personality Test.

### **2. HOW TO APPLY**

Candidates are required to apply online by using the website **[upsconline.nic.in](http://upsconline.nic.in)**. It is essential for the applicant to register himself/herself first at One Time Registration (OTR) platform, available on the Commission's website, and then proceeds for filling up the online application for the examination. OTR has to be registered only once in life time. This can be done anytime throughout the year. If the candidate is already registered, he/she can proceed straightway for filling up the online application for the examination.

#### **2.1 Modification in OTR Profile:**

In case, the candidate wants to effect any change in his/her OTR profile, it shall be allowed only once in the lifetime after the registration at OTR platform. The option to change in OTR profile data shall be available till expiry of 7 days from the next day after the closure of application window of his/her first final application for any Examination of the Commission. In case, the candidate after registration of OTR applies for the first time in this examination; last date of modification of OTR would be **13.06.2023**.

#### **2.2 Modification in application form (Other than OTR Profile):**

The Commission has also decided to extend the facility of making correction(s) in any field(s) of the application form for this examination from next day of the closure of the application window of this Examination. This window will remain open for 7 days from the date of opening of the same i.e. from **07.06.2023 to 13.06.2023**. In case a candidate wants to carry out any change in his/her OTR profile during this period, then he/she should login to the OTR platform and do the needful accordingly. In other words, no change in the OTR profile can be made by visiting the window for Modification in application form.

2.3 The candidate will not be allowed to withdraw their applications after the submission of the same.

2.4 Candidate should have details of one Photo ID Card viz. Aadhaar Card/Voter Card/PAN Card/Passport/Driving Licence/Any other Photo ID Card issued by the State/Central Government. The details of this Photo ID Card will have to be provided by the candidate while filling up the online application form. The candidates will have to upload a scanned copy of the Photo ID whose details have been provided in the online application by him/her. This Photo ID Card will be used for all future reference and the candidate is advised to carry this Photo ID Card while appearing for Examination/Personality Test/SSB.

Brief instructions for filling up the online Application Form have been given in the Appendix-II. Detailed instructions are available on the above mentioned website.

### 3. LAST DATE FOR SUBMISSION APPLICATIONS:

The Online Applications can be filled upto 6<sup>th</sup> June, 2023 till 6:00 PM. **The eligible candidates shall be issued an e-Admit Card three weeks before the commencement of the examination. The e-Admit Card will be made available on the UPSC website ( <http://upsc.gov.in>) for downloading by candidates. No e-Admit Card will be sent by post. All the applicants are required to provide valid & active e-mail id while filling up online application form as the Commission may use electronic mode for contacting them.**

### 4. PENALTY FOR WRONG ANSWERS:

Candidates should note that there will be penalty (**Negative Marking**) for wrong answers marked by a candidate in the Objective Type Question Papers.

### 5. Online Question Paper Representation Portal (QPrep)

The Commission has introduced a time frame of 7 days (a week) i.e. from the next day of the Examination Date to 6.00 p.m. of the 7th day is fixed for the candidates to make representations to the Commission on the questions asked in the Papers of the Examination. Such representation must be submitted through the **“Online Question Paper Representation Portal (QPrep)”** only by accessing the URL <http://upsconline/nic/in/miscellaneous/QPrep/>. No representation by email/post/hand or by any other mode shall be accepted and the Commission shall not involve into any correspondence with the candidates in this regard. No representation shall be accepted under any circumstances after this window of 7 days is over.

6. For both writing and marking answers in the OMR sheet (Answer Sheet) candidates must use **black ball pen** only Pens with any other colour are prohibited. Do not use Pencil or Ink pen. Candidates should note that any omission/mistake/discrepancy in encoding/filling of details in the OMR answer sheet especially with regard to Roll Number and Test Booklet Series Code will render the answer sheet liable for rejection. **Candidates are further advised to read carefully the “Special Instructions” contained in Appendix-III of the Notice.**

**7. FACILITATION COUNTER FOR GUIDANCE OF CANDIDATES:**

In case of any guidance/information/clarification regarding their application, candidature etc. candidates can contact UPSC's Facilitation Counter near Gate 'C' of its campus in person or over **Telephone No.011-23385271/011-23381125/011-23098543** on working days between 10:00 hrs. to 17:00 hrs.

**8. MOBILE PHONES BANNED:**

(a) The use of any mobile phone (even in switched off mode), pager or any electronic equipment or programmable device or storage media like pen drive, smart watches etc. or camera or blue tooth devices or any other equipment or related accessories either in working or switched off mode capable of being used as a communication device during the examination is strictly prohibited. Any infringement of these instructions shall entail disciplinary action including ban from future examinations.

(b) Candidates are advised in their own interest not to bring any of the banned item including mobile phones or any valuable/costly items to the venue of the examination, as arrangement for safe-keeping cannot be assured. Commission will not be responsible for any loss in this regard.

**CANDIDATES ARE REQUIRED TO APPLY ONLINE AT <http://upsconline.nic.in> ONLY.**

**NO OTHER MODE IS ALLOWED FOR SUBMISSION OF APPLICATION.**

**GOVERNMENT STRIVES TO HAVE A WORKFORCE WHICH REFLECTS GENDER BALANCE AND WOMEN CANDIDATES ARE ENCOURAGED TO APPLY.**



No.F.8/1/2023-E.I(B)—Combined Defence Services Examination (II), 2023 will be conducted by the Union Public Service Commission on 3<sup>rd</sup> September, 2023 for admission to the under mentioned courses :—

Name of the Course and Approximate No. of Vacancies:

1. Indian Military Academy, Dehradun— 157 <sup>th</sup> (DE) Course commencing in July, 2024 [including 13 vacancies reserved for NCC 'C' (Army Wing) holders]	100
2. Indian Naval Academy, Ezhimala—Course commencing in July, 2024 Executive Branch (General Service)/Hydro [including 06 vacancies for NCC 'C' Certificate (Naval Wing) holders]	32
3. Air Force Academy, Hyderabad—(Pre-Flying) Training Course commencing in July, 2024 i.e. No. 216 F(P) Course. [including 03 vacancies are reserved for NCC 'C' Certificate (Air Wing) holders through NCC Special Entry]	32
4. Officers' Training academy, Chennai (Madras) 120 <sup>th</sup> SSC (Men) (NT) (UPSC) Course Commencing in October, 2024.	169
5. Officers Training Academy, Chennai (Madras) 34 <sup>th</sup> SSC Women (NT) (UPSC) Course commencing in October, 2024.	16
	_____
	349
	_____

NOTE (i) : The date of holding the examination as mentioned above is liable to be changed at the discretion of the Commission.

NOTE (ii) : The number of vacancies given above is tentative and may be changed at any stage by Services H. Q.

N.B. (I) (a) : A candidate is required to specify clearly in respective column of the Online Application the Services for which he/she wishes to be considered in the order of his/her preference. A male candidate is advised to indicate as many preferences as he wishes to, subject to the condition given at paras (b) and (c) below, so that having regard to his rank in the order of merit due consideration can be given to his preferences when making appointment.

Since women candidates are eligible for OTA only, they should give OTA as their first and only preference.

(b) (i) : If a male candidate is competing for Short Service Commission (Army) only, he should indicate OTA as the one and only choice. However, a male candidate competing for Short Service Commission Course at OTA as well as Permanent Commission course at IMA, Indian Naval Academy and Air Force Academy should indicate OTA as his last preference; otherwise OTA will be deemed to be the last choice even if it is given a higher preference by the candidate.

(b) (ii) : Women candidates are being considered only for Short Service Commission at OTA. They should indicate OTA as the only choice.

(c) Candidates who desire to join Air Force Academy must indicate AFA as first choice, as they have to be administered Computer Pilot Selection System (CPSS) and/or and AF Medicals at Central Establishment/Institute of Aviation Medicines. Choice exercised for AFA as second/third etc. will be treated as invalid.

(d) Candidates should note that, except as provided in N.B. (II) below, they will be considered for appointment to those courses only for which they exercise their preference and for no other course(s).

(e) No request for addition/alteration in the preferences already indicated by a candidate in his/her application will be entertained by the Commission. Nonetheless, the Commission has decided to extend the facility of making correction(s) in any field(s), of the application form for this examination after 7 days of the closure of the application window of this Examination. This window will remain open for 7 days from the date of opening of the same i.e. from **07.06.2023 to 13.06.2023**. In case a candidate wants to carry out any change in his/her OTR profile during this period, then he/she should log into the OTR platform and do the needful accordingly. In other words, no change in the OTR profile can be made by visiting the window for Modification in application form. Thereafter, no change of choice will be allowed. Second choice will come for consideration only when the first choice is not offered to the candidate by Services HQ. When first choice is offered and a candidate declines the same, his/her candidature will be cancelled for all other choices for regular Commission.

N.B. (II) The left-over candidates of IMA/Indian Naval Academy/Air Force Academy courses viz., those who have been recommended by the Union Public Service Commission for grant of Permanent Commission on the basis of the final results of this Examination, but who could not be inducted on these courses for any reason whatsoever may be considered for grant of SSC even if they have not indicated their choice for this course in their applications, if they are subsequently willing to be considered for this course subject to the following conditions :

(i) There is a shortfall after detailing all the candidates who competed for the SSC Course; and

(ii) The candidates who are detailed for training even though they have not expressed their preference for SSC will be placed in the order of Merit List after the last candidate who had opted for this Course, as these candidates will be getting admission to the Course to which they are not entitled according to the preference expressed by them.

(iii) Candidates with Air Force as first and only choice cannot be considered as left-over for grant of SSC (OTA) if they fail in Computer Pilot Selection System (CPSS) and/or Pilot Aptitude Battery Test. Such candidates, if they desire to be considered for SSC (OTA) should exercise their option for OTA also.

NOTE 1: NCC 'C' Certificate (Army Wing (Senior Division)/ Air Wing/Naval Wing) holders may also compete for the vacancies in the Short Service Commission Course but since there is no reservation of vacancies for them in this course, they will be treated as general candidates for the purpose of filling up vacancies in this course. Candidates who have yet to pass NCC 'C' Certificate (Army Wing (Senior Division)/ Air Wing/Naval Wing) examination, but are otherwise eligible to compete for the reserved vacancies, may also apply but they will be required to submit the proof of passing the NCC 'C' Certificate (Army Wing (Senior Division)/ Air Wing/Naval Wing) examination to reach the IHQ of MoD (Army) / Dte Gen of Rtg (Rtg A) CDSE Entry for SSC male candidates and SSC women entry for female candidates West Block III, R. K. Puram,

New Delhi-110066 in case of IMA/SSC first choice candidates and IHQ of MOD (Navy) DMPR, (OI&R Section), Room No. 204, 'C' Wing, Sena Bhawan, New Delhi-110 011 in case of Navy first choice candidates and Dte of Personnel (Offrs), Kasturba Gandhi Marg, New Delhi-110001. Phone No. 23010231 Extn. 7645/7646/7610 in case of Air Force first choice candidates by 13<sup>th</sup> May, 2024. To be eligible to compete for reserved vacancies the candidates should have served for not less than 3 academic years in the Senior Division Army Wing Air Wing/Naval Wing of National Cadet Corps and should not have been discharged from the NCC for more than 24 months for IMA/Indian Naval Academy/Air Force Academy courses on the last date of receipt of Application in the Commission's Office.

NOTE 2 : In the event of sufficient number of qualified NCC 'C' Certificate (Army Wing (Senior Division)/ Air Wing/Naval Wing) holders not becoming available on the results of the examination to fill all the vacancies reserved for them in the Indian Military Academy Course/Air Force Academy Course/Indian Naval Academy Course, the unfilled reserved vacancies shall be treated as unreserved and filled by general candidates. Admission to the above courses will be made on the results of the written examination to be conducted by the Commission followed by intelligence and personality test by the Services Selection Board of candidates who qualify in the written examination. The details regarding the (a) scheme, standard, syllabus of the examination, (b) Instructions to candidates for filling up the Online Application Form (c) Special instructions to candidates to objective type tests (d) Guidelines with regard to physical standards for admission to the Academy and (e) Brief particulars of services etc. for candidates joining the Indian Military Academy, Indian Naval Academy, Air Force Academy and Officers' Training Academy are given in Appendices I, II, III, IV and V respectively.

## 2. CENTRES OF EXAMINATION:

The Examination will be held at the following Centres :

AGARTALA	GHAZIABAD	PANAJI (GOA)
AGRA	GORAKHPUR	PATNA
AJMER	GURGAON	PORT BLAIR
AHMEDABAD	GWALIOR	PRAYAGRAJ (ALLAHABAD)
AIZAWL	HYDERABAD	PUDUCHERRY
ALIGARH	IMPHAL	PUNE
ALMORA (UTTARAKHAND)	INDORE	RAIPUR
ANANTPUR (ANDHRA PRADESH)	ITANAGAR	RAJKOT
AURANGABAD (MAHARASHTRA)	JABALPUR	RANCHI
BENGALURU	JAIPUR	SAMBALPUR
BAREILLY	JAMMU	SHILLONG
BHOPAL	JODHPUR	SHIMLA
BILASPUR (CHHATISGARH)	JORHAT	SILIGUDI
CHANDIGARH	KOCHI	SRINAGAR
CHENNAI	KOHIMA	SRINAGAR (UTTARAKHAND)
COIMBATORE	KOLKATA	THANE
CUTTACK	KOZHIKODE (CALICUT)	THIRUVANANTHAPURAM
DEHRADUN	LEH	TIRUCHIRAPALLI
DELHI	LUCKNOW	TIRUPATI

DHARAMSHALA	LUDHIANA	UDAIPUR
DHARWAD	MADURAI	VARANASI
DISPUR	MANDI	VELLORE
FARIDABAD	MUMBAI	VIJAYAVADA
GANGTOK	MYSORE	VISHAKHAPATNAM
GAYA	NAGPUR	WARANGAL
GAUTAM BUDDH NAGAR	NAVI MUMBAI	

Applicants should note that there will be a ceiling on the number of candidates allotted to each of the centres except Chennai, Dispur, Kolkata and Nagpur. Allotment of Centres will be on the first-apply-first-allot basis and once the capacity of a particular centre is attained, the same will be frozen. Applicants, who cannot get a centre of their choice due to ceiling, will be required to choose a Centre from the remaining ones. Applicants are, thus, advised that they may apply early so that they could get a Centre of their choice.

**NB : Notwithstanding the aforesaid provision, Commission reserve the right to change the Centres at their discretion if the situation demands.**

Candidates admitted to the examination will be informed of the time table and place or places of examination. Candidates should note that no request for change of centre will be granted.

NOTE : While filling in his/her online Application form, the candidates should carefully decide about his/her choice for the centre for the examination.

If any candidate appears at a Centre/Paper other than the one indicated by the Commission in his/her Admission Certificate, the papers of such a candidate will not be valued and his/her candidature will be liable to cancellation.

### **3. CONDITIONS OF ELIGIBILITY:**

**(a) Nationality:** A candidate must be unmarried and must either be:

- (i) a Citizen of India, or
- (ii) a subject of Nepal, or
- (iii) a person of Indian origin who has migrated from Pakistan, Burma, Sri Lanka and East African Countries of Kenya, Uganda, the United Republic of Tanzania, Zambia, Malawi, Zaire and Ethiopia or Vietnam with the intention of permanently settling in India.

Provided that a candidate belonging to categories (ii) and (iii)-above shall be a person in whose favour a certificate of eligibility has been issued by the Government of India.

Certificate of eligibility will, however, not be necessary in the case of candidates who are Gorkha subjects of Nepal.

A candidate in whose case a certificate of eligibility is necessary, may be admitted to the examination provisionally subject to the necessary certificate being given to him/her by the Govt. before declaration of result by UPSC.



**(b) Age Limits, Sex and Marital Status :**

(i) For IMA—Unmarried male candidates born not earlier than 2<sup>nd</sup> July, 2000 and not later than 1<sup>st</sup> July, 2005 only are eligible.

(ii) For Indian Naval Academy—Unmarried male candidates born not earlier than 2<sup>nd</sup> July, 2000 and not later than 1<sup>st</sup> July, 2005 only are eligible.

(iii) For Air Force Academy—

**Age:** 20 to 24 years as on 1<sup>st</sup> July, 2024 i.e. born not earlier than 2<sup>nd</sup> July, 2000 and not later than 1<sup>st</sup> July, 2004 (Upper age limit for candidates holding valid and current Commercial Pilot Licence issued by DGCA (India) is relaxable upto 26 yrs. i.e. born not earlier than 2<sup>nd</sup> July, 1998 and not later than 1<sup>st</sup> July, 2004 only are eligible.

Note: Candidate below 25 years of age must be unmarried. Marriage is not permitted during training. Married candidates above 25 years of age are eligible to apply but during training period they will neither be provided married accommodation nor can they live with family out of the premises.

(iv) For Officers' Training Academy—(SSC Course for men) unmarried male candidates born not earlier than 2<sup>nd</sup> July, 1999 and not later than 1<sup>st</sup> July, 2005 only are eligible.

(v) For Officers' Training Academy—(SSC Women Non-Technical Course) Unmarried women, issueless widows who have not remarried and issueless divorcees (in possession of divorce documents) who have not remarried are eligible. They should have been born not earlier than 2<sup>nd</sup> July, 1999 and not later than 1<sup>st</sup> July, 2005.

NOTE : Male divorcee/widower candidates cannot be treated as unmarried male for the purpose of their admission in IMA/INA/AFA/OTA, Chennai courses and accordingly they are not eligible for these courses.

The date of birth accepted by the Commission is that entered in the Matriculation/Secondary School Examination Certificate or in a certificate recognised by an Indian University as equivalent to Matriculation or in an extract from a Register of Matriculates maintained by a University, which extract must be certified by the proper authority of the University or in the Matriculation/Secondary School Examination or an equivalent examination certificate. These certificates are required to be submitted only after the declaration of the result of the written part of the examination. No other document relating to age like horoscopes, affidavits, birth extracts from Municipal Corporation, service records and the like will be accepted.

The expression Matriculation/Secondary School Examination Certificate in this part of the instruction includes the alternative certificates mentioned above.

Sometimes the Matriculation/Secondary School Examination Certificate does not show the date of birth, or only shows the age by completed years or completed years and months. In such cases a candidate must send in addition to the self attested/certified copy of Matriculation/Secondary School Examination Certificate a self attested/certified copy of a certificate from the Headmaster/Principal of the Institution from where he/she passed the Matriculation/Secondary School Examination showing the date of his/her birth or exact age as recorded in the Admission Register of the Institution.

**NOTE 1 :** Candidates should note that only the Date of Birth as recorded in the Matriculation/Secondary School Examination Certificate or an equivalent certificate on the date of submission of applications will be accepted by the Commission and no subsequent request for its change will be considered or granted.

**NOTE 2 :** Candidates should also note that once a Date of Birth has been claimed by them and entered in the records of the Commission for the purpose of admission to an Examination, no change will be allowed subsequently or at a subsequent examination on any ground whatsoever.

Provided that in case of an inadvertent/ unintentional/typographical error committed by a candidate in indicating the date of birth in the Online Application Form, the candidate may make a request to the Commission for subsequent rectification along with supporting documents, as specified in the Rule 2 (b) of the Examination Rules and the request may be considered by the Commission, if the same is made latest by the date of the Combined Defence Services Examination (II), 2023 which is 03.09.2023.

All communication in this regard should contain the following particulars:-

1. NAME AND YEAR OF THE EXAMINATION.
2. REGISTRATION I.D. (RID.).
3. ROLL NUMBER (IF RECEIVED)
4. NAME OF CANDIDATE (IN FULL AND IN BLOCK LETTERS).
5. COMPLETE POSTAL ADDRESS AS GIVEN IN THE APPLICATION.
6. VALID AND ACTIVE EMAIL ID.

**NOTE 3 :** The candidates should exercise due care while entering their date of birth. If on verification at any subsequent stage any variation is found in their date of birth from the one entered in their Matriculation or equivalent examination certificate, disciplinary action will be taken against them by the Commission under the Rules.

**(c) Educational Qualifications:**

(i) For I.M.A. and Officers' Training Academy, Chennai — Degree of a recognised University or equivalent.

(ii) For Indian Naval Academy— Degree in Engineering from a recognised University/Institution

(iii) For Air Force Academy—Degree of a recognised University (with Physics and Mathematics at 10+2 level) or Bachelor of Engineering.

Graduates with first choice as Army/Navy/Air Force are to submit proof of Graduation/provisional certificates on the date of commencement of the SSB Interview at the SSB.

Candidates who are studying in the final year/semester Degree course and have yet to pass the final year degree examination can also apply provided candidate should not have any present backlog upto the last semester / year for which results have been declared upto the time of submission of application and they will be required to submit proof of passing the degree examination at the time of commencement of course to reach the IHQ of MoD (Army), Rtg 'A', CDSE Entry, West Block III, R. K. Puram, New Delhi-110066 in case of IMA/SSC first choice candidates and Naval HQ "DMPR" (OI & R Section), Room No. 204, 'C' Wing, Sena Bhawan, New Delhi-110011 in case of Navy first choice candidates Dte of Personnel (Offrs), Kasturba Gandhi Marg, New Delhi-110001. Phone No. 23010231 Extn. 7645/7646/7610 in case of Air Force first choice candidates by the following dates failing which their candidature will stand cancelled :

(i) For admission to IMA on or before 1<sup>st</sup> July, 2024, Indian Naval Academy on or before 1<sup>st</sup> July, 2024 and Air Force Academy on or before 13<sup>th</sup> May, 2024.

(ii) For admission to Officers' Training Academy, Chennai on or before 1<sup>st</sup> October, 2024.

Candidates possessing professional and technical qualifications which are recognised by government as equivalent to professional and technical degrees would also be eligible for admission to the examination.

In exceptional cases the Commission may treat a candidate, who does not possess any of the qualifications prescribed in this rule as educationally qualified provided that he/she possesses qualifications, the standard of which in the opinion of the Commission, justifies his/her admission to the examination.

**NOTE I :** Candidates, who have yet to pass their degree examination will be eligible only if they are studying in the final year of degree examination. Those candidates who have yet to qualify in the final year Degree Examination and are allowed to appear in the UPSC Examination should note that this is only a special concession given to them. They are required to submit proof of passing the Degree Examination by the prescribed date and no request for extending this date will be entertained on the grounds of late conduct of basic qualifying University Examination, delay in declaration of results or any other ground whatsoever. Candidates who are studying in the final year/semester degree course are required to submit at the time of SSB interview a bonafide certificate issued by University/College stating that they will be able to submit their proof of passing the graduation degree examination by the specified date, failing which their candidature will be cancelled.

**NOTE II :** Candidates who are debarred by the Ministry of Defence from holding any type of commission in the Defence Services shall not be eligible for admission to the examination and if admitted, their candidature will be cancelled.

**NOTE III :** In the event of Air Force candidates being suspended from Flying training for failure to learn flying, they would be absorbed in the Navigation/Ground Duty (Non Tech) Branches of the IAF. This will be subject to availability of vacancies and fulfilling the laid down qualitative requirements.

**(d) Physical Standards:**

Candidates must be physically fit according to physical standards for admission to Combined Defence Services Examination (II), 2023 as per guidelines given in Appendix-IV.

**4. FEE :**

Candidates (excepting Female/SC/ST candidates who are exempted from payment of fee) are required to pay a fee of Rs. 200/- (Rupees Two Hundred Only) either by remitting the money in any Branch of SBI by cash, or by using Visa/Master/Rupay Credit/Debit Card/UPI Payment or by using internet banking facility of any Bank.

**NOTE 1:** Applicants who opt for "Pay by Cash" mode should print the system generated Pay in-slip during Part-II registration and deposit the fee at the counter of SBI Branch on the next working day only. "Pay by Cash" mode option will be deactivated at 11:59 PM of **05.06.2023** i.e. one day before the closing date. However, applicants who have generated their Pay-in slip before it is de-activated may pay at the counter of SBI Branch during banking hours on the closing date. Such applicants who are unable to pay by cash on the closing date i.e. during banking hours at SBI Branch, for reason whatsoever, even if holding a valid Pay-in-Slip will have no other offline option but to opt for online Debit/Credit Card/UPI Payment or internet Banking Payment mode on the closing date i.e. till 6:00 PM of **06.06.2023**.

**NOTE 2 :** Candidates should note that payment of examination fee can be made only through the modes prescribed above. Payment of fee through any other mode is neither

valid nor acceptable. Applications submitted without the prescribed fee/mode (unless remission of fee is claimed) shall be summarily rejected.

**NOTE 3 :** Fee once paid shall not be refunded under any circumstances nor can the fee be held in reserve for any other examination or selection.

**NOTE 4 :** For the applicants in whose case payments details have not been received from the bank, they will be treated as fictitious payment cases and their applications will be rejected in the first instance. A list of all such applicants shall be made available on the Commission website within two weeks after the last day of submission of online application. The applicants shall be required to submit the proof of their fee payment within 10 days from the date of such communication either by hand or by speed post to the Commission. On receipt of documentary proof, genuine fee payment cases will be considered and their applications will be revived, if they are otherwise eligible.

ALL FEMALE CANDIDATES AND CANDIDATES BELONGING TO SCHEDULED CASTES/SCHEDULED TRIBES ARE NOT REQUIRED TO PAY ANY FEE. NO FEE EXEMPTION IS, HOWEVER, AVAILABLE TO OBC CANDIDATES AND THEY ARE REQUIRED TO PAY THE FULL PRESCREIBED FEE.

## **5. HOW TO APPLY:**

- (a) Candidates are required to apply online by using the website [upsconline.nic.in](http://upsconline.nic.in). It is essential for the applicant to register himself/herself first at One Time Registration (OTR) platform, available on the Commission's website, and then proceed for filling up the online application for the examination. OTR has to be registered only once in life time. This can be done anytime throughout the year. If the candidate is already registered, he/she can proceed straightway for filling up the online application for the examination.

### **(i) Modification in OTR Profile**

In case, the candidate wants to effect any change in his/her OTR profile, it shall be allowed only once in the lifetime after the registration at OTR platform. The option to change in OTR profile data shall be available till expiry of 7 days from the next day after the closure of application window of his/her first final application for any Examination of the Commission. In case the candidate after registration of OTR applies for the first time in this examination, the last date of modification of OTR would be 13.06.2023.

### **(ii) Modification in application form (Other than OTR Profile):**

The Commission has also decided to extend the facility of making corrections) in any field(s) of the application form for this examination from next day of the closure of the application window of this Examination. This window will remain open for 7 days from the date of opening of the same, i.e. from **07.06.2023 to 13.06.2023**. In case a candidate wants to carry out any change in his/her OTR profile during this period, then he/she should login to the OTR platform and do the needful accordingly. In other words, no change in the OTR profile can be made by visiting the window for Modification in application form.

- (iii)** The candidates will not be allowed to withdraw their applications after the submission of the same

Detailed instructions for filling up Online Applications are available on the above-mentioned website.

No queries, representations etc. shall be entertained by the Commission in respect of correcting details that are required to be filled up by the candidates by exercising due



diligence and caution as the timely completion of examination process is of paramount importance.

All candidates whether already in Government Service including candidates serving in the Armed Forces, Government owned industrial undertakings or other similar organizations or in private employment should submit their applications online direct to the Commission.

N.B.I: Persons already in Government Service, whether in permanent or temporary capacity or as work charged employees other than casual or daily rated employees or those serving under the Public Enterprises are, however, required to inform their Head of Office/Department in writing that they have applied for the Examination.

N.B.II: Candidates serving in the Armed Forces are required to inform their Commanding Officer in writing that they have applied for this examination. They are also required to submit NOC in this regard at the time of SSB interview.

Candidates should note that in case a communication is received from their employer by the Commission withholding permission to the candidates applying for/appearing at the examination, their applications will be liable to be rejected/candidatures will be liable to be cancelled.

**NOTE:** APPLICATIONS WITHOUT THE PRESCRIBED FEE (UNLESS REMISSION OF FEE IS CLAIMED AS IN PARA 4 ABOVE) OR INCOMPLETE APPLICATIONS SHALL BE SUMMARILY REJECTED.

No representation or correspondence regarding such rejection shall be entertained under any circumstances. Candidates are not required to submit alongwith their applications any certificate in support of their claims regarding age, educational qualifications, Scheduled Caste/Scheduled Tribe/OBC and fee remission etc.

The candidates applying for the examination should ensure that they fulfil all the eligibility conditions for admission to the examination.

Their admission at all the stages of examination for which they are admitted by the Commission viz. written examination and interview test will be purely provisional, subject to their satisfying the prescribed eligibility conditions. If on verification at any time before or after the written examination or Interview Test, it is found that they do not fulfil any of the eligibility conditions, their candidature for the examination will be cancelled by the Commission.

Candidates are advised to keep ready the following documents in original alongwith their self attested copies soon after the declaration of the result of the written part of the examination which is likely to be declared in the month of September/October, 2023 for submission to the Army HQ/Naval HQ/Air HQ as the case may be:

(1) Matriculation/Secondary School Examination Certificate or its equivalent showing date of birth (2) Degree/Provisional Degree Certificate/Marks sheet showing clearly having passed degree examination and eligible for award of degree.

In the first instance all qualified candidates eligible for SSB interview will carry their original Matriculation/Secondary School Examination Certificate as also their Degree/Provisional Degree Certificate/Marks sheet with them while going to the Services Selection Centres for SSB interview. Candidates who have not yet qualified the final year Degree examination must carry with them a certificate in original from the Principal of the College/Institution stating that the candidate has appeared/is appearing at the final year Degree examination. Candidates who do not carry the above certificates with them while going to the Services Selection Centres shall not be allowed to appear for the SSB interview. No relaxation for production of the above certificates in original at the selection centre is allowed, and candidates who do not carry with them

any of these certificates in original will not be permitted to appear for their SSB test and interview and they will be sent back home at their own expense.

(1) If any of their claims is found to be incorrect/false/fraud/fabricated they may render themselves liable to disciplinary action by the Commission in terms of the following provisions:

A candidate who is or has been declared by the Commission to be guilty of :—

- (a) Obtaining support for candidature by the following means, namely :—
  - (i) offering illegal gratification to; or
  - (ii) applying pressure on; or
  - (iii) blackmailing, or threatening to blackmail any person connected with the conduct of the examination; or
- (b) impersonation; or
- (c) procuring impersonation by any person; or
- (d) submitting fabricated/incorrect documents or documents which have been tampered with; or
- (e) uploading irrelevant or incorrect photos/signature in the application form in place of actual photo/signature.
- (f) making statements which are incorrect or false or suppressing material information; or
- (g) resorting to the following means in connection with the candidature for the examination, namely :—
  - (i) obtaining copy of question paper through improper means;
  - (ii) finding out the particulars of the persons connected with secret work relating to the examination;
  - (iii) influencing the examiners; or
- (h) being in possession of or using unfair means during the examination; or
- (i) writing obscene matter or drawing obscene sketches or irrelevant matter in the scripts; or
- (j) misbehaving in the examination hall including tearing of the scripts, provoking fellow examinees to boycott examination, creating a disorderly scene and the like; or
- (k) harassing, threatening or doing bodily harm to the staff employed by the Commission for the conduct of the examination; or
- (l) being in possession of or using any mobile phone, (even in switched-off mode), pager or any electronic equipment or programmable device or storage media like pen drive, smart watches etc. or camera or Bluetooth devices or any other equipment or related accessories (either in working or switched off mode) capable of being used as a communication device during the examination; or
- (m) violating any of the instructions issued to candidates along with their admission certificates permitting them to take the examination; or
- (n) attempting to commit or, as the case may be, abetting the commission of all or any of the acts specified in the foregoing clauses;  
in addition to being liable to criminal prosecution, shall be disqualified by the Commission from the Examination held under these Rules; and/or shall be liable to be debarred either permanently or for a specified period :—
  - (i) by the Commission, from any examination or selection held by them;
  - (ii) by the Central Government from any employment under them;and shall be liable to face disciplinary action under the appropriate rules if already in service under Government.

Provided that no penalty under this rule shall be imposed except after:—

- (i) giving the candidate an opportunity of making such representation in writing as the candidate may wish to make in that behalf; and
- (ii) taking the representation, if any, submitted by the candidate within the period allowed for this purpose, into consideration.

**(2)** Any person who is found by the Commission to be guilty of colluding with a candidate(s) in committing or abetting the commission of any of the misdeeds listed at Clauses (a) to (m) above will be liable to action in terms of the Clause (n).

## **6. LAST DATE FOR SUBMISSION OF APPLICATIONS:**

The Online Applications can be filled upto 6<sup>th</sup> June, 2023 till 6:00 PM.

## **7. CORRESPONDENCE WITH THE COMMISSION/ARMY/NAVAL/AIR HEAD QUARTERS.**

The Commission will not enter into any correspondence with the candidates about their candidature except in the following cases:

- (i) The eligible candidates shall be issued an e-Admit Card three weeks before the commencement of the examination. The e-Admit Card will be made available in the UPSC website [www.upsc.gov.in] for downloading by candidates. No Admit Card will be sent by post. For downloading the e-Admit Card the candidate must have his/her vital parameters like RID & Date of Birth or Roll No. (if received) & date of birth or name, Father's name & Date of Birth available with him/her.
- (ii) If a candidate does not receive his/her e-Admit Card or any other communication regarding his/her candidature for the examination three weeks before the commencement of the examination, he/she should at once contact the Commission. Information in this regard can also be obtained from the Facilitation Counter located in the Commission's Office either in person or over phone Nos. 011-23381125/011-23385271/011-23098543. In case no communication is received in the Commission's Office from the candidate regarding non-receipt of his/her e-Admit Card at least 3 weeks before the examination, he/she himself/herself will be solely responsible for non-receipt of his/her e-Admit Card.

No candidate will ordinarily be allowed to take the examination unless he/she holds an e-Admit Card for the examination. On downloading of Admit Card, check it carefully and bring discrepancies/errors, if any, to the notice of UPSC immediately.

The courses to which the candidates are admitted will be according to their eligibility as per age and educational qualifications for different courses and the preferences given by the candidates.

The candidates should note that their admission to the examination will be purely provisional based on the information given by them in the Application Form. This will be subject to verification of all the eligibility conditions.

- (iii) The decision of the Commission as to the acceptance of the application of a candidate and his/her eligibility or otherwise for admission to the Examination shall be final.
- (iv) Candidates should note that the name in the e-Admit Card in some cases, may be abbreviated due to technical reasons.
- (v) Candidates must ensure that their e-mail IDs given in their applications are valid and active.

**IMPORTANT:** All communications to the Commission/Army Headquarters should invariably contain the following particulars.

1. Name and year of the examination.
2. Registration ID (RID)
3. Roll Number (if received)
4. Name of candidate (in full and in block letters)

5. Complete Postal Address as given in the application with telephone number, if any.

N.B. (i) Communications not containing the above particulars may not be attended to.

N.B. (ii) If a letter/communication is received from a candidate after an examination has been held and it does not give his/her full name and Roll number, it will be ignored and no action will be taken thereon.

N.B. (iii) Candidates recommended by the Commission for interview by the Services Selection Board who have changed their addresses subsequent to the submission of their application for the examination should immediately after announcement of the result of the written part of the examination notify the changed address, along with an unstamped self addressed envelope, also to IHQ of MoD (Army)/Dte Gen Of Rtg (Rtg A) CDSE Entry Section for males and SSC Women Entry Section for women candidates, West Block-III, Ground Floor, Wing 1, Rama Krishna Puram, New Delhi-110066 in case of IMA/SSC first choice candidates and IHQ of MOD(Navy) DMPR (OI&R Section), Room No. 204, 'C' Wing, Sena Bhawan, New Delhi-110011 in case of Navy first choice candidates, and Dte of Personnel (Offrs), Kasturba Gandhi Marg, New Delhi-110001. Phone No. 23010231 Extn. 7645/7646/7610 in case of Air Force first choice candidates. Failure to comply with this instruction will deprive the candidate of any claim to consideration in the event of his/her not receiving the summon letter for interview by the Services Selection Board. For all queries regarding allotment of centres, date of SSB interview, merit list, Joining Instructions, and any other relevant information regarding selection process, please visit website [www.joinindianarmy.nic.in](http://www.joinindianarmy.nic.in) or contact in case of candidates having IMA or OTA as their first choice IHQ of MOD (NAVY) DMPR (OI&R Section), Room No. 204, 'C' Wing, Sena Bhawan, New Delhi-110011 in the case of candidates having Navy as first choice and Dte of Personnel (Offrs), Kasturba Gandhi Marg, New Delhi-110001. Phone No. 23010231 Extn. 7645/7646/7610 in the case of candidates having Air Force as first choice.

Candidates are requested to report for SSB interview on the date intimated to them in the call up letter for interview. Requests for postponing interview will only be considered in very genuine circumstances and that too if it is administratively convenient for which Army Headquarters/Naval HQ/Air Headquarter will be the sole deciding authority. Such requests should be sent to Selection Centre/SSB from where the call for SSB interview has been received. Navy candidates can download their call letters from the naval website [www.joinindiannavy.gov.in](http://www.joinindiannavy.gov.in) or send email at [officer@navy.gov.in](mailto:officer@navy.gov.in) three weeks after publication of results.

N.B. In case a candidate does not get the interview call for SSB interview for IMA by 4<sup>th</sup> week of February, 2024 and by 4<sup>th</sup> week of May, 2024 for OTA, he/she should write to IHQ of MoD(Army)/Rtg. CDSE Entry/SSC Women Entry for Officers Training Academy, West Block-III, Ramakrishna Puram, New Delhi-110066 regarding non-receipt of the call-up letter. For similar query by the Navy/Air Force candidates, having first choice as given *ibid*, should write to Naval Hqrs. or Air Hqrs. as mentioned in N.B. III (in case of non-receipt of call by 4<sup>th</sup> week of February, 2024).

## **8. ANNOUNCEMENT OF THE RESULTS OF THE WRITTEN EXAMINATION, INTERVIEW OF QUALIFIED CANDIDATES, ANNOUNCEMENT OF FINAL RESULTS AND ADMISSION TO THE TRAINING COURSES OF THE FINALLY QUALIFIED CANDIDATES.**

The Union Public Service Commission shall prepare a list of candidates who obtain the minimum qualifying marks in the written examination as fixed by the Commission in their discretion. Candidates who are declared successful in the written exam will be detailed for intelligence and personality test at the Service



Selection Board based on their preference by the respective service HQ. CANDIDATES WHO QUALIFY IN THE WRITTEN EXAM AND GIVEN THEIR FIRST CHOICE AS ARMY (IMA/OTA) ARE REQUIRED TO REGISTER THEMSELVES ON THE RECRUITING DIRECTORATE WEBSITE WWW.JOININDIANARMY.NIC.IN IN ORDER TO ENABLE THEM TO RECEIVE CALL UP INFORMATION FOR SSB INTERVIEW. THOSE CANDIDATES WHO HAVE ALREADY REGISTERED ON THE RECRUITING DIRECTORATE WEBSITE ARE ADVISED NOT TO REGISTER AGAIN. The email ID registered with DG Recruiting website i.e. [www.joinindianarmy.nic.in](http://www.joinindianarmy.nic.in) and that given to UPSC must be same and unique to the applicant. Results of the test conducted by Service Selection Board will hold good for all the courses [i.e. Indian Military Academy (DE) Course, Dehradun, Indian Naval Academy, Ezhimala Course, Air Force Academy (Pre-Flying) Course, Hyderabad and SSC (NT) Course at OTA, Chennai] for which the candidate has qualified in the written exam, irrespective of the service HQ conducting it. Two-stage selection procedure based on Psychological Aptitude Test and intelligence Test has been introduced at Service Selection Boards. All the candidates will be put to stage one test on first day of reporting at Selection Centres. Only those candidates who qualify at stage one will be admitted to the second stage/remaining tests and all those who fail to pass stage one, will be returned. Only those candidate who qualify at stage two will be required to submit photocopy each of:—(i) Matriculation pass certificate or equivalent in support of date of birth, (ii) Bachelors Degree/Provisional Degree alongwith mark sheets of all the years/semesters in support of educational qualification.

Candidates will appear before the Services Selection Board and undergo the test there at their own risk and will not be entitled to claim any compensation or other relief from Government in respect of any injury which they may sustain in the course of or as a result of any of the tests given to them at the Services Selection Board whether due to the negligence of any person or otherwise. Candidates will be required to sign a certificate to this effect on the form appended to the application.

To be acceptable, candidates should secure the minimum qualifying marks separately in (i) written examination and (ii) SSB test as fixed by the Commission and Service Selection Board respectively in their discretion. The candidates will be placed in the order of merit on the basis of the total marks secured by them in the written examination and in the SSB tests. The form and manner of communication of the result of the examination to individual candidates shall be decided by the Commission in their discretion and the Commission will not enter into correspondence with them regarding the result.

Success at the examination confers no right of admission to the Indian Military Academy, Indian Naval Academy, Air Force Academy or the Officers' Training Academy as the case may be. The final selection will be made in order of merit subject to medical fitness and suitability in all other respects and number of vacancies available.

**NOTE:** Every candidate for the Air Force and Naval Aviation is given Pilot Aptitude Test only once. The Grade secured by him at the first test (CPSS and/or PABT) will therefore hold good for every subsequent interview at the Air Force Selection Board. Those who have failed Indian Navy Selection Board/Computer Pilot Selection System (CPSS) and/or Pilot Aptitude Battery Test earlier and those who habitually wear spectacles are not eligible for Air Force.

TEST/INTERVIEW AT AIR FORCE SELECTION BOARDS FOR THOSE CANDIDATES WHO APPLY FOR AIR FORCE THROUGH MORE THAN ONE SOURCE:- There are three modes of entry in F(P) course CDSE/NCC/AFCAT. Candidates who fail in Computer Pilot Selection System (CPSS) will be considered for other preferred services only if it is found that they have applied through CDS Exam. Candidates who qualify in the written examination for IMA(D.E) Course and/or Navy (S.E)

Course and / or Air Force Academy course irrespective of whether they have also qualified for SSC Course or not will be detailed for SSB test in February-March, 2024 and candidates who qualify for SSC Course only will be detailed for SSB tests in April to June, 2024.

## **9. DISQUALIFICATION FOR ADMISSION TO THE TRAINING COURSE:**

Candidates who were admitted to an earlier course at the National Defence Academy, Indian Military Academy, Air Force Academy, Indian Naval Academy, Officers' Training Academy, Chennai but were removed there from on disciplinary ground will not be considered for admission to the Indian Military Academy, Indian Naval Academy, Air Force Academy or for grant of Short Service Commission in the Army.

Candidates who were previously withdrawn from the Indian Military Academy for lack of Officer-like qualities will not be admitted to the Indian Military Academy.

Candidates who were previously selected as Special Entry Naval Cadets but were withdrawn from the National Defence Academy or from Naval Training Establishments for lack of Officer-like qualities will not be eligible for admission to the Indian Navy.

Candidates who were withdrawn from Indian Military Academy, Officers' Training Academy, NCC and Graduate course for lack of Officer-like qualities will not be considered for grant of Short Service Commission in the Army.

Candidates who were previously withdrawn from the NCC and Graduates' course for lack of Officer-like qualities will not be admitted to the Indian Military Academy.

## **10. PUBLIC DISCLOSURE OF MARKS SCHEME**

As per the decision taken by the Government for increasing the access of unemployed to job opportunities, the Commission will publically disclose the scores of the candidates (obtained in the Written Examination and SSB Interview/Personality Test) through the public portals. The disclosure will be made in respect of only those candidates who will appear in the SSB Interview for the Combined Defence Services Examination and are not qualified. The information shared through this disclosure scheme about the unsuccessful candidates may be used by other public and private recruitment agencies to appoint suitable candidates from the information made available in the public portal.

Candidates, who will appear for SSB, will be required to give their options when asked by the Commission. A candidate may opt out of the scheme also and in that case his/her details will not be published by the Commission.

Besides sharing of the information of the unqualified candidates of this CDS Examination, the Commission will not assume any responsibility or liability for the method and manner in which information related to candidates is utilized by other private or public organizations.

## **11. RESTRICTIONS ON MARRIAGE DURING TRAINING IN THE INDIAN MILITARY ACADEMY OR IN THE INDIAN NAVAL ACADEMY OR IN THE AIR FORCE ACADEMY OR OFFICERS TRAINING ACADEMY, CHENNAI::**

Candidates for the Indian Military Academy Course or Naval Academy Course or Indian Air Force Academy Course or Officers' Training Academy, Chennai must undertake not to marry until they complete their full training. A candidate who marries subsequent to the date of his/her application though successful at this or any subsequent examination will not be selected for training. A candidate who marries

during training shall be discharged and will be liable to refund all expenditure incurred on him/her by the Government.

Candidates must undertake not to marry until they complete their full training. A candidate who marries subsequent to the date of his application, through successful at the written examination or service Selection Board interview or medical examination will not be eligible for training. A candidate who marries during this period, shall be discharged and will be liable to refund all expenditure incurred on him by the Government.

**12. OTHER RESTRICTIONS DURING TRAINING IN THE INDIAN MILITARY ACADEMY OR IN THE INDIAN NAVAL ACADEMY OR IN THE AIR FORCE ACADEMY:**

After admission to the Indian Military Academy or the Indian Naval Academy or the Air Force Academy, candidates will not be considered for any other commission. They will also not be permitted to appear for any interview or examination after they have been finally selected for training in the Indian Military Academy or the Indian Naval Academy or the Air Force Academy.

**(Om Prakash)**  
**Under Secretary**  
**Union Public Service Commission**

## APPENDIX-I

The scheme, standard and syllabus of the examination

### A. SCHEME OF EXAMINATION

1. The Competitive examination comprises:

(a) Written examination as shown in para 2 below.

(b) Interview for intelligence and personality test (vide Part 'B' of this Appendix) of such candidates as may be called for interview at one of the Services Selection Centres.

2. The subjects of the written examination, the time allowed and the maximum marks allotted to each subject will be as follows:

(a) For Admission to Indian Military Academy, Indian Naval Academy and Air Force Academy:—

Subject	Code	Duration	Maximum Marks
1. English	11	2 Hours	100
2. General Knowledge	12	2 Hours	100
3. Elementary Mathematics	13	2 Hours	100

(b) For Admission to Officers' Training Academy :—

Subject	code	Duration	Maximum Marks
1. English	11	2 Hours	100
2. General Knowledge	12	2 Hours	100

The maximum marks allotted to the written examination and to the interviews will be equal for each course i.e. the maximum marks allotted to the written examination and to the interviews will be 300, 300, 300 and 200 each for admission to the Indian Military Academy, Indian Naval Academy, Air Force Academy and Officers' Training Academy respectively.

3. The papers in all the subjects will consist of objective type questions only. The question papers (Test Booklets) of General Knowledge and Elementary Mathematics will be set bilingually in Hindi as well as English.

4. In the question papers, wherever necessary, questions involving the metric system of Weights and Measures only will be set.

5. Candidates must write the papers in their own hand. In no circumstances will they be allowed the help of a scribe to write answers for them.

6. The Commission have discretion to fix qualifying marks in any or all the subjects of the examination.

7. The candidates are not permitted to use calculator for answering objective type papers (Test Booklets). They should not therefore, bring the same inside the Examination Hall.

### B. STANDARD AND SYLLABUS OF THE EXAMINATION

#### STANDARD

The standard of the papers in Elementary Mathematics will be of Matriculation level. The standard of papers in other subjects will approximately be such as may be expected of a graduate of an Indian University.

## **SYLLABUS**

### **ENGLISH (Code No. 11)**

The question paper will be designed to test the candidates' understanding of English and workmanlike use of words.

### **GENERAL KNOWLEDGE (Code No. 12)**

General Knowledge including knowledge of current events and of such matters of everyday observation and experience in their scientific aspects as may be expected of an educated person who has not made a special study of any scientific subject. The paper will also include questions on History of India and Geography of a nature which candidate should be able to answer without special study.

### **ELEMENTARY MATHEMATICS (Code No. 13)**

#### **ARITHMETIC**

Number System—Natural numbers, Integers, Rational and Real numbers. Fundamental operations, addition, subtraction, multiplication, division, Square roots, Decimal fractions. Unitary method, time and distance, time and work, percentages, applications to simple and compound interest, profit and loss, ratio and proportion, variation.

Elementary Number Theory—Division algorithm. Prime and composite numbers. Tests of divisibility by 2, 3, 4, 5, 9 and 11. Multiples and factors. Factorisation Theorem. H.C.F. and L.C.M. Euclidean algorithm. Logarithms to base 10, laws of logarithms, use of logarithmic tables.

#### **ALGEBRA**

Basic Operations, simple factors, Remainder Theorem, H.C.F., L.C.M., Theory of polynomials, solutions of quadratic equations, relation between its roots and coefficients (Only real roots to be considered). Simultaneous linear equations in two unknowns—analytical and graphical solutions. Simultaneous linear inequations in two variables and their solutions. Practical problems leading to two simultaneous linear equations or inequations in two variables or quadratic equations in one variable & their solutions. Set language and set notation, Rational expressions and conditional identities, Laws of indices.

#### **TRIGONOMETRY**

Sine  $\times$ , cosine  $\times$ , Tangent  $\times$  when  $0^\circ \leq \times \leq 90^\circ$  Values of  $\sin \times$ ,  $\cos \times$  and  $\tan \times$ , for  $\times = 0^\circ, 30^\circ, 45^\circ, 60^\circ$  and  $90^\circ$

Simple trigonometric identities.

Use of trigonometric tables.

Simple cases of heights and distances.

#### **GEOMETRY**

Lines and angles, Plane and plane figures, Theorems on (i) Properties of angles at a point, (ii) Parallel lines, (iii) Sides and angles of a triangle, (iv) Congruency of triangles, (v) Similar triangles, (vi) Concurrence of medians and altitudes, (vii) Properties of angles, sides and diagonals of a parallelogram, rectangle and square, (viii) Circles and its properties including tangents and normals, (ix) Loci.



## **MENSURATION**

Areas of squares, rectangles, parallelograms, triangle and circle. Areas of figures which can be split up into these figures (Field Book), Surface area and volume of cuboids, lateral surface and volume of right circular cones and cylinders, surface area and volume of spheres.

## **STATISTICS**

Collection and tabulation of statistical data, Graphical representation frequency polygons, histograms, bar charts, pie charts etc. Measures of central tendency.

## **INTELLIGENCE AND PERSONALITY TEST**

The SSB procedure consists of two stage Selection process - stage I and stage II. Only those candidates who clear the stage I are permitted to appear for stage II. The details are:-

(a) Stage I comprises of Officer Intelligence Rating (OIR) tests are Picture Perception\* Description Test (PP&DT). The candidates will be shortlisted based on combination of performance in OIR Test and PP&DT.

(b) Stage II Comprises of Interview, Group Testing Officer Tasks, Psychology Tests and the Conference. These tests are conducted over 4 days. The details of these tests are given on the website [www.joinindianarmy.nic.in](http://www.joinindianarmy.nic.in).

The personality of a candidate is assessed by three different assessors viz. The Interviewing Officer (IO), Group Testing Officer (GTO) and the Psychologist. There are no separate weightage for each test. The marks are allotted by assessors only after taking into consideration the performance of the candidate holistically in all the test. In addition, marks for Conference are also allotted based on the initial performance of the Candidate in the three techniques and decision of the Board. All these have equal weightage.

The various tests of IO, GTO and Psych are designed to bring out the presence/absence of Officer Like Qualities and their trainability in a candidate. Accordingly candidates are Recommended or Not Recommended at the SSB.

## **APPENDIX-II**

### **INSTRUCTIONS TO THE CANDIDATES FOR FILLING ONLINE APPLICATION**

Candidates are required to apply online by using the website [www.upsconline.nic.in](http://www.upsconline.nic.in)

Salient Features of the system to Online Applications Form are given here under:

1. Detailed instructions for filling up Online Applications are available on the above mentioned website.
2. Candidates will be required to complete the Online Application form containing two stages viz. Part I and Part II as per the instructions available in the above mentioned site through drop down menu.
3. The candidates are required to pay a fee of Rs. 200/- (Rupees two hundred only) [except SC/ST candidates and those specified in Note-2 of Point 4 (Fee) of the Notice who are exempted from payment of fee] either by depositing the money in any branch of SBI by cash or by using any Visa/Master/ Rupay Credit/Debit Card/UPI Payment or by using internet banking facility of any Bank
4. Before start filling up Online Application, a candidate must have his photograph and signature duly scanned in the .jpg format in such a

manner that each file should not exceed 300 KB each and must not be less than 20 KB in size for the photograph and signature.

5. A candidate must have his Matriculation Certificate ready prior to filling up his application form. The details viz. Candidate's Name, Father's Name, Mother's Name & Date of Birth to be filled in Online Application Form of the candidate should match exactly with particulars mentioned in the Matriculation Certificate.
6. In addition to this, candidate should also have details of one photo ID viz. Aadhar Card/ Voter Card/ PAN Card/ Passport/ Driving License/ Any other photo ID Card issued by the State/Central Government. The details of this photo ID will have to be provided by the candidate while filling up the online application form. The candidates will have to upload a scanned copy of the Photo ID whose details have been provided in the online application by him/her. This photo ID will be used for all future referencing and the candidate is advised to carry this ID while appearing for examination/Personality Test/SSB.
7. The Online Applications (Part I and II) can be filled from 17<sup>th</sup> May, 2023 to 6<sup>th</sup> June, 2023 till 6:00 PM.
9. The applicants must ensure that while filling their Application Form, they are providing their valid and active E-mail Ids as the Commission may use electronic mode of communication while contacting them at different stages of examination process.
8. The applicants are advised to check their e-mails at regular intervals and ensure that the email address ending with @nic.in are directed to their inbox folder and not to the SPAM folder or any other folder.
9. **Candidates are strongly advised to apply online well in time without waiting for the last date for submission of online application. Moreover, the Commission has introduced provision of withdrawal of application for the candidate, who does not want to appear at the Examination, he/she may withdraw his/her application.**

### APPENDIX-III

#### Special Instructions to Candidates for objective type tests

##### 1. Articles permitted inside Examination Hall

Clip board or hard board (on which nothing is written) a good quality Black Ball Pen for marking responses on the Answer Sheet. Answer Sheet and sheet for rough work will be supplied by the invigilator.

##### 2. Articles not permitted inside Examination Hall

Do not bring into the Examination Hall any article other than those specified above e.g. books, notes, loose sheets, electronic or any other type of calculators, mathematical and drawing instruments, Log Tables, stencils of maps, slide rules, Test Booklets and rough sheets pertaining to earlier session(s) etc.

**Mobiles, phones, Bluetooth, pagers or any other communication devices are not allowed inside the premises where the examination is being conducted. Any infringement of these instructions shall entail disciplinary action including ban from future examinations. Candidates are advised in their own interest not to bring any of the banned items including mobile phones/Bluetooth/pagers to the venue of the examination, as arrangements for safekeeping cannot be assured. Candidates are advised not to bring any valuable/costly items to the**

**Examination Halls, as safe keeping of the same cannot be assured. Commission will not be responsible for any loss in this regard.**

### **3. Penalty for wrong Answers**

**THERE WILL BE PENALTY (NEGATIVE MARKING) FOR WRONG ANSWERS MARKED BY A CANDIDATE IN THE OBJECTIVE TYPE QUESTION PAPERS.**

- (i) There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate. **One third (0.33)** of the marks assigned to that question will be deducted as penalty.
- (ii) If a candidate given more than one answer, it will be treated as a wrong answer even if one of the given answers happens to be correct and there will be same penalty as above for that question.
- (iii) If a question is left blank i.e. no answer is given by the candidate, there will be **no penalty** for that question.

### **4. Unfair means strictly prohibited**

No candidate shall copy from the papers of any other candidate nor permit his papers to be copied nor give nor attempt to give nor obtain nor attempt to obtain irregular assistance of any description.

### **5. Conduct in Examination Hall**

No candidate should misbehave in any manner or create disorderly scene in the Examination Hall or harass the staff employed by the Commission for the conduct of the examination. Any such misconduct will be severely penalised.

### **6. Answer Sheet particulars**

- (i) Write with Black ball pen your Centre and subject followed by test booklet series (in bracket), subject code and roll number at the appropriate space provided on the answer sheet at the top. Also encode your booklet series (A, B, C, or D as the case may be), subject code and roll number in the circles provided for the purpose in the answer sheet. The guidelines for writing the above particulars and for encoding the above particulars are given in Annexure. In case the booklet series is not printed on the test booklet or answer sheet is un-numbered, please report immediately to the invigilator and get the test booklet/answer sheet replaced.
  - (ii) Candidates should note that any omission/mistakes/discrepancy in encoding/filling of details in the OMR answer sheet, especially with regard to Roll Number and Test Booklet Series Code, will render the answer sheet liable for rejection.
  - (iii) Immediately after commencement of the examination please check that the test booklet supplied to you does not have any unprinted or torn or missing pages or items etc., if so, get it replaced by a complete test booklet of the same series and subject.
7. Do not write your name or anything other than the specific items of information asked for, on the answer sheet/test booklet/sheet for rough work.
8. Do not fold or mutilate or damage or put any extraneous marking in the Answer Sheet. Do not write anything on the reverse of the answer sheet.

9. Since the answer sheets will be evaluated on computerised machines, candidates should exercise due care in handling and filling up the answer sheets. **They should use black ball pen only to darken the circles. For writing in boxes, they should use black ball pen. Since the entries made by the candidates by darkening the circles will be taken into account while evaluating the answer sheets on computerised machines, they should make these entries very carefully and accurately.**

#### **10. Method of marking answers**

In the 'OBJECTIVE TYPE' of examination, you do not write the answers. For each question (hereinafter referred to as "Item") several suggested answers (hereinafter referred to as "Responses") are given. You have to choose one response to each item. The question paper will be in the Form of TEST BOOKLET. The booklet will contain item bearing numbers 1, 2, 3.....etc. Under each item, Responses marked (a), (b), (c), (d) will be given. Your task will be to choose the correct response. If you think there is more than one correct response, then choose what you consider the best response.

In any case, for each item you are to select only one response, if you select more than one response, your response will be considered wrong.

In the Answer Sheet, Serial Nos. From 1 to 160 are printed. Against each numbers, there are circles marked (a), (b), (c) and (d). After you have read each item in the Test Booklet and decided which one of the given responses is correct or the best. **You have to mark your response by completely blackening with black ball pen to indicate your response.**

For example, if the correct answer to item 1 is (b), then the circle containing the letter (b) is to be completely blackened with black ball pen as shown below :- Example : (a) • (c) (d).

11. Candidates must write the papers in their own hand. In no circumstances will they be allowed the help of a scribe.

#### **12. Entries in Scannable Attendance List.**

Candidates are required to fill in the relevant particulars with **black ball pen** only against their columns in the Scannable Attendance List, as given below.

- i) Blacken the circle (P) under the column (Present/Absent)
- ii) Blacken the relevant circle for Test Booklet Series
- iii) Write Test Booklet Serial No.
- iv) Write the Answer Sheet Serial No. and also blacken the Corresponding circles below.
- v) Append signature in the relevant column.
- vi)

13. Please read and abide by the instructions on the cover of Test Booklet. If any candidate indulges in disorderly or improper conduct he will render himself liable for disciplinary action and/or imposition of a penalty as the Commission may deem fit.

#### **ANNEXURE**

##### **How to fill in the Answer Sheet of objective type tests in the Examination Hall**

Please follow these instructions very carefully. You may note that since the answer sheets are to be evaluated on machine, any violation of these instructions may result in reduction of your score for which you would yourself be responsible. Before you mark your responses on the Answer Sheet, you will have to fill in various particulars in it.

As soon as the candidate receives the Answer Sheet, he should check that it is numbered at the bottom. If it is found un-numbered he should at once get it replaced by a numbered one.

You will see from the Answer Sheet that you will have to fill in the top line, which reads thus:

केंद्र विषय विषय कोड अनुक्रमांक  
**Centre Subject S. Code Roll Number**

If you are, say, appearing for the examination in Delhi Centre for the Mathematics Paper\* and your Roll No. is 081276, and your test booklet series is 'A' you should fill in thus, using black ball pen.

केंद्र विषय विषय कोड अनुक्रमांक  
**Centre Delhi Subject English S.Code**

1	1
---	---

**Roll Number**

0	8	1	2	7	6
---	---	---	---	---	---

You should write with black ball pen the name of the centre and subject in English or Hindi

























The test Booklet Series is indicated by Alphabets A, B, C or D at the top right hand corner of the Booklet.

Write your Roll Numbers exactly as it is in your e-Admission Certificate with Black ball pen in the boxes provided for this purpose. Do not omit any zero(s) which may be there.

The next step is to find out the appropriate subject code from the Time Table. Now encode the Test Booklet Series, Subject Code and the Roll Number in the circles

provided for this purpose. Do the encoding with Black Ball pen. The name of the Centre need not be encoded.





























































Writing and encoding of Test Booklet Series is to be done after receiving the Test Booklet and confirming the Booklet Series from the same. For Mathematics \*subject paper of 'A' Test Booklet Series you have to encode the subject code, which is 01. Do it thus:

पुस्तिका क्रम (ए) Booklet Series (A)	विषय Subject	0	1
			
			
			
			
			
			
			
			
			
			

अनुक्रमांक  
Roll Number

All that is required is to blacken completely the circle marked 'A' below the Booklet Series and the subject code blacken completely the Circles for "0" (in the first vertical column) and "1" (in the second vertical column). You should then encode the Roll No.081276. Do it thus similarly:

**Important** : Please ensure that you have carefully encoded your

0	8	1	2	7	6
					
					
					
					
					
					
					
					
					
					



subject. Test Booklet series and  
Roll Number:

\*This is just illustrative and may  
not be relevant to your  
Examination.

## APPENDIX-IV

### **GUIDELINES WITH REGARD TO PHYSICAL STANDARDS FOR CANDIDATES FOR COMBINED DEFENCE SERVICES EXAMINATION.**

#### **ARMY** **MEDICAL STANDARDS AND PROCEDURE OF MEDICAL EXAMINATION** **FOR OFFICER ENTRIES INTO ARMY**

1. Aim:

Aim of this literature is to familiarize the general population on medical standards for enrolment of candidates into Army through various types of entries. This literature also serves the purpose of placing information in public domain as per the policy of Information Commission under RTI Act -2005

2. Introduction:

(a) The primary responsibility of the Armed Forces is defending territorial integrity of the nation. For this purpose Armed Forces should always be prepared for war. Armed Forces personnel undergo rigorous training in preparation for war. Armed Forces also assist civil authorities if required whenever the need arises like in the case of disasters. To carry out such tasks Armed Forces requires candidates with robust mental and physical health. Such candidates should also be capable of withstanding rigorous stress and strain of service conditions to perform their military duties in adverse terrain and uncongenial climate incl sea and air, in remote areas, in austere conditions with no medical facilities. A medically unfit individual due to disease/disability can not only drain precious resources but can also jeopardize lives of other members of the team during operations. Therefore only medically fit candidates are selected who emerge fit to be trained for war.

(b) The Armed Forces Medical Services are responsible for ensuring selection of **'Medically Fit'** individuals into the Armed Forces.

(c) All Armed Forces personnel regardless of occupational specialty, unit assignment, age or gender should have a basic level of general **'Medical fitness'** when inducted into service. This basic level of fitness can then be used as a benchmark to train personnel for further physically demanding occupational specialties or unit assignments. This will enhance deployable combat readiness.

(d) Medical examinations are carried out meticulously by Armed Forces Medical Services Medical Officers. These Medical Officers are well oriented to specific working conditions of Armed Forces after undergoing basic military training. Medical examinations are finalized by the Board of Medical Officers. **The decision of the Medical Board is final. In case of any doubt about any disease/disability/injury/genetic disorder etc noticed during enrolment/commissioning, the benefit of doubt will be given to State.**

#### **Medical Standards.**

3. Medical standards described in the following paragraphs are general guidelines. They are not exhaustive in view of the vast knowledge of disease. These standards are subject to change with advancement in the scientific knowledge and change in working conditions of Armed Forces due to introduction of new eqpt/trades. Such changes will be promulgated from time to time by policy letters by competent authorities. Medical Officers, Spl Medical Officers and Medical Boards will take appropriate decisions based on following guidelines and principles.

4. **To be deemed 'Medically fit', a candidate must be in good physical and mental health and free from any disease/syndrome/disability likely to interfere**

**with the efficient performance of military duties in any terrain, climate, season incl. sea and air, in remote areas, in austere conditions with no medical aid. Candidate also should be free of medical conditions which require frequent visit to medical facilities and use of any aid / drugs.**

- (a) It will, however, be ensured that candidate is in good health. There should be no evidence of weak constitution, imperfect development of any system, any congenital deformities/ diseases/syndrome or malformation.
- (b) No swelling/s including tumours/cyst/swollen lymph node/s anywhere on the body. No sinus/es or fistula/e anywhere on the body.
- (c) No hyper or hypo pigmentation or any other disease/syndrome/disability of the skin.
- (d) No hernia anywhere on the body.
- (e) No scars which can impair the functioning and cause significant disfigurement.
- (f) No arterio-venous malformation anywhere in/on the body.
- (g) No malformation of the head and face including asymmetry, deformity from fracture or depression of the bones of the skull; or scars indicating old operative interference and malformation like sinuses and fistulae etc.
- (h) No impairment of vision including colour perception and field of vision.
- (j) No hearing impairment, deformities/disabilities in ears vestibule-cochlear system.
- (k) No impediment of speech due to any aetiology.
- (l) No disease/disability/ congenital anomaly/syndrome of the bones or cartilages of the nose, or palate, nasal polyps or disease of the naso-Pharynx, uvula and accessory sinuses. There should be no nasal deformity and no features of chronic tonsillitis.
- (m) No disease /syndrome/disability of the throat, palate tonsils or gums or any disease or injury affecting the normal function of either mandibular joint.
- (n) No disease /syndrome/disability of the heart and blood vessels incl congenital, genetic, organic incl hypertension, and conduction disorders.
- (o) No evidence of pulmonary tuberculosis or previous history of this disease or any other disease /syndrome/disability chronic disease of the lungs and chest including allergies /immunological conditions, connective tissue disorders, musculoskeletal deformities of chest.
- (p) No disease of the digestive system including any abnormality of the liver, pancreas incl endocrinal, congenital, hereditary or genetic diseases /syndromes and disabilities.
- (q) No diseases/syndrome/disability of any endocrinal system, reticuloendothelial system.
- (r) No diseases/syndrome/disability of genito-urinary system including malformations, atrophy/hypertrophy of any organ or gland.

- (s) No active, latent or congenital venereal disease
  - (t) No history or evidence of mental disease, epilepsy, incontinence of urine or enuresis.
  - (u) No disease/deformity/syndrome of musculo-skeletal system and joints incl skull, spine and limbs.
  - (v) There is no congenital or hereditary disease/ syndrome/disability.
5. Psychological examinations will be carried out during SSB selection procedure. However, any abnormal traits noticed during medical examination will be a cause for rejection.
6. Based on the above mentioned guidelines usual medical conditions which lead to rejection are:-
- (a) Musculo-skeletal deformities of spine, chest and pelvis, limbs e.g. scoliosis, torticollis, kyphosis, deformities of vertebrae, ribs, sternum, clavicle, other bones of skeleton, mal-united fractures, deformed limbs, fingers, toes and congenital deformities of spine.
  - (b) Deformities of Limbs: Deformed limbs, toes and fingers, deformed joints like cubitus valgus, cubitus varus, knock knees, bow legs, hyper mobile joints, amputated toes or fingers and shortened limbs.
  - (c) Vision and eye: Myopia, hypermetropia, astigmatism, lesions of cornea, lens, retina, squint and ptosis.
  - (d) Hearing, ears, nose and throat: Sub standard hearing capability, lesions of pinna, tympanic membranes, middle ear, deviated nasal septum, and congenital abnormalities of lips, palate, peri-auricular sinuses and lymphadenitis/adenopathy of neck. Hearing capacity should be 610 cm for Conversational Voice and Forced Whispering for each ear.
  - (e) Dental conditions:-
    - (i) Incipient pathological conditions of the jaws, which are known to be progressive or recurrent.
    - (ii) Significant jaw discrepancies between upper and lower jaw which may hamper efficient mastication and/or speech will be a cause for rejection.
    - (iii) Symptomatic Temporo-Mandibular Joint clicking and tenderness. A mouth opening of less than 30 mm measured at the incisal edges, Dislocation of the TMJ on wide opening.
    - (iv) All potentially cancerous conditions.
    - (v) Clinical diagnosis for sub mucous fibrosis with or without restriction of mouth opening.
    - (vi) Poor oral health status in the form of gross visible calculus, periodontal pockets and/or bleeding from gums.
    - (vii) Loose teeth: More than two mobile teeth will render the candidate unfit.

(viii) Cosmetic or post-traumatic maxillofacial surgery/trauma will be UNFIT for at least 24 weeks from the date of surgery/injury whichever is later.

(ix) If malocclusion of teeth is hampering efficient mastication, maintenance of oral hygiene or general nutrition or performance of duties efficiently.

(f) Chest: Tuberculosis, or evidence of tuberculosis, lesions of lungs, heart, musculo skeletal lesions of chest wall.

(g) Abdomen and genitor-urinary system: Hernia, un-descended testis, varicocele, organomegaly, solitary kidney, horseshoe kidney & cysts in the kidney/liver, Gall bladder stones, renal and ureteric stones, lesions/deformities of urogenital organs, piles, sinuses and lymphadenitis/pathy.

(h) Nervous system: Tremors, speech impediment and imbalance.

(j) Skin: Vitiligo, haemangiomas, warts, corns, dermatitis, skin infections growths and hyperhydrosis.

7. **Height and Weight:** Height requirement varies as per the stream of entry. Weight should be proportionate to height as per the chart given below:-

Age (yrs)	Minimum weight for all ages	Age: 17 to 20 yrs	Age: 20+01 day - 30 yrs	Age: 30 + 01 day - 40 yrs	Age: Above 40 yrs
Height (cm)	Weight (Kg)	Weight (Kg)	Weight (Kg)	Weight (Kg)	Weight (Kg)
140	35.3	43.1	45.1	47.0	49.0
141	35.8	43.7	45.7	47.7	49.7
142	36.3	44.4	46.4	48.4	50.4
143	36.8	45.0	47.0	49.1	51.1
144	37.3	45.6	47.7	49.8	51.8
145	37.8	46.3	48.4	50.5	52.6
146	38.4	46.9	49.0	51.2	53.3
147	38.9	47.5	49.7	51.9	54.0
148	39.4	48.2	50.4	52.6	54.8
149	40.0	48.8	51.1	53.3	55.5
150	40.5	49.5	51.8	54.0	56.3
151	41.0	50.2	52.4	54.7	57.0
152	41.6	50.8	53.1	55.4	57.8
153	42.1	51.5	53.8	56.2	58.5
154	42.7	52.2	54.5	56.9	59.3
155	43.2	52.9	55.3	57.7	60.1
156	43.8	53.5	56.0	58.4	60.8
157	44.4	54.2	56.7	59.2	61.6
158	44.9	54.9	57.4	59.9	62.4
159	45.5	55.6	58.1	60.7	63.2
160	46.1	56.3	58.9	61.4	64.0
161	46.7	57.0	59.6	62.2	64.8
162	47.2	57.7	60.4	63.0	65.6
163	47.8	58.5	61.1	63.8	66.4
164	48.4	59.2	61.9	64.6	67.2
165	49.0	59.9	62.6	65.3	68.1
166	49.6	60.6	63.4	66.1	68.9
167	50.2	61.4	64.1	66.9	69.7



Age (yrs)	Minimum weight for all ages	Age: 17 to 20 yrs	Age: 20+01 day - 30 yrs	Age: 30 + 01 day - 40 yrs	Age: Above 40 yrs
Height (cm)	Weight (Kg)	Weight (Kg)	Weight (Kg)	Weight (Kg)	Weight (Kg)
168	50.8	62.1	64.9	67.7	70.6
169	51.4	62.8	65.7	68.5	71.4
170	52.0	63.6	66.5	69.4	72.3
171	52.6	64.3	67.3	70.2	73.1
172	53.3	65.1	68.0	71.0	74.0
173	53.9	65.8	68.8	71.8	74.8
174	54.5	66.6	69.6	72.7	75.7
175	55.1	67.4	70.4	73.5	76.6
176	55.8	68.1	71.2	74.3	77.4
177	56.4	68.9	72.1	75.2	78.3
178	57.0	69.7	72.9	76.0	79.2
179	57.7	70.5	73.7	76.9	80.1
180	58.3	71.3	74.5	77.8	81.0
181	59.0	72.1	75.4	78.6	81.9
182	59.6	72.9	76.2	79.5	82.8
183	60.3	73.7	77.0	80.4	83.7
184	60.9	74.5	77.9	81.3	84.6
185	61.6	75.3	78.7	82.1	85.6
186	62.3	76.1	79.6	83.0	86.5
187	62.9	76.9	80.4	83.9	87.4
188	63.6	77.8	81.3	84.8	88.4
189	64.3	78.6	82.2	85.7	89.3
190	65.0	79.4	83.0	86.6	90.3
191	65.7	80.3	83.9	87.6	91.2
192	66.4	81.1	84.8	88.5	92.2
193	67.0	81.9	85.7	89.4	93.1
194	67.7	82.8	86.6	90.3	94.1
195	68.4	83.7	87.5	91.3	95.1
196	69.1	84.5	88.4	92.2	96.0
197	69.9	85.4	89.3	93.1	97.0
198	70.6	86.2	90.2	94.1	98.0
199	71.3	87.1	91.1	95.0	99.0
200	72.0	88.0	92.0	96.0	100.0
201	72.7	88.9	92.9	97.0	101.0
202	73.4	89.8	93.8	97.9	102.0
203	74.2	90.7	94.8	98.9	103.0
204	74.9	91.6	95.7	99.9	104.0
205	75.6	92.5	96.7	100.9	105.1
206	76.4	93.4	97.6	101.8	106.1
207	77.1	94.3	98.6	102.8	107.1
208	77.9	95.2	99.5	103.8	108.2
209	78.6	96.1	100.5	104.8	109.2
210	79.4	97.0	101.4	105.8	110.3

(a) Weight for height charts given above is for all categories of personnel. This chart is prepared based on the BMI. The chart specifies the minimum acceptable weight that candidates of a particular height must have. Weights below the minimum specified will not be acceptable in any case. The maximum acceptable weight of height has been specified in age wise categories. Weights higher than the acceptable limit will be acceptable only in the case of candidates with documented evidence of body building, wrestling, and boxing at the National level. In such cases the following criteria will have to be met.

- (i) Body Mass Index should be below 25.
- (ii) Waist Circumference should be less than 90 cm for males and 80 cm for females.
- (iii) All biochemical metabolic parameters should be within normal limits.
- (b) The minimum height required for male candidates for entry into the Armed Forces is 157 cm or as decided by the respective recruiting agency. Gorkhas and candidates belonging to Hills of North Eastern region of India, Garhwal and Kumaon, will be accepted with a minimum height of 152 cm.
- (c) The minimum height required for female candidates for entry into the Armed Forces is 152 cm. Gorkhas and candidates belonging to Hills of North Eastern region of India, Garhwal and Kumaon will be accepted with a minimum height of 148 cm.
8. Following investigations will be carried out for all officer entries and for pre-commission training academies. However examining medical officer/ medical board may ask for any other investigation deemed fit.
- Complete haemogram
  - Urine RE
  - Chest X-ray
  - USG abdomen and Pelvis.
  -
9. Certain standards vary depending on age and type entry viz stds for vision as follows:-

<b>Parameter</b>	<b>Standards : 10+2 entries, NDA(Army), TES and equivalent</b>	<b>Graduate &amp; equivalent entries: CDSE, IMA, OTA, UES, NCC,TGC &amp; equivalent</b>	<b>Post graduate &amp; equivalent entries: JAG, AEC , APS, RVC,TA, AMC, ADC, SL &amp; equivalent</b>
Uncorrected vision(max allowed)	6/36 & 6/36	6/60 & 6/60	3/60 & 3/60
BCVA	Rt 6/6 & Lt 6/6	Rt 6/6 & Lt 6/6	Rt 6/6 & Lt 6/6
Myopia	$\leq -2.5$ D Sph ( including max astigmatism $\leq \pm 2.0$ D Cyl)	$\leq -3.50$ D Sph ( including max astigmatism $\leq \pm 2.0$ D Cyl)	$\leq -5.50$ D Sph (including max astigmatism $\leq \pm 2.0$ D Cyl)
Hypermetropia	$\leq +2.5$ D Sph, ( including max astigmatism $\leq \pm 2.0$ D Cyl)	$\leq +3.50$ D Sph ( including max astigmatism $\leq \pm 2.0$ D Cyl)	$\leq +3.50$ D Sph (including max astigmatism $\leq \pm 2.0$ D Cyl)
Lasik/equivalent surgery	Not permitted	Permitted *	Permitted*
Colour perception	CP-II	CP-II	CP-II

**\*LASIK or Equivalent kerato-refractive procedure**

- (a) Any candidate who has undergone any kerato-refractive procedure will have a certificate from the centre where he/she has undergone the procedure, specifying the date and type of surgery.

Note: Absence of such a certificate will necessitate the Ophthalmologist to make a decision to reject the candidate with specific endorsement of "Unfit due to undocumented Visual Acuity corrective procedure".

- (b) In order to be made FIT, the following criteria will have to be met:
- (i) Age more than 20 yrs at the time of surgery
  - (ii) Minimum 12 months post LASIK
  - (iii) Central corneal thickness equal to or more than 450  $\mu$
  - (iv) Axial length by IOL Master equal to or less than 26 mm
  - (v) Residual refraction of less than or equal to  $\pm 1.0$  D incl cylinder, (provided acceptable in the category applied for).
  - (vi) Normal healthy retina.
  - (vii) Corneal topography and ectasia markers can also be included as addl criteria.

**Candidates who have undergone radial keratotomy are permanently unfit**

10. Form to be used for med board proceedings is AFMSF-2A.

11. Procedure of Medical Examination Board: Medical Examination Board for selection for officers and pre-commissioning training academies are convened at designated Armed Forces Medical Services Hospitals near Service Selection Boards (SSB). These Medical Boards are termed as 'Special Medical Board' (SMB). Candidates who clear SSB interview are referred to Armed Forces Medical Services Hospital with identification documents. Staff Surgeon of Hospital will identify the candidate, guide the candidate to fill the relevant portions of the AFMSF-2, organize investigations and examination by Medical, Surgical, Eye, ENT, Dental specialists. Female candidates are examined by Gynaecology Specialist also. After examination by Specialists, the candidate is brought before Medical Board. Medical Board once satisfied with findings of Specialists will declare fitness of candidate. If any candidate is declared 'Unfit' by SMB, such candidates can request for 'Appeal Medical Board' (AMB). Detailed procedure for AMB will be provided by President SMB.

12. Miscellaneous aspects:

- (a) Clinical methods of examinations are laid down by O/O DGAFMS.
- (b) Female candidates will be examined by female medical officers and specialists. In case of non-availability they will be examined by Medical Officer in the presence of female attendant.
- (c) Fitness following surgery: Candidates may be declared fit after surgery. However, there should not be any complication; scar should be healthy, well healed and attained required tensile strength. The candidate shall be considered fit after 01 year of open/laparoscopic surgeries for hernia and twelve weeks of laparoscopic abdominal surgery for cholecystectomy. For any other surgery, fitness shall be considered only after 12 weeks of the laparoscopic surgery and 12 months after an open surgery. Candidate shall be unfit for any surgeries for injuries, ligament tear, and meniscus tear of any joint, irrespective of duration of surgery.

**MEDICAL STANDARD AND PROCEDURE OF MEDICAL EXAMINATION  
FOR OFFICER ENTRIES INTO NAVY**

**PROCEDURE ON CONDUCT OF MEDICAL BOARDS**

1. A candidate recommended by the Services Selection Board (SSB) will undergo a medical examination (Special Medical Board) by a Board of Service Medical Officers. Only those candidates, who are declared fit by the Medical Board, will be admitted to the Academy. However, the President of the Medical Board will intimate the candidates declared unfit of their results and the procedure for an Appeal Medical Board (AMB) to be completed in a Command Hospital or equivalent within 42 days of Special Medical Board.

2. Candidates who are declared unfit by the Appeal Medical Board (AMB) may request for Review Medical Board (RMB) within one day of completion of Appeal Medical Board. The President AMB will intimate about the procedure of challenging the findings of AMB. The candidates will also be intimated that sanction for holding of Review Medical Board (RMB) will be granted at the discretion of DGAFMS based on the merit of the case and that RMB is not a matter of right. The candidate should address the request for RMB if he/ she so desires to DMPR, Integrated Headquarters Ministry of Defence (Navy), Sena Bhawan, Rajaji Marg, New Delhi – 110011 and a copy of the same is handed over to the President of AMB. O/o DGAFMS will inform the date and place (Delhi and Pune only) where the candidate will appear for a RMB.

3. The following investigations will be carried out mandatorily during Special Medical Board. However, Medical Officer / Medical Board examining a candidate may ask for any other investigation as required or indicated :-

- (a) Complete Haemogram
- (b) Urine RE/ME
- (c) X Ray chest PA view
- (d) USG abdomen & pelvis
- (e) Liver Function Tests
- (f) Renal Function Tests
- (g) X Ray Lumbosacral spine, Anterior-Posterior and Lateral views
- (h) Electrocardiogram (ECG)

**PHYSICAL STANDARDS FOR OFFICERS (MALE/ FEMALE) ON ENTRY**

4. The candidate must be physically fit according to the prescribed physical standards.

- (a) The candidate must be in good physical and mental health and free from any disease/ disability which is likely to interfere with the efficient performance of duties both ashore and afloat, under peace as well as war conditions in any part of the world.
- (b) There should be no evidence of weak constitution, bodily defects or underweight. The candidate should not be overweight or obese.

5. **Weight**

**Height-Weight Chart : Navy**

<b>Height in Mtrs</b>	<b>Up to 17 yrs</b>		<b>17 yrs + 1 day to 18 yrs</b>		<b>18 yrs + 1 day to 20 yrs</b>		<b>20 yrs + 1 day to 30 yrs</b>		<b>Above 30 yrs</b>	
	<b>Minimum Weight in Kg</b>	<b>Maximum Weight in Kg</b>	<b>Minimum Weight in Kg</b>	<b>Maximum Weight in Kg</b>	<b>Minimum Weight in Kg</b>	<b>Maximum Weight in Kg</b>	<b>Minimum Weight in Kg</b>	<b>Maximum Weight in Kg</b>	<b>Minimum Weight in Kg</b>	<b>Maximum Weight in Kg</b>
<b>1.47</b>	37	<b>45</b>	40	<b>45</b>	40	<b>48</b>	40	<b>50</b>	40	<b>52</b>
<b>1.48</b>	37	<b>46</b>	41	<b>46</b>	41	<b>48</b>	41	<b>50</b>	41	<b>53</b>
<b>1.49</b>	38	<b>47</b>	41	<b>47</b>	41	<b>49</b>	41	<b>51</b>	41	<b>53</b>
<b>1.5</b>	38	<b>47</b>	42	<b>47</b>	42	<b>50</b>	42	<b>52</b>	42	<b>54</b>
<b>1.51</b>	39	<b>48</b>	42	<b>48</b>	42	<b>50</b>	42	<b>52</b>	42	<b>55</b>
<b>1.52</b>	39	<b>49</b>	43	<b>49</b>	43	<b>51</b>	43	<b>53</b>	43	<b>55</b>
<b>1.53</b>	40	<b>49</b>	43	<b>49</b>	43	<b>51</b>	43	<b>54</b>	43	<b>56</b>
<b>1.54</b>	40	<b>50</b>	44	<b>50</b>	44	<b>52</b>	44	<b>55</b>	44	<b>57</b>
<b>1.55</b>	41	<b>50</b>	44	<b>50</b>	44	<b>53</b>	44	<b>55</b>	44	<b>58</b>
<b>1.56</b>	41	<b>51</b>	45	<b>51</b>	45	<b>54</b>	45	<b>56</b>	45	<b>58</b>
<b>1.57</b>	42	<b>52</b>	46	<b>52</b>	46	<b>54</b>	46	<b>57</b>	46	<b>59</b>
<b>1.58</b>	42	<b>52</b>	46	<b>52</b>	46	<b>55</b>	46	<b>57</b>	46	<b>60</b>
<b>1.59</b>	43	<b>53</b>	47	<b>53</b>	47	<b>56</b>	47	<b>58</b>	47	<b>61</b>
<b>1.6</b>	44	<b>54</b>	47	<b>54</b>	47	<b>56</b>	47	<b>59</b>	47	<b>61</b>
<b>1.61</b>	44	<b>54</b>	48	<b>54</b>	48	<b>57</b>	48	<b>60</b>	48	<b>62</b>
<b>1.62</b>	45	<b>55</b>	49	<b>55</b>	49	<b>58</b>	49	<b>60</b>	49	<b>63</b>
<b>1.63</b>	45	<b>56</b>	49	<b>56</b>	49	<b>58</b>	49	<b>61</b>	49	<b>64</b>
<b>1.64</b>	46	<b>56</b>	50	<b>56</b>	50	<b>59</b>	50	<b>62</b>	50	<b>65</b>
<b>1.65</b>	46	<b>57</b>	50	<b>57</b>	50	<b>60</b>	50	<b>63</b>	50	<b>65</b>
<b>1.66</b>	47	<b>58</b>	51	<b>58</b>	51	<b>61</b>	51	<b>63</b>	51	<b>66</b>
<b>1.67</b>	47	<b>59</b>	52	<b>59</b>	52	<b>61</b>	52	<b>64</b>	52	<b>67</b>
<b>1.68</b>	48	<b>59</b>	52	<b>59</b>	52	<b>62</b>	52	<b>65</b>	52	<b>68</b>
<b>1.69</b>	49	<b>60</b>	53	<b>60</b>	53	<b>63</b>	53	<b>66</b>	53	<b>69</b>
<b>1.7</b>	49	<b>61</b>	53	<b>61</b>	53	<b>64</b>	53	<b>66</b>	53	<b>69</b>
<b>1.71</b>	50	<b>61</b>	54	<b>61</b>	54	<b>64</b>	54	<b>67</b>	54	<b>70</b>
<b>1.72</b>	50	<b>62</b>	55	<b>62</b>	55	<b>65</b>	55	<b>68</b>	55	<b>71</b>
<b>1.73</b>	51	<b>63</b>	55	<b>63</b>	55	<b>66</b>	55	<b>69</b>	55	<b>72</b>
<b>1.74</b>	51	<b>64</b>	56	<b>64</b>	56	<b>67</b>	56	<b>70</b>	56	<b>73</b>
<b>1.75</b>	52	<b>64</b>	57	<b>64</b>	57	<b>67</b>	57	<b>70</b>	57	<b>74</b>
<b>1.76</b>	53	<b>65</b>	57	<b>65</b>	57	<b>68</b>	57	<b>71</b>	57	<b>74</b>
<b>1.77</b>	53	<b>66</b>	58	<b>66</b>	58	<b>69</b>	58	<b>72</b>	58	<b>75</b>
<b>1.78</b>	54	<b>67</b>	59	<b>67</b>	59	<b>70</b>	59	<b>73</b>	59	<b>76</b>
<b>1.79</b>	54	<b>67</b>	59	<b>67</b>	59	<b>70</b>	59	<b>74</b>	59	<b>77</b>
<b>1.8</b>	55	<b>68</b>	60	<b>68</b>	60	<b>71</b>	60	<b>75</b>	60	<b>78</b>
<b>1.81</b>	56	<b>69</b>	61	<b>69</b>	61	<b>72</b>	61	<b>75</b>	61	<b>79</b>



<b>1.82</b>	56	<b>70</b>	61	<b>70</b>	61	<b>73</b>	61	<b>76</b>	61	<b>79</b>
<b>1.83</b>	57	<b>70</b>	62	<b>70</b>	62	<b>74</b>	62	<b>77</b>	62	<b>80</b>
<b>1.84</b>	58	<b>71</b>	63	<b>71</b>	63	<b>74</b>	63	<b>78</b>	63	<b>81</b>
<b>1.85</b>	58	<b>72</b>	63	<b>72</b>	63	<b>75</b>	63	<b>79</b>	63	<b>82</b>
<b>1.86</b>	59	<b>73</b>	64	<b>73</b>	64	<b>76</b>	64	<b>80</b>	64	<b>83</b>
<b>1.87</b>	59	<b>73</b>	65	<b>73</b>	65	<b>77</b>	65	<b>80</b>	65	<b>84</b>
<b>1.88</b>	60	<b>74</b>	65	<b>74</b>	65	<b>78</b>	65	<b>81</b>	65	<b>85</b>
<b>1.89</b>	61	<b>75</b>	66	<b>75</b>	66	<b>79</b>	66	<b>82</b>	66	<b>86</b>
<b>1.9</b>	61	<b>76</b>	67	<b>76</b>	67	<b>79</b>	67	<b>83</b>	67	<b>87</b>
<b>1.91</b>	62	<b>77</b>	67	<b>77</b>	67	<b>80</b>	67	<b>84</b>	67	<b>88</b>
<b>1.92</b>	63	<b>77</b>	68	<b>77</b>	68	<b>81</b>	68	<b>85</b>	68	<b>88</b>
<b>1.93</b>	63	<b>78</b>	69	<b>78</b>	69	<b>82</b>	69	<b>86</b>	69	<b>89</b>
<b>1.94</b>	64	<b>79</b>	70	<b>79</b>	70	<b>83</b>	70	<b>87</b>	70	<b>90</b>
<b>1.95</b>	65	<b>80</b>	70	<b>80</b>	70	<b>84</b>	70	<b>87</b>	70	<b>91</b>

**Notes:-**

(a) The minimum and maximum weight for height will be standard for all categories of personnel. Candidates with weight below the minimum specified will not be accepted.

(b) Male candidates with weight higher than specified will be acceptable only in exceptional circumstances in case of candidates with documented evidence of body building, wrestling, boxing or muscular build. In such cases, the following criteria are to be met :-

- (i) Body Mass Index should not be more than 25.
- (ii) Waist : Hip Ratio less than 0.9.
- (iii) All biochemical parameters such as blood sugar Fasting and PP, blood urea, creatinine, cholesterol, HbA1C%, etc are within normal limits.

(c) The fitness can only be given by a Medical Specialist.

6. During the medical examination of candidates, the following principal points will be ensured:-

- (a) The candidate is sufficiently intelligent.
- (b) The hearing is good and that there is no sign of any disease of ear, nose or throat.
- (c) Vision in either eye is up to the required standard. His/ her eyes are bright, clear and with no obvious squint or abnormality. Movements of eye balls should be full and free in all directions.
- (d) Speech is without impediment.
- (e) There is no glandular swelling.
- (f) Chest is well formed and that his/her heart and lungs are sound.
- (g) Limbs of the candidates are well formed and fully developed.
- (h) There is no evidence of hernia of any degree or form.
- (j) There is free and perfect action of all the joints.
- (k) Feet and toes are well formed.
- (l) Absence of any congenital malformation or defects.
- (m) He/she does not bear traces of previous acute or chronic disease pointing to an impaired constitution.
- (n) Presence of sufficient number of sound teeth for efficient mastication.
- (p) Absence of any disease of the Genito-Urinary tract.

7. Major defects for rejection are as under:-
- (a) Weak constitution, imperfect development, congenital malformation, muscular wasting.
  - (b) Malformation of the head including deformity from fracture or depression of the bones of the skull.
  - (c) Assessment of Scoliosis. Cobb's angle of 15 degrees at Lumbar Spine and 20 degrees at Dorsal Spine will be the cut-off limits for scoliosis. Scoliosis will be declared Unfit if deformity exists on full flexion of the spine with restriction of range of movements or due to organic defect causing structural abnormality.
  - (d) Skeletal deformity either hereditary or acquired and disease or impairment of function of bones or joints.
- Note:-** Rudimentary cervical rib causing no signs or symptoms is acceptable.
- (e) Asymmetry of torso or limbs, abnormality of locomotion including amputation.
  - (f) Deformity of feet and toes.
- (i) **Hyperextensible Finger Joints.** All candidates shall be thoroughly examined for hyper-extensible finger joints. Any extension of fingers bending backwards beyond 90 degrees shall be considered hyper-extensible and considered unfit. Other joints like Knee, Elbow, Spine and Thumb shall also be examined carefully for features of hyper laxity/ hypermobility. Although the individual may not show features of hyper laxity in other joints, isolated presentation of hyper extensibility of finger joints shall be considered unfit because of the various ailments that may manifest later if such candidates are subjected to strenuous physical training as mentioned above.
  - (ii) **Mallet Finger.** Loss of extensor mechanism at the distal inter-phalangeal joint leads to Mallet finger. Chronic mallet deformity can lead to secondary changes in the PIP and MCP joint which can result in compromised hand function. Normal range of movement at DIP joints is 0-80 degree and PIP joint is 0-90 degrees in both flexion and extension. In Mallet finger, candidate unable to extend/ straighten distal phalanx of fingers completely.
    - (aa) Candidates with mild condition i.e., less than 10 degrees of extension lag without any evidence of trauma, pressure symptoms and any functional deficit should be declared Fit.
    - (ab) Candidates with fixed deformity of fingers will be declared Unfit.
  - (iii) **Polydactyly.** Can be assessed for fitness 12 weeks post-op. Can be declared fit if there is no bony abnormality (X-Ray), wound is well healed and scar is supple.
  - (iv) **Simple Syndactyly.** Can be assessed for fitness 12 weeks post op. Can be declared fit if there is no bony abnormality (X-Ray), wound is well healed and scar is supple.
  - (v) **Complex Syndactyly.** Unfit
  - (vi) **Polymazia.** Can be assessed for fitness 12 weeks post-op.
  - (vii) **Hyperostosis Frontalis Interna.** Will be considered fit in the absence of any other metabolic abnormality.
  - (viii) **Healed Fractures.**

(aa) All intra-articular fractures especially of major joints (Shoulder, elbow, wrist, hip, knee and ankle) with or without surgery, with or without implant shall be considered unfit.

(ab) All extra-articular injuries with post-operative status with or without implant shall be considered unfit.

(ac) All extra-articular injuries of long bones which have been managed conservatively shall be thoroughly evaluated clinically for soft tissue involvement, crush component, alignment, mal-union/ non-union or any miscellaneous causes which can later on present with a disability on being subjected to physical stress shall be considered unfit if found so. However, the fitness of a candidate in whom the fracture has consolidated well and remodelled after conservative treatment with no evidence of mal-alignment, shortening, soft tissue involvement etc. shall be at the discretion of Surgical Specialist or Medical Board.

(viii) **Cubitus Recurvatum.** >10 degrees is Unfit

(ix) **Cubitus Valgus.**

(aa) **Measurement of Carrying Angle.** The carrying angle at the elbow is assessed conventionally with the elbow in full extension using a protractor goniometer to measure the axes from the surface margin of the arm and forearm. However, variations in the development of the soft tissues in the arm and forearm generally lead to inconsistencies in the measured results. So far, there is no uniform method to measure the carrying angle of the elbow. However, measuring the carrying angle of the elbow through identification of bony landmarks on the acromion, medial and lateral epicondyles of the humerus, and the distal radial and ulnar styloid processes is recommended. Carrying angle is measured by a manual goniometer with two drawing axes of the arm and forearm. The axis of the arm is defined by the lateral border of the cranial surface of the acromion to the midpoint of the lateral and medial epicondyles of the humerus. The axis of the forearm is defined by the midpoint of the lateral and medial epicondyles of the humerus to the midpoint of the distal radial and ulnar styloid processes.

(ab) Cubitus valgus should be primarily a clinical diagnosis. The suggested indications to perform a radiographic evaluation include:-

- (i) History of trauma
- (ii) Scar around elbow
- (iii) Asymmetry of angles
- (iv) Distal neurovascular deficit
- (v) Restricted range of motion
- (vi) If deemed necessary by Orthopaedic Surgeon

(x) **Hyperextension at Elbow Joint.** Individuals can have naturally hyperextended elbow. This condition is not a medical problem, but can be a cause of fracture or chronic pain especially considering the stress and strains military population is involved in. Also, the inability to return the elbow to within 10 degrees of the neutral position is impairment in the activities of daily living.

(aa) Measurement modality. Measured using a Goniometer

(ab) Normal elbow extension is 0 degrees. Up to 10 degrees of hyperextension is within normal limits if the patient has no history of trauma to the joint. Anyone with hyperextension more than 10 degree should be unfit.

8. **Eye.**

- (a) Deformity or morbid condition of the eye or eyelids that is liable for aggravation or recurrence.
- (b) Manifest squint of any degree.
- (c) Active trachoma or its complication or sequelae.
- (d) Visual acuity below prescribed standards.

**Notes:-**

1. Visual standards for CDSE entry are as follows :-

Criteria	CDSE
Uncorrected Vision	6/12 6/12
Corrected Vision	6/6 6/6
Limits of Myopia	-1.5 D Sph
Limits of Hypermetropia	+ 1.5 D Cyl
Astigmatism (within limits of myopia and hypermetropia)	$\pm 0.75$ D Sph / Cyl
Binocular Vision	III
Colour Perception	I

2. **Kerato Refractive Surgery.** Candidates who have undergone any Refractory Surgery (PRK/LASIK/SMILE) can be considered fit in all branches (except submarine, diving and MARCO cadre) subject to the following conditions :-

- (a) Surgery should not have been carried out before 20 yrs of age.
- (b) Uncomplicated surgery at least 12 months before examination (Certificate mentioning the type of refractive surgery, date of surgery and pre-operative refractive error from concerned eye centre is to be produced by the candidate at the time of recruitment medical examination).

**Post LASIK Standards.** Candidate will be considered Fit if Axial Length by IOL Master is equal to or less than 26 mm and Central Corneal Thickness is equal to or more than 450 microns

- (c) Residual refraction less than or equal to  $\pm 1.0$  D Sph or Cyl, provided within the permissible limit for the category applied for. However, for Pilot and Observer entries, the residual refraction should be nil.

- (d) Pre-operative refractive error not more than +/- 6.0 D
- (e) Normal retinal examination.

3. Kerato-Refractory Surgery (PRK, LASIK, SMILE) is not acceptable for special cadres such as submarine, diving and MARCO. **Candidates who have undergone Radial Keratotomy are permanently unfit for all branches.**

(i) **Ptosis.** Candidate will be considered fit post-operative provided there is no recurrence one year after surgery, visual axis is clear with normal visual fields and upper eyelid is 02 mm below the superior limbus. Candidates, who have not undergone surgery for the condition, would be considered fit if they meet any of the following criteria:-

- (aa) Mild ptosis
- (ab) Clear visual axis
- (ac) Normal visual field
- (ad) No sign of aberrant degeneration/ head tilt

(ii) **Exotropia.** Unfit

(iii) **Anisocoria.** If size difference between the pupils is >01mm, candidate will be considered unfit.

(iv) **Heterochromia Iridum.** Unfit

(v) **Sphincter Tears.** Can be considered fit if size difference between pupils is <01mm, pupillary reflexes are brisk with no observed pathology in cornea, lens or retina.

(vi) **Pseudophakia.** Unfit

(vii) **Lenticular Opacities.** Any lenticular opacity causing visual deterioration, or is in the visual axis or is present in an area of 07 mm around the pupils, which may cause glare phenomenon, should be considered Unfit. The propensity of the opacities not to increase in size or number should also be a consideration when deciding fitness. Small stationary lenticular opacities in the periphery like congenital blue dot cataract, not affecting the visual axis/ visual field may be considered by specialist (Should be less than 10 in number and central area of 04 mm to be clear).

(viii) **Optic Nerve Drusen.** Unfit

(ix) **High Cup Disc Ratio.** Candidate will be considered fit if the ratio is <0.2 with normal visual fields with no other evidence of glaucoma. Candidates with high cup disc ratio (>0.2)/Abnormal RNFL study/Visual Field Defect detected by Visual Field Analyzer will be considered Unfit.

(x) **Keratoconus.** Unfit

(xi) **Lattice.**

(aa) The following lattice degenerations will render a candidate Unfit:-

(i) Single circumferential lattice extending more than two clock in either or both eyes.



(ii) Two circumferential lattices each more than one clock hour in extent in either or both eyes.

(iii) Radial lattices.

(iv) Any lattice with atrophic hole/ flap tears (Unlasered).

(v) Lattice degenerations posterior to equator.

(ab) Candidates with lattice degeneration will be considered Fit under the following conditions:-

(i) Single circumferential lattice without holes of less than two clock hours in either or both eyes.

(ii) Two circumferential lattices without holes each being less than one clock hour in extent in either or both eyes.

(iii) Post Laser delimitation single circumferential lattice, without holes/ flap tear, less than two clock hours extent in either or both eyes.

(iv) Post Laser delimitation two circumferential lattices, without holes/ flap tear, each being less than one clock hour extent in either or both eyes.

9. ***Ear, Nose and Throat.***

(a) ***Ear.*** History or recurrent ear ache, tinnitus or vertigo, impairment of hearing, disease of the external meatus including atresia, exostosis or neoplasm which prevent a thorough examination of the drum, unhealed perforation of the tympanic membrane, aural discharge or sign of acute or chronic suppurative otitis media, evidence of radical or modified radical mastoid operation.

**Notes:-**

1. A candidate should be able to hear forced whisper at a distance of 610 cms with each ear separately with back to the examiner.

2. Otitis Media. Current Otitis Media of any type will entail rejection. Evidence of healed chronic otitis media in the form of tympanosclerosis/ scarred tympanic membrane affecting less than 50% of Pars Tensa of tympanic membrane will be assessed by ENT Specialist and will be acceptable if Pure Tone Audiometry (PTA) and Tympanometry are normal. Healed healthy scar (Dimeric Tympanic Membrane or cartilage) of the Neo-Tympanic Membrane involving less than 50% of Pars Tensa due to Type 1 Tympanoplasty (tympanic membrane repair with or without cartilage)/ Myringoplasty (with or without intact cortical mastoidectomy) for Chronic Otitis Media (mucosal type) and Myringotomy (for Otitis Media with Effusion) may be accepted after minimum period of 1 year post surgery if PTA and tympanometry are normal.

(i) The fwg conditions would render a candidate Unfit:-

(aa) Residual perforation

(ab) Residual hearing loss on Free Field Hearing and/or PTA

(ac) Any other type of tympanoplasty (other than Type 1 Tympanoplasty) or middle ear surgery (including ossiculoplasty, stapedotomy, canal wall down mastoidectomy, atticotomy, attico-antroostomy etc)

(ad) Any implanted hearing device (eg. cochlear implant, bone conduction implant, middle ear implants etc).

(b) **Bony Growth of External Auditory Canal.** Any candidate with clinically evident bony growth of external auditory canal like exostosis, osteoma, fibrous dysplasia etc. will be declared Unfit. Assessment of operated cases will be done after minimum period of 4 weeks. Post-surgery histopathology report and HRCT temporal bone will be mandatory. If the histo-pathological report is suggestive of a neoplasia or HRCT temporal bone is suggestive of partial removal or deep extension it would entail rejection.

(c) **Nose.** Disease of the bones or cartilages of the nose, marked nasal allergy, nasal polyps, atrophic rhinitis, disease of the accessory sinuses and nasopharynx.

**Note:-** Septal Deformity. Nasal septal perforation can be anterior cartilaginous or posterior bony perforation. Simple nasal deformity not causing disfigurement, minor septal deviation not interfering with nasal airway and small traumatic septal perforation which are asymptomatic are acceptable. Any septal perforation greater than 01 cm in the greatest dimension is a ground for rejection. A septal perforation which is associated with nasal deformity, nasal crusting, epistaxis and granulation irrespective of the size is a ground for rejection.

**Nasal Polyposis.** It is also known as Chronic Rhinosinusitis with polyposis (CRSwNP). Nasal polyposis is mostly associated with allergy, asthma, sensitivity to NSAIDs and infection i.e. bacterial and fungal. Most of these patients have high chances of recurrence and require long term management with nasal/ oral steroids and are unfit for extremes of climate and temperature conditions. Any individual detected to have nasal polyposis on examination or with history of having undergone surgery for nasal polyposis will be rejected.

(d) **Throat.** Disease of throat palate, tongue, tonsils, gums and disease or injury affecting the normal function of either mandibular joints.

**Note:-** Simple hypertrophy of the tonsils without associated history of attacks of tonsillitis is acceptable.

(d) **Disease of the larynx and impediment of speech.** Voice should be normal. Candidates with pronounced stammer will not be accepted.

10. **Dental Condition.** It should be ensured that a sufficient number of natural and sound teeth are present for efficient mastication.

(a) A candidate must have a minimum of 14 dental points to be acceptable in order to assess the dental condition of an individual. Dental points less than 14 are a cause of rejection. The dental points are allotted as under for teeth in good opposition with corresponding teeth in the other jaw:-

(i) Central incisor, lateral incisor, canine, 1<sup>st</sup> Premolar, 2<sup>nd</sup> Premolar and under developed third molar with 1 point each.

(ii) 1<sup>st</sup> molar and 2<sup>nd</sup> molar and fully developed 3<sup>rd</sup> molar with 2 points each.

(iii) When all 32 teeth are present, there will be a total count of 22 or 20 points according to whether the third molars are well developed or not.

(b) The following teeth in good functional apposition must be present in each jaw:-

(i) Any 4 of the 6 anteriors.

(ii) Any 6 of the 10 posteriors.

- All these teeth must be sound/ repairable.
- (c) Candidates suffering from severe pyorrhea will be rejected. Where the state of pyorrhea is such that in the opinion of the Dental Officer, it can be cured without extraction of teeth, the candidates may be accepted. A note about the affected teeth is to be inserted by the Medical/ Dental Officer in the medical documents.
- (d) Artificial dentures are not to be included while counting the dental points.
11. **Neck.**
- (a) Enlarged glands, tubercular or due to other diseases in the neck or other parts of the body.
- Note:-** Scars of operations for the removal of tubercular glands are not a cause for rejection provided there has been no active disease within the preceding five years and the chest is clinically and radiologically clear.
- (b) Disease of the thyroid gland.
12. **Chest.** The following are criteria for rejection:-
- (a) Deformity of chest, congenital or acquired.
- (b) Expansion less than 5 cms.
- (c) Significant bilateral/ unilateral Gynaecomastia in males can be evaluated for fitness 12 weeks post-op.
13. **Skin and Sexually Transmitted Infection (STI).**
- (a) Skin disease unless temporary or trivial.
- (b) Scars which by their extent or position cause or are likely to cause disability/ or marked disfigurement.
- (c) Hyperhydrosis - Palmar, plantar or axillary.
- (d) Congenital, active or latent sexually transmitted diseases.
- (e)
- Note:-** In cases with old healed scar over the groin or penis/ vagina suggestive of past STI, blood will be tested for STI (Including HIV) to exclude latent Sexually Transmitted Disease.
14. **Respiratory System.**
- (a) History of chronic cough or Bronchial Asthma.
- (b) Evidence of pulmonary Tuberculosis.
- (c) Evidence of diseases of bronchi, lungs or pleurae detected on radiological examination of the chest will disqualify the candidate.
- Note:-** An X-Ray examination of the chest will be carried out under following circumstances:-
- (i) On entry into the service as a cadet or direct entry.
- (ii) At the time of grant of permanent commission in case of short service commissioned officer.
15. **Cardio-Vascular System.**
- (a) Functional or organic disease of the heart or blood vessels, presence of murmurs or clicks on auscultation.
- (b) Tachycardia (Pulse Rate persistently over 96/min at rest), bradycardia (Pulse Rate persistently below 40/ min at rest), any abnormality of peripheral pulse.
- (c) **Blood Pressure.** Candidate with Blood Pressure consistently greater than 140/90mm Hg will be rejected. All such candidates shall undergo a 24 hour Ambulatory Blood Pressure Monitoring (24 h ABPM) to differentiate between white coat hypertension and persistent hypertension. Wherever feasible, candidates will be evaluated by a Cardiologist at AMB. Those with normal 24 h ABPM and without any

target organ damage can be considered fit after evaluation by a cardiologist

(d) **Electrocardiogram (ECG)**. Any ECG abnormality detected at SMB will be a ground for rejection. Such candidates will be evaluated by a cardiologist during AMB with echocardiography for structural abnormality and stress test if deemed necessary. Benign ECG abnormalities like incomplete RBBB, T wave inversion in inferior leads, T inversion in V1-V3 (persistent juvenile pattern), LVH by voltage criteria (due to thin chest wall) may exist without any structural heart disease. Echocardiography should be performed in all such cases to rule out an underlying structural heart disease and opinion of Senior Adviser (Medicine)/ Cardiologist should be obtained. If echocardiography and stress tests (if indicated) are normal, the individual can be considered fit.

16. ***Abdomen.***

(a) Evidence of any disease of the gastro-intestinal tract, enlargement of liver, gall bladder or spleen, tenderness on abdominal palpation, evidence/ history of peptic ulcer or previous history of extensive abdominal surgery. All officer entry candidates are to be subjected to the Ultra Sound Examination of the abdominal and pelvic organs for detecting any abnormalities of the internal organs.

(b) **Post-op Assessment**. Post-op duration for assessment of fitness in common conditions:-

(i) **Hernia**. Those who have been operated for hernia may be declared fit provided:-

(aa) 24 weeks have elapsed since the operation for Anterior Abdominal Wall hernia. Documentary proof to this effect is to be produced by the candidate.

(ab) General tone of the abdominal musculature is good.

(ac) There has been no recurrence of hernia or any complication connected with the operation.

(ii) **Other Conditions**. Those who have been operated for below mentioned conditions may be declared fit provided:-

(aa) Open Cholecystectomy. 24 weeks (In the absence of Incisional Hernia)

(ab) Laparoscopic Cholecystectomy. 08 weeks (Normal LFT, Normal histopathology).

(ac) Appendicectomy. 04 weeks (with normal histo-pathological findings)

(ad) Pilonidal Sinus. 12 weeks

(ae) Fistula-in-Ano, Anal Fissure and Grade IV Hemorrhoids. 12 weeks post-op with satisfactory treatment and recovery.

(af) Hydrocele and Varicocele. 08 weeks post-op with satisfactory treatment and recovery.

(c) Fistula in anus, anal fissures and Hemorrhoids unless satisfactory to treatment has been carried out.

(d) **Agenesis of Gall Bladder**. Will be considered fit in the absence of any other abnormality of the biliary tract. MRCP will be done for all such cases.

17. ***Genito-Urinary System.***

- (a) Any evidence of disease of genital organs.
- (b) Bilateral undescended testis, unilateral undescended testis retained in the inguinal canal or at the external abdominal ring unless corrected by operation.

**Note:-** Absence of one testis is not a cause for rejection unless the testis has been removed on account of disease or its absence has affected the physical or mental health of the candidate.

- (c) Disease or malformation of the kidneys or urethra.
- (d) Incontinence of urine and nocturnal enuresis.
- (e) Any abnormality on examination of urine including albuminuria or glycosuria.
- (f) The following are criteria for rejection:-

(aa) Renal Calculi. Irrespective of size, numbers, obstructive or non-obstructive. History of renal calculi (History or radiological evidence) will render a candidate Unfit.

(ab) Calycecdasis

(ac) Bladder Diverticulum

(ad) Simple Renal Cyst. > 1.5Cm

18. **Central Nervous System.**

- (a) Organic disease of Central Nervous System.
- (b) Tremors.
- (c) Candidates with history of fits and recurrent attacks of headache/migraine will not be accepted.

19. **Psychiatric Disorders.** History or evidence of mental disease or nervous instability in the candidate or his family.

20. **Lab Investigation (Hematology).**

- (a) **Polycythemia.** Hemoglobin more than 16.5g/dL in males and more than 16g/dL in females will be considered as Polycythemia and deemed Unfit.
- (b) **Monocytosis.** Absolute monocyte counts greater than 1000/cu mm or more than or equal to 10% of total WBC counts is to be deemed Unfit.
- (c) **Eosinophilia.** Absolute eosinophil counts greater than or equal to 500/ cu mm is deemed Unfit.

21. **Women Candidates.** They should not be pregnant and should also be free from gynaecological disorders such as primary or secondary Amenorrhea/ Dysmenorrhoea/ Menorrhagia etc. All women candidates are to be subjected to Ultra Sound Examination of the abdominal and pelvic organs for detecting any abnormalities of the internal organs.



**MEDICAL STANDARD AND PROCEDURE OF MEDICAL EXAMINATION FOR  
OFFICER ENTRIES INTO AIR FORCE**

**GENERAL INSTRUCTIONS**

1. In this section, standardized guidelines for the physical assessment of candidates for commissioning through CDSE into flying branch in the IAF are elaborated. The purpose of these guidelines is to lay down uniform physical standards and to ensure that the candidates are free of health conditions that may hamper or limit their performance in the respective branch. The guidelines enumerated in this section are meant to be applied in conjunction with the standard methods of clinical examination.
2. All candidates during their induction should meet the basic physical fitness standards which will enable them to proficiently undergo the training and the subsequent service in varied climatic and work environments. A candidate will not be assessed physically fit unless the complete examination shows that he/ she is physically and mentally capable of withstanding the severe physical and mental strain for prolonged periods. The requirements of medical fitness are essentially the same for all branches, except for aircrew in whom the parameters for visual acuity, anthropometry and certain other physical standards are more stringent.
3. The results of initial examination are recorded on AFMSF – 2. The complete medical examination consists of:-
  - (a) A questionnaire, which is to be carefully and truthfully completed by the candidate and countersigned by the examining medical officer. The importance of all aspects of the questionnaire, including the legal aspect, should be emphasised to all the candidates. Any subsequent detection of disability or revelation of a significant past history, not declared earlier, may lead to disqualification at any stage prior to commissioning. USG abdomen would be conducted for all candidates and cadets during medical examination prior to commissioning.
  - (b) A complete medical and surgical examination including dental examination
  - (c) An ophthalmic examination.
  - (d) An examination of the ear, nose and throat.
4. The medical standards spelt out pertain to initial entry medical standards. Continuation of medical fitness during training will be assessed during the periodic medical examinations held at AFA prior to commissioning.

**GENERAL PHYSICAL ASSESSMENT**

1. Every candidate, to be fit for the Air Force, must conform to the minimum standards laid down in the succeeding paragraphs. The physical parameters should fall within the acceptable ranges and should be proportionate.
2. The residual effects of old fractures/ injuries are to be assessed for any functional limitation. If there is no effect on function, the candidate can be assessed fit. Following categories should be meticulously assessed:
  - (a) **Spine injuries**. Cases of old fractures of spine are unfit. Any residual deformity of spine or compression of a vertebra will be cause for rejection.
  - (b) **Nerve injuries**. Injuries involving the trunks of the larger nerves, resulting in loss of function, or neuroma formation, which causes pain significant tingling, indicate unsuitability for employment in flying duties.
  - (c) **Keloids**. The presence of large or multiple keloids will be a cause for rejection.

3. **(a) Surgical Scars.** Minor well-healed scars for e.g. as resulting from any superficial surgery do not, per se, indicate unsuitability for employment. Extensive scarring of a limb or torso that may cause functional limitation or unsightly appearance should be considered unfit.

**(b) Birth Marks.** Abnormal pigmentation in the form of hypo or hyperpigmentation is not acceptable. Localized, congenital mole/ naevus, however, is acceptable provided its size is <10 cm. Congenital multiple naevi or vascular tumours that interfere with function or are exposed to constant irritation are not acceptable.

**(c) Subcutaneous Swellings.** Lipoma will be considered fit unless the lipoma is causing significant disfigurement/ functional impairment due to the size/ location. Neurofibroma, if single will be considered fit. Multiple neurofibromas associated with significant Café-au-lait spots (more than 1.5 cm size or more than one in number) will be considered unfit.

4. **Cervical Rib.** Cervical rib without any neuro-vascular compromise will be accepted. Meticulous clinical examination to rule out neuro-vascular compromise should be performed in such cases. This should be documented in the Medical Board proceedings.

5. **Cranio-facial Deformities.** Asymmetry of the face and head or uncorrected deformities of skull, face or mandible which will interfere with proper fitting of oxygen mask, helmet or military headgear will be considered unfit. Major deformities even after corrective surgery will be considered unfit.

6. **History relating to Operations.** A candidate who has undergone an abdominal operation involving extensive surgical intervention or partial/ total excision of any organ is, as a rule, unfit for service . Operation involving the cranial vault with any residual bony defect will be unfit. Major thoracic operations will make the candidate unfit.

#### **MEASUREMENTS AND PHYSIQUE**

7. **Chest Shape and Circumference.** The shape of the chest is as important as its actual measurement. The chest should be well proportioned and well developed. Any chest deformity likely to interfere with physical exertion during training and performance of military duties or adversely impact military bearing or are associated with any cardiopulmonary or musculoskeletal anomaly are to be considered unfit. Minimum recommended chest circumference for cadets is 77 cm. The chest expansion should be at least 05 cm for all candidates. For the purpose of documentation, any decimal fraction lower than 0.5 cm will be ignored, 0.5 cm will be recorded as such and 0.6 cm and above will be recorded as 1 cm.

#### **Height, Sitting Height, Leg Length and Thigh Length.**

8. Minimum height for Flying Branch will be 162.5 cm. Acceptable measurements of leg length, thigh length and sitting height for such aircrew will be as under: -

(a)	<i>Sitting height</i>	Minimum	-	81.5 cm
		Maximum	-	96.0 cm
(b)	<i>Leg Length</i>	Minimum	-	99.0 cm
		Maximum	-	120.0 cm
(c)	<i>Thigh Length</i>	Maximum	-	64.0 cm

The minimum height for entry into ground duty branches will be 157.5 cm. For Gorkhas and individual belonging to North-Eastern regions of India and hilly regions of Uttarakhand, the minimum acceptable height will be 5 cm less (152.5 cm). In case of

candidates from Lakshwadweep the minimum acceptable height can be reduced by 2 cm (155.5 cm).

#### 9. **Body Weight Parameters**

(a) Male Candidates (except NDA candidates). Ideal weight relative to age and height is given in Appendix 'A' to this notification. The weight will be rounded off to the nearest 0.5 kg. The maximum permissible variation from the ideal body weight is  $\pm 1$  SD.

(b) For in-service candidates the criteria of body weight applicable to serving personnel will be used.

10. Weights higher than the prescribed limit will be acceptable only in exceptional circumstances in case of those candidates where there is documented evidence of bodybuilding, wrestling and boxing. However, in such cases, the following criteria will have to be met:

(a) BMI should be below 27.

(b) Waist Hip ratio should be below 0.9 for males and 0.8 for females.

(c) Waist circumference should be less than 94 cm for males and 89 cm for females.

(d) All biochemical metabolic parameters should be within normal limits.

#### **Appendix-A Height and Weight Standards for Male**

Height in cm	Age Range (Years)				
	15-17	18-22	23-27	28-32	33-37
152	46	47	50	54	54
153	47	47	51	55	55
154	47	48	51	56	56
155	48	49	52	56	56
156	48	49	53	57	57
157	49	50	54	58	58
158	49	50	54	58	58
159	50	51	55	59	59
160	51	52	56	59	60
161	51	52	56	60	60
162	52	53	57	61	61
163	52	54	58	61	62
164	53	54	59	62	63
165	53	55	59	63	63
166	54	56	60	63	64
167	54	56	61	64	65
168	55	57	61	65	65
169	55	57	62	65	66
170	56	58	63	66	67
171	56	59	64	66	68
172	57	59	64	67	68
173	58	60	65	68	69
174	58	61	66	68	70
175	59	61	66	69	71
176	59	62	67	70	71

177	60	62	68	70	72
178	60	63	69	71	73
179	61	64	69	72	73
180	61	64	70	72	74
181	62	65	71	73	75
182	62	66	72	74	76
183	63	66	72	74	76
184	64	67	73	75	77
185	64	68	74	75	78
186	65	68	74	76	78
187	65	69	75	77	79
188	66	69	76	77	80
189	66	70	77	78	81
190	67	71	77	79	81
191	67	71	78	79	82
192	68	72	79	80	82
193	68	73	79	81	83
SD	6.0	6.3	7.1	6.6	6.9

### **CARDIOVASCULAR SYSTEM**

1. History of chest pain, breathlessness, palpitation, fainting attacks, giddiness, rheumatic fever, ankle swelling, chorea, frequent sore throats and tonsillitis should be given due consideration in assessment of the cardiovascular system.

2. **Pulse**. Rate, rhythm, volume, tension, regularity of the pulse and conditions of the arterial wall are assessed. The normal pulse rate varies from 60-100 bpm. The pulse should be counted for one full minute. The pulsations for the radial and femoral arteries should always be compared and any difference, if any, should be recorded. Other peripheral pulsations viz. carotid, popliteal, posterior tibial artery and dorsalis pedis artery on both sides should also be palpated and any difference, if noted should be documented. Persistent sinus tachycardia (> 100 bpm) as well as persistent sinus bradycardia (< 60 bpm) are unfit. In case bradycardia is considered to be physiological, the candidate can be declared fit after evaluation by Medical Specialist/ Cardiologist.

3. **Blood Pressure**. Candidates are quite prone to develop White Coat

Hypertension, which is a transient rise of BP, due to stress of medical examination. Every effort must be made to eliminate the White Coat effect by repeated recordings under basal conditions with the candidate in a relaxed state. An individual with BP consistently greater than or equal to 140/90 mm of Hg shall be rejected.

4. **Cardiac Murmurs**. Evidence of organic cardiovascular disease will be cause for rejection. Diastolic murmurs are invariably organic. Short systolic murmurs of ejection systolic nature and not associated with thrill and which diminish on standing, especially if associated with a normal ECG and chest radiograph, are most often functional. In case of any doubt the case should be referred to cardiologist for opinion.

5. **ECG**. Assessment of a properly recorded ECG (resting – 12 lead) should be carried out by a medical specialist. Note will be taken of wave patterns, the amplitude, duration and time relationship. All ECG abnormalities are unfit except incomplete RBBB which may exist without any structural heart disease. 2D ECHO should be performed in cases with incomplete RBBB to rule out an underlying structural heart disease and opinion of Senior Adviser (Medicine) or Cardiologist should be obtained.

**6. Cardiac surgery and interventions.** Candidates with history of cardiac surgery/ intervention in the past will be considered unfit.

### **RESPIRATORY SYSTEM**

1. History of pulmonary tuberculosis, pleurisy with effusion, frequent episodes of expectorant cough, haemoptysis, frequent episodes of bronchitis, asthma, spontaneous pneumothorax and injuries to the chest should be elicited. Spirometry/ Peak Expiratory Flow Rate may be done in cases suspected to have obstructive airway disease. In case there is any suspicion of lung pathology, relevant investigations, including X Ray/ CT chest/ Immunological tests etc may be carried out to decide fitness. Final fitness in doubtful cases will be decided only at appeal level after opinion of Sr Adv (Med)/ Pulmonologist.

2. **Pulmonary Tuberculosis.** Any residual scarring in pulmonary parenchyma or pleura, as evidenced by a demonstrable opacity on chest radiogram will be a ground for rejection. Old treated cases with no significant residual abnormality can be accepted if the diagnosis and treatment was completed more than two years earlier. In these cases, a CT scan chest and fiberoptic bronchoscopy with bronchial lavage can be done along with USG, ESR, PCR, Immunological tests and Mantoux test as decided by the Physician. If all the tests are normal the candidate may be considered fit. However, in such cases fitness will only be decided at Appeal/ Review Medical Board.

3. **Pleurisy with Effusion.** Any evidence of significant residual pleural thickening will be a cause for rejection.

4. **Bronchitis.** History of repeated attacks of cough/ wheezing/ bronchitis may be manifestations of chronic bronchitis or other chronic pathology of the respiratory tract. Such cases will be assessed unfit. Pulmonary Function Tests may be carried out, if available. In such cases, opinion of the Medical Specialist/ Chest Physician may be obtained.

5. **Bronchial Asthma.** History of repeated attacks of bronchial asthma/ wheezing/ allergic rhinitis will be a cause for rejection.

6. **Radiographs of the Chest.** Definite radiological evidence of disease of the lungs, mediastinum and pleurae are criteria for declaring the candidate unfit. If required, investigations as outlined in para 2 above can be carried out under the advice of a pulmonologist.

7. **Thoracic surgery.** Candidate with history of any resection of the lung parenchyma will be considered unfit. Any other major surgery of the thorax will be considered on a case to case basis.

### **GASTROINTESTINAL SYSTEM**

1. The examiner should enquire whether the candidate has any past history of ulceration or infection of the mouth, tongue, gums or throat. Record should be made of any major dental alteration. When discussing a candidate's medical history the examiner must ask direct questions about any history of heartburn, history of recurrent dyspepsia, peptic ulcer-type pain, chronic diarrhoea, jaundice or biliary colic, indigestion, constipation, bleeding PR and any abdominal surgery.

2. **Head to toe examination.** Presence of any sign of liver cell failure (e.g. loss of hair, parotidomegaly, spider naevi, gynaecomastia, testicular atrophy, flapping tremors etc) and any evidence of malabsorption (pallor, nail and skin changes, angular cheilitis, pedal edema) will entail rejection. The condition of oral mucosa, gums and any restriction of mouth opening should be noted.



3. **Gastro-Duodenal Disabilities.** Candidates who are suffering or have suffered, during the previous one year, from symptoms suggestive of acid-peptic disease including proven peptic ulcers, are not to be accepted. Any past surgical procedure involving partial or total loss of an organ (other than vestigial organs/ gall bladder) will entail rejection.

4. **Diseases of the Liver.** If past history of jaundice is noted or any abnormality of the liver function is suspected, full investigation is required for assessment. Candidates suffering from viral hepatitis or any other form of jaundice will be rejected. Such candidates can be declared fit after a minimum period of 6 months has elapsed provided there is full clinical recovery; HBV and HCV status are both negative and liver functions are within normal limits. History of recurrent jaundice and hyperbilirubinemia of any nature is unfit.

5. **Disease of the Spleen.** Candidates who have undergone partial/ total splenectomy are unfit, irrespective of the cause for operation.

6. **Hernia.** Hernial sites are to be examined for presence of inguinal, epigastric, umbilical and femoral hernia. Any abdominal wall hernia is unfit. A candidate with a wellhealed surgical scar, after 06 months of either open or laparoscopic repair, is considered fit provided there is no evidence of recurrence and the abdominal wall musculature is good.

## **7. Abdominal Surgery**

(a) A candidate with well-healed scar after conventional abdominal surgery will be considered fit after one year of successful surgery provided there is no potential for any recurrence of the underlying pathology, no evidence of incisional hernia and the condition of the abdominal wall musculature is good.

(b) A candidate after laparoscopic cholecystectomy will be considered fit if 08 weeks have passed since surgery provided they are free from signs and symptoms and their evaluation including LFT and USG abdomen are normal and there is total absence of gall bladder with no intra-abdominal collection. Other abdominal laparoscopic procedures can also be considered fit after 08 weeks of surgery provided the individual is asymptomatic, recovery is complete and there is no residual complication or evidence of recurrence.

8. **Anorectal Conditions.** The examiner should do a digital rectal examination and rule out haemorrhoids, sentinel piles, anal skin tags, fissures, sinuses, fistulae, prolapsed, rectal mass or polyps.

### **(a) Fit**

(i) Only external skin tags.

(ii) After rectal surgery for polyps, haemorrhoids, fissure, fistula or ulcer, provided there is no residual/ recurrent disease.

### **(b) Unfit**

(i) Rectal prolapse even after surgical correction

(ii) Active anal fissure

(iii) Haemorrhoids (external or internal)

(iv) Anal Fistula

(v) Anal or rectal polyp

(vi) Anal stricture

(vii) Faecal incontinence

## **Ultrasonography of Abdomen**

### **9. Liver**

#### **(a) Fit**

- (i) Normal echo-anatomy of the liver, CBD, IHBR, portal and hepatic veins with liver span not exceeding 15 cm in the mid-clavicular line.
- (ii) Solitary simple cyst (thin wall, anechoic) upto 2.5 cm diameter provided that the LFT is normal and hydatid serology is negative.
- (iii) Hepatic calcifications to be considered fit if solitary and less than 1 cm with no evidence of active disease like tuberculosis, sarcoidosis, hydatid disease or liver abscess based on relevant clinical examinations and appropriate investigations.

#### **(b) Unfit**

- (i) Hepatomegaly more than 15 cm in mid-clavicular line.
- (ii) Fatty liver – Grade 2 and 3, grade 1 in presence of abnormal LFT.
- (iii) Solitary cyst > 2.5 cm.
- (iv) Solitary cyst of any size with thick walls, septations, papillary projections, calcifications and debris.
- (v) Multiple hepatic calcifications or cluster > 1 cm.
- (vi) Multiple hepatic cysts of any size.
- (vii) Any haemangioma irrespective of the size and location.
- (viii) Portal vein thrombosis.
- (ix) Evidence of portal hypertension (PV >13 mm, collaterals, ascites).
- (x)

### **10. Gall Bladder**

#### **(a) Fit**

- (i) Normal echo-anatomy of the gall bladder.
- (ii) Post laparoscopic Cholecystectomy. Candidates having undergone laparoscopic cholecystectomy may be considered fit if 08 weeks have passed since surgery and there is total absence of gall bladder with no intra-abdominal collection. Wound should have healed well without incisional hernia.
- (iii) Post Open Cholecystectomy. Candidates having undergone Open Cholecystectomy may be considered fit if one year has passed since surgery, the scar is healthy with no incisional hernia and there is total absence of gall bladder with no intra-abdominal collection.

#### **(b) Unfit**

- (i) Cholelithiasis or biliary sludge.
- (ii) Choledocolithiasis.
- (iii) Polyp of any size and number.
- (iv) Choledochal cyst.
- (v) Gall bladder mass.
- (vi) Gall bladder wall thickness > 05 mm.
- (vii) Septate gall bladder.
- (viii) Persistently contracted gall bladder on repeat USG.
- (ix) Incomplete Cholecystectomy.

### **11. Spleen**

#### **(a) Unfit**

- (i) Spleen more than 13 cm in longitudinal axis (or if clinically palpable).
- (ii) Any Space Occupying Lesion in the spleen.
- (iii) Asplenia.
- (iv) Candidates who have undergone partial/ total splenectomy are unfit, irrespective of the cause of operation.

### **12. Pancreas**

#### **(a) Unfit**

- (i) Any structural abnormality.
- (ii) Space Occupying Lesion/ Mass lesion.
- (iii) Features of chronic pancreatitis (calcification, ductal abnormality, atrophy).

### 13. **Peritoneal Cavity**

#### (a) Unfit

- (i) Ascites.
- (ii) Solitary mesenteric or retroperitoneal lymph node >1 cm. (Single retroperitoneal LN <1 cm and normal in architecture may be considered fit).
- (iii) Two or more lymph nodes of any size
- (iv) Any mass or cyst.

14. Major Abdominal Vasculature (Aorta/ IVC). Any structural abnormality, focal ectasia, aneurysm and calcification will be considered as unfit.

## **UROGENITAL SYSTEM**

1. Enquiry should be made about any alteration in micturition or urinary stream e.g. dysuria, frequency, poor stream etc. Recurrent attacks of cystitis; pyelonephritis and haematuria must be excluded from history. Detailed enquiry must be made about any history of renal colic, attacks of acute nephritis, any operation on the renal tract including loss of a kidney, passing of stones or urethral discharges. If there is any history of enuresis, past or present, full details must be obtained. History of urethral discharge and Sexually Transmitted Disease (STD) should be elicited.

2. The external genitalia should be meticulously examined to rule out the presence of congenital anomalies e.g. hypospadias, epispadias, ambiguous genitalia, undescended testis (UDT) or ectopic testis etc. Conditions like hydrocele, varicocele, epididymal cyst, phimosis, urethral stricture, meatal stenosis etc should also be ruled out. The criteria to be followed are as follows:

#### (a) **Undescended testis (UDT)**

- (i) Unfit – Any abnormal position of testis (unilateral or bilateral) is unfit. Bilateral orchidectomy due to any cause such as trauma, torsion or infection is unfit.
- (ii) Fit - Operatively corrected UDT may be considered fit at least 04 weeks after surgery, provided after surgical correction, the testis is normal in location and the wound has healed well. Unilateral atrophic testis/ unilateral orchidectomy for benign cause may be considered fit, provided other testis is normal in size, fixation and location.

#### (b) **Varicocele**

Unfit – All grades of current varicocele.

Fit - Post-operative cases of varicocele with no residual varicocele and no post op complication or testicular atrophy may be made fit after 04 weeks of surgery, for sub-inguinal varicocelectomy.

#### (c) **Hydrocele**

- (i) Unfit – Current hydrocele on any side.
- (ii) Fit - Operated cases of hydrocele may be made fit after 04 weeks of surgery, if there are no post-op complications and wound has healed well.

#### (d) **Epididymal Cyst/ Mass, Spermatocoele**

- (i) Unfit – Current presence of cyst / mass.
- (ii) Fit – Post operative cases, where wound has healed well, there is no recurrence and only when benign on histopathology report.

#### (e) **Epididymitis/ Orchitis**

- (i) Unfit – Presence of current orchitis or epididymitis/ tuberculosis.
- (ii) Fit – After treatment, provided the condition has resolved completely.

(f) **Epispadias/ Hypospadias**

- (i) Unfit – All are unfit, except glanular variety of hypospadias and epispadias, which is acceptable.
- (ii) Fit – Post-operative cases at least 08 weeks after successful surgery, provided recovery is complete and there are no complications.

(g) **Penile Amputation.** Any amputation will make the candidate unfit.

(h) **Phimosis**

- (i) Unfit – Current phimosis, if tight enough to interfere with local hygiene and voiding and/ or associated with Balanitis Xerotica Obliterans.
- (ii) Fit – Operated cases will be considered fit after 04 weeks of surgery, provided wound is fully healed and no post-op complications are seen.

(j) **Meatal Stenosis**

- (i) Unfit – Current disease, if small enough to interfere with voiding.
- (ii) Fit – Mild disease not interfering with voiding and post-operative cases after a period of 04 weeks of surgery with adequately healed wound and no post op complications.

(k) **Stricture Urethra, Urethral Fistula.** Any history of / current cases or post-op cases are unfit.

(l) Sex reassignment surgery/ Intersex condition. Unfit

(m) **Nephrectomy.** All cases, irrespective of the type of surgery (Simple/ radical/ donor/ partial/ RFA/ cryo-ablation) are unfit. (n) **Renal Transplant Recipients.** Unfit

3. **Urine Examination**

**Proteinuria.** Proteinuria will be a cause for rejection, unless it proves to be orthostatic.

**Glycosuria.** When glycosuria is detected, a blood sugar examination (fasting and after 75 g glucose) and glycosylated Hb is to be carried out, and fitness decided as per results. Renal glycosuria is not a cause for rejection.

**UrinaryInfections.** When the candidate has history or evidence of urinary infection it will entail full renal investigation. Persistent evidence of urinary infection will entail rejection.

**Haematuria.** Candidates with history of haematuria will be subjected to full renal investigation.

4. **Glomerulonephritis**

- (a) Acute. In this condition there is a high rate of recovery in the acute phase, particularly in childhood. A candidate who has made a complete recovery and has no proteinuria may be assessed fit, after a minimum period of one year after full recovery.
- (b) Chronic. Candidate with chronic glomerulonephritis will be rejected.

5. **Renal Colic and Renal Calculi.** Complete renal and metabolic evaluation is required. Current or history of urolithiasis, recurrent calculus, bilateral renal calculi, nephrocalcinosis are unfit. Even after surgery or any procedure to treat urolithiasis the candidate remains unfit.

6. **Sexual Transmitted Diseases and Human Immuno Deficiency Virus (HIV).**

Seropositive HIV status and/ or evidence of STD will entail rejection.

**Ultrasonography of the Abdomen - Urogenital System**

7. Kidneys, ureters and urinary bladder
  - (a) Unfit
    - (i) Congenital structural abnormalities of kidneys or urinary tract (aa) Unilateral renal agenesis.
      - (ab) Unilateral or bilateral hypoplastic/ contracted kidney of size less than 08 cm.
      - (ac) Malrotation of kidney.
      - (ad) Horseshoe kidney.
      - (ae) Ptosed kidney.
      - (af) Crossed fused/ ectopic kidney.
    - (ii) Simple single renal cyst of more than 1.5 cm size in one kidney.
    - (iii) Complex cyst/ polycystic disease/ multiple or bilateral cysts.
    - (iv) Renal/ ureteric/ vesical mass.
    - (v) Hydronephrosis or Hydroureteronephrosis.
    - (vi) Calculi - Renal/ Ureteric/ Vesical.
  - (b) Fit - Solitary, unilateral, simple renal cyst <1.5 cm provided the cyst is peripherally located, round/ oval, with thin smooth wall and no loculations, with posterior enhancement, no debris, no septa and no solid component.
  - (c) During Appeal Medical Board/ Review Medical Board unfit candidates will be subjected to specific investigations and detailed clinical examination. Candidates having isolated abnormality of echo texture of Kidney may be considered fit if Renal Function, DTPA scan and CECT kidney is normal.
8. Scrotum and Testis. The following cases will be made unfit:
  - (a) Bilateral atrophied testis.
  - (b) Varicocele (Unilateral or bilateral).
  - (c) Any abnormal location of testis (Unilateral or Bilateral).
  - (d) Hydrocele
  - (e) Epididymal lesions e.g. cyst.
  - (f)

### **ENDOCRINE SYSTEM**

1. History should be carefully elicited for any endocrine conditions particularly Diabetes Mellitus, disorders of thyroid and adrenal glands, gonads etc. Any history suggestive of endocrine disorders will be a cause for rejection. In case of any doubt, Medical Spl/ Endocrinologist opinion should be taken.
2. A thorough clinical examination to detect any obvious disease of the endocrine system should be carried out. Any clinical evidence of endocrine disease will be unfit.
3. All cases of thyroid swelling having abnormal iodine uptake and abnormal thyroid hormone levels will be rejected. All cases of thyroid swelling are unfit.
4. Candidates detected to have diabetes mellitus will be rejected. A candidate with a family history of Diabetes Mellitus will be subjected to blood sugar (Fasting and after Glucose load) and HbA1c evaluation, which will be recorded.

### **DERMATOLOGICAL SYSTEM**

1. Careful interrogation followed by examination of the candidate's skin is necessary to obtain a clear picture of the nature and severity of any dermatological condition claimed or found. Borderline skin conditions should be referred to a dermatologist. Candidates who give history of sexual exposure to a Commercial Sex Worker (CSW), or have evidence of healed penile sore in the form of a scar should be declared permanently unfit, even in absence of an overt STD, as these candidates are likely 'repeaters' with similar indulgent promiscuous behavior.
2. Assessment of Diseases of the Skin. Acute non-exanthematous and noncommunicable diseases, which ordinarily run a temporary course, need not be a



cause of rejection. Diseases of a trivial nature, and those, which do not interfere with general health or cause incapacity, do not entail rejection.

3. Certain skin conditions are apt to become active and incapacitating under tropical conditions. An individual is unsuitable for service if he has a definite history or signs of chronic or recurrent skin disease. Some of such conditions are described below:-

- (a) Some amount of Palmoplantar Hyperhydrosis is physiological, considering the situation that recruits face during medical examination. However, candidates with significant Palmoplantar Hyperhydrosis should be considered unfit.
- (b) Mild (Grade I) acne consisting of few comedones or papules, localized only to the face may be acceptable. However, moderate to severe degree of acne (nodulocystic type with or without keloidal scarring) or involving the back should be considered unfit.
- (c) Any degree of palmoplantar keratoderma manifesting with hyperkeratotic and fissured skin over the palms, soles and heels should be considered unfit.
- (d) Ichthyosis involving the upper and lower limbs, with evident dry, scaly, fissured skin should be considered unfit. Mild xerosis (dry skin) could be considered fit.
- (e) Candidates having any keloid should be considered unfit.
- (f) Clinically evident onychomycosis of finger and toe-nails should be declared unfit, especially if associated with nail dystrophy. Mild degree of distal discoloration involving single nail without any dystrophy may be acceptable.
- (g) Giant congenital melanocytic naevi, greater than 10 cm should be considered unfit, as there is a malignant potential in such large sized naevi.
- (h) Single corns/ Warts/ Callosities will be considered fit, three months after successful treatment and no recurrence. However, candidates with multiple warts/ corns/ callosities on palms and soles or diffuse palmoplantar mosaic warts, large callosities on pressure areas of palms and soles should be rejected.
- (j) Psoriasis is a chronic skin condition known to relapse and/or recur and hence should be considered unfit.
- (k) Candidates suffering from minor degree of Leukoderma affecting the covered parts may be accepted. Vitiligo limited only to glans penis and prepuce may be considered fit. Those having extensive degree of skin involvement and especially, when the exposed parts are affected, even to a minor degree, should be made unfit.

1. A history of chronic or recurrent episodes of skin infections will be cause for rejection. Folliculitis or sycosis barbae from which there has been complete recovery may be considered fit.

2. Individuals who have chronic or frequently recurring episodes of a skin disease of a serious or incapacitating nature e.g. eczema are to be assessed as permanently unfit and rejected.

3. Any sign of Leprosy will be a cause for rejection. All peripheral nerves should be examined for any thickness of the nerves and any clinical evidence suggestive of leprosy is a ground for rejection.

4. Naevus depigmentosus and Beckers naevus may be considered fit. Intradermal naevus, vascular naevi are to be made unfit.

5. Pityriasis Versicolor is to be made unfit.

6. Any fungal infection (like Tinea Cruris and Tinea Corporis) of any part of the body will be unfit.

7. Scrotal Eczema may be considered fit on recovery.

8. Canities (premature graying of hair) may be considered fit if mild in nature and no systemic association is seen.

9. Intertrigo may be considered fit on recovery.

10. Genital Ulcers should be considered unfit. Anal and perianal area should also be included as a part of genital examination to rule out STD.

11. Scabies may be considered fit only on recovery.

12. Alopecia areata single and small (<2 cm in diameter) lesion on scalp can be accepted. However if multiple, involving other areas or having scarring, the candidate should be rejected.

## **MUSCULOSKELETAL SYSTEM AND PHYSICAL CAPACITY**

1. Assessment of the candidate's physique is to be based upon careful observation of such general parameters as apparent muscular development, age, height, weight and the correlation of this i.e. potential ability to acquire physical stamina with training. The candidate's physical capacity is affected by general physical development or by any constitutional or pathological condition.

### **SPINAL CONDITIONS**

2. Past medical history of disease or injury of the spine or sacroiliac joints, either with or without objective signs, which has prevented the candidate from successfully following a physically active life, is a cause for rejection for commissioning. History of recurrent lumbago/ spinal fracture/ prolapsed intervertebral disc and surgical treatment for these conditions will entail rejection.

### **Evaluation of Spine**

3. **Clinical Examination.** Normal thoracic kyphosis and cervical/ lumbar lordosis are barely noticeable and not associated with pain or restriction of movement.

(a) If clinical examination reveals restriction of spine movements, deformities, tenderness of the spine or any gait abnormalities, it will be considered unfit.

(b) Gross kyphosis, affecting military bearing/ restricts full range of spinal movements and/or expansion of chest is unfit.

(c) Scoliosis is unfit, if deformity persists on full flexion of the spine, when associated with restricted range of spine movements or when due to an underlying pathological cause. When scoliosis is noticeable or any pathological condition of the spine is suspected, radiographic examination of the appropriate part of the spine needs to be carried out.

(d) **Spina Bifida.** The following markers should be looked for, on clinical examination and corroborated with radiological evaluation:

(i) Congenital defects overlying the spine e.g. hypertrichosis, skin dimpling, haemangioma, pigmented naevus or dermal sinus.

(ii) Presence of lipoma over spine.

(iii) Palpable spina bifida.

(iv) Abnormal findings on neurological examination.

**Radiograph Spine.** For flying duties, radiograph (AP and lateral views) of cervical, thoracic and lumbosacral spine is to be carried out. For ground duties, radiographic examination of spine may be carried out, if deemed necessary by Medical Officer/ Specialist.

### **Spinal Conditions Unfit for Air Force Duties (Both Flying and Ground Duties)**

(a) **Congenital/ Developmental Anomalies**

(ii) Wedge Vertebra

(iii) Hemivertebra

(iv) Anterior Central Defect

(v) Cervical Ribs (Unilateral/ Bilateral) with demonstrable neurological or circulatory deficit

(vi) Spinabifida:- All types are unfit except in sacrum and LV5 (if completely sacralised)

(vii) Loss of Cervical Lordosis when assessed with clinically restricted movement of cervical spine.

(viii) Scoliosis-

(aa) Lumbar Scoliosis greater than 15 degrees

(ab) Thoracic scoliosis greater than 20 degrees

(ac) Thoraco-lumbar scoliosis greater than 20 degrees

(ix) Atlanto-occipital and Atlanto-axial anomalies

- (x) Incomplete Block (fused) vertebra at any level in cervical, dorsal or lumbar spine.\
- (xi) Complete Block (fused) vertebra at more than one level in cervical or dorsal spine. (Single level is acceptable. Annotation is to be made in AFMSF-2)
- (xii) Unilateral sacralisation or lumbarisation (complete or incomplete) and Bilateral incomplete sacralisation or lumbarisation (LSTV- Castellvi Type II a & b, III a & IV) (Bilateral Complete Sacralisation of LV5 and Bilateral Complete Lumbarisation of SV1 i.e LSTV Castellvi Type III b and Type I a & b are acceptable (Annotation is to be made in AFMSF-2)
- (b) **Traumatic Conditions**
  - (ii) Spondylolysis/ Spondylolisthesis
  - (iii) Compression fracture of vertebra
  - (iv) Intervertebral Disc Prolapse
  - (v) Schmorl's Nodes at more than one level
- (c) **Infective**
  - (i) Tuberculosis and other Granulomatous disease of spine (old or active)
  - (ii) Infective Spondylitis
- (d) **Autoimmune**
  - (i) Rheumatoid Arthritis and allied disorders
  - (ii) Ankylosing spondylitis
  - (iii) Other rheumatological disorders of spine e.g Polymyositis, SLE and Vasculitis
- (e) **Degenerative**
  - (i) Spondylosis
  - (ii) Degenerative Joint Disorders
  - (iii) Degenerative Disc Disease
  - (iv) Osteoarthritis/ osteoarthritis
  - (v) Scheuerman's Disease (Adolescent Kyphosis)
- (f) **Any other spinal abnormality, if so considered by the specialist.**

## **CONDITIONS AFFECTING THE ASSESSMENT OF UPPER LIMBS**

7. Deformities of the upper limbs or their parts will be cause for rejection. Candidate with an amputation of a limb will not be accepted for entry. Amputation of terminal phalanx of little finger on both sides is, however, acceptable.

### **8. Healed Fractures**

- (a) In the following conditions, healed fractures of upper limb are not acceptable:-
  - (i) Fractures involving articular surfaces
  - (ii) Fractures associated with neuro-vascular deficit
  - (iii) Malunited fractures
  - (iv) Fracture causing impairment of function
  - (v) Fractures with implant in-situ
- (b) Fracture of the upper limb, presenting 06 months after the injury with none of the sequelae as mentioned above are acceptable after assessment by orthopaedic surgeon.

**9. Fingers and Hands.** Syndactyly and polydactyly will be assessed as unfit except when polydactyly is excised. Deformities and limitations to movements will be considered unfit.

**10. Wrist.** Painless limitation of movement of the wrist will be assessed according to the degree of stiffness. Loss of dorsiflexion is more serious than loss of palmar flexion.

11. **Elbow.** Slight limitation of movement does not bar acceptance provided functional capacity is adequate. Ankylosis will entail rejection. Cubitus Valgus is said to be present when the carrying angle (angle between arm and forearm in anatomical posture) is exaggerated. In absence of functional disability and obvious cause like a fracture mal-union, fibrosis or the like, a carrying angle of upto 15° in male and 18° in female candidates would be made fit.

12. Cubitus Varus of > 5 degree will be unfit.

13. **Shoulder Girdle.** History of recurrent dislocation of shoulder with or without corrective surgery will be unfit.

14. **Clavicle.** Non-union of an old fracture clavicle will entail rejection. Mal-united clavicle fracture without loss of function and without obvious deformity are acceptable.

### **CONDITIONS AFFECTING THE ASSESSMENT OF LOWER LIMBS**

15. Hallux valgus with angle >20 degrees and first-second metatarsal angle of >10 degrees is unfit. Hallux valgus of any degree with bunion, corns or callosities is unfit.

16. Hallux rigidus is unfit for service.

17. Isolated single flexible mild hammer toe without symptoms may be accepted. Fixed (rigid) deformity or hammer toe associated with corns, callosities, mallet toes or hyperextension at meta-tarso-phalangeal joint (claw toe deformity) are to be rejected.

18. Loss of any digits/ toes entails rejection.

19. Extra digits will entail rejection if there is bony continuity with adjacent digits. Cases of syndactyly will be rejected.

20. **Pes Planus (Flat feet)**

(a) If the arches of the feet reappear on standing on toes, if the candidate can skip and run well on the toes and if the feet are supple, mobile and painless, the candidate is acceptable.

(b) Rigid or fixed flat feet, gross flat feet, with planovalgus, eversion of heel, cannot balance himself on toes, cannot skip on the forefoot, tender painful tarsal joints, prominent head of talus will be considered unfit. Restriction of the movements of the foot will also be a cause for rejection. Rigidity of the foot, whatever may be the shape of the foot, is a cause for rejection.

21. **Pes Cavus and Talipes (Club Foot).** Mild degree of idiopathic pes cavus without any functional limitation is acceptable. Moderate and severe pes cavus and pes cavus due to organic disease will entail rejection. All cases of Talipes (Club Foot) will be rejected.

22. **Ankle Joints.** Any significant limitation of movement following previous injuries will not be accepted. Functional evaluation with imaging should be carried out wherever necessary.

23. **Knee Joint.** Any ligamentous laxity is not accepted. Candidates who have undergone ACL reconstruction surgery are to be considered unfit.

24. Genu valgum (knock knee) with intermalleolar distance > 5 cm in males and > 8 cm in females will be unfit.

25. Genu varum (bow legs) with intercondylar distance >7 cm will be considered unfit.

**26. Genu Recurvatum.** If the hyperextension of the knee is within 10 degrees and is unaccompanied by any other deformity, the candidate should be accepted as fit.

27. True lesions of the hip joint or early signs of arthritis will entail rejection.

28. Peripheral Vascular System

(a) Varicose Veins. All cases with active varicose veins will be declared unfit. Post-op cases of varicose veins also remain unfit.

(b) Arterial System. Current or history of abnormalities of the arteries and blood vessels e.g. aneurysms, arteritis and peripheral arterial disease will be considered unfit.

(c) Lymphoedema. History of past/ current disease makes the candidate unfit.

### **CENTRAL NERVOUS SYSTEM**

1. A candidate giving a history of mental illness/ psychological afflictions requires detailed investigation and psychiatric referral. Such cases should normally be rejected. Most often the history is not volunteered. The examiner should try to elicit a history by direct questioning, which may or may not be fruitful. Every examiner should form a general impression of the candidate's personality as a whole and may enquire into an individual's stability and habitual reactions to difficult and stressful situations. Family history and prior history of using medication is also relevant.

2. History of insomnia, phobias, nightmares or frequent sleepwalking or Bedwetting, when recurrent or persistent, will be a cause for rejection.

3. Common types of recurrent headaches are those due to former head injury or migraine. Other forms of occasional headache must be considered in relation to their probable cause. A candidate with migraine, which was severe enough to make him consult his doctor, should normally be a cause for rejection. Even a single attack of migraine with visual disturbance or Migrainous epilepsy is to be made unfit.

4. History of epilepsy in a candidate is a cause for rejection. Convulsions/ fits after the age of five are also a cause for rejection. Convulsions in infancy may not be of ominous nature provided it appears that the convulsions were febrile convulsions and were not associated with any overt neurological deficit. Causes of epilepsy include genetic factors, traumatic brain injury, stroke, infection, demyelinating and degenerative disorders, birth defects, substance abuse and withdrawal seizures. Enquiry should not be limited only to the occurrence of major attacks. Seizures may masquerade as – “faints” and therefore the frequency and the conditions under which – “faints” took place must be elicited. Such attacks will be made unfit, whatever their apparent nature. An isolated fainting attack calls for enquiry into all the attendant factors to distinguish between syncope and seizures e.g. fainting in school are of common occurrence and may have little significance. Complex partial seizures, which may manifest as vegetative movements as lip smacking, chewing, staring, dazed appearance and periods of unresponsiveness, are criteria for making the candidate unfit.

5. History of repeated attacks of heat stroke, hyperpyrexia or heat exhaustion bars employment for Air Force duties, as it is an evidence of a faulty heat regulating mechanism. A single severe attack of heat effects, provided the history of exposure was severe, and no permanent sequelae were evident is, by itself, not a reason for rejecting the candidate.

6. A history of severe head injury is a cause for rejection. Other sequelae of head injury like post-concussion syndrome, focal neurological deficit and post traumatic epilepsy should be noted which may be associated with subjective symptoms of headache, giddiness, insomnia, restlessness, irritability, poor concentration and attention deficits. Post traumatic neuropsychological impairment can also occur which includes deficits in attention concentration, information processing speeds, mental flexibility and frontal lobe executive functions and psychosocial functioning. Neuropsychological testing including psychometry can assess these aspects. It is important to realize that sequelae may persist for considerable period and may even be permanent. Fracture of the skull need not be a cause for rejection unless there is a history of associated intracranial damage or any residual bony defect in the calvaria.

7. When there is a history of severe injury or an associated convulsive attack, an electroencephalogram should be carried out which must be normal. Presence of burr holes will be cause for rejection for flying duties, but not for ground duties. Each case is to be judged on individual merits. Opinion of Neurosurgeon and Psychiatrist must be obtained before acceptance.

8. When a history of nervous breakdown, mental disease, or suicide of a near relative is obtained, a careful investigation of the personal past history from a psychological point of view is to be obtained. Any evidence of even the slightest psychological instability in the personal history or present condition should entail rejection and the candidate should be referred to the psychiatrist for further evaluation.

9. If a family history of epilepsy is admitted, an attempt should be made to determine its type. When the condition has occurred in a near (first degree) relative, the candidate may be accepted, if he has no history of associated disturbance of consciousness, neurological deficit or higher mental functions and his electroencephalogram is completely normal.

10. The assessment of emotional stability must include family and personal history, any indication of emotional instability under stress as evidenced by the occurrence of undue emotionalism as a child or of any previous nervous illness or breakdown. The presence of stammering, tic, nail biting, excessive hyperhydrosis or restlessness during examination could be indicative of emotional instability and should be made unfit.

11. All candidates who are suffering from psychosis are to be rejected. Drug dependence in any form will also be a cause for rejection.

12. **Psychoneurosis.** Mentally unstable and neurotic individuals are unfit for commissioning. Juvenile and adult delinquency, history of nervous breakdown or chronic ill-health is causes for rejection. Particular attention should be paid to such factors as unhappy childhood, poor family background, truancy, juvenile and adult delinquency, poor employment and social maladjustment records, history of nervous breakdown or chronic ill-health, particularly if these have interfered with employment in the past.

13. Any evident neurological deficit should call for rejection.

14. Tremors are rhythmic oscillatory movements of reciprocally innervated muscle groups. Two categories are recognized: normal or physiologic and abnormal or pathologic. Fine tremor is present in all contracting muscle groups, it persists throughout the waking state, the movement is fine between 8 to 13 Hz. Pathologic tremor is coarse, between 4 to 7 Hz and usually affects the distal part of limbs. Gross tremors are generally due to enhanced physiological causes where, at the same frequency, the amplitude of the tremor is grossly enhanced and is elicited by outstretching the arms and fingers which are spread apart. This occurs in cases of excessive fright, anger, anxiety, intense physical exertion, metabolic disturbances including hyperthyroidism, alcohol withdrawal and toxic effects of lithium, smoking



(nicotine) and excessive tea, coffee. Other causes of coarse tremor are Parkinsonism, cerebellar tremors (intentional tremors), essential (familial) tremor, tremors of neuropathy and postural or action tremors.

15. Candidates with stammering will not be accepted for Air Force duties. Careful assessment by ENT Specialist, Speech therapist, psychologist/ psychiatrist may be required in doubtful cases.

16. **Basal Electroencephalogram (EEG).** EEG is to be recorded for candidates for aircrew duties only in case there is a history of epilepsy in the family, past history of head injury and/or any other psychological or neurological abnormality noted in the past. These aspects will be carefully enquired into. In case of other candidates also, EEG can be taken if indicated or considered necessary by the medical examiner. Those with following EEG abnormalities in resting EEG or EEG under provocative techniques will be rejected for aircrew duties: -

(a) **Background Activity.** Focal, excessive and high amplitude beta activity/hemispherical asymmetry of more than 2.3 Hz/generalized and focal runs of slow waves approaching background activity in amplitude.

(b) **Hyperventilation.** Paroxysmal spikes and slow waves/spikes/focal spike pattern.

(c) **Photo Stimulation.** Bilaterally synchronous or focal paroxysmal spikes and slow waves persisting in post-photoc stimulation period/suppression or driving response over one hemisphere.

17. Non specific EEG abnormality will be acceptable provided opinion of Neuropsychiatrist/ Neurophysician is obtained. The findings of EEG will be entered in AFMSF-2. In case an EEG is reported as abnormal, the cadet would be referred to CHAF (B) for a comprehensive evaluation by neurophysician followed by review by a Board at IAM IAF.

## **EAR, NOSE AND THROAT**

1. **History.** Any significant history of otorrhoea, hearing loss, vertigo including motion sickness, tinnitus etc is to be elicited.

2. **Nose and Para-nasal Sinuses.** The following entails rejection:

(a) Gross external deformity of nose causing cosmetic deformity may be rejected if it adversely impacts military bearing. However, minor deformities of dorsum and nasal tip should not be a cause of rejection.

(b) Obstruction to free breathing as a result of a marked septal deviation. Post corrective surgery with residual mild deviation with adequate airway patency will be acceptable.

(c) Septal perforation is unacceptable. However, asymptomatic anterior (cartilaginous) septal perforation may be accepted by ENT specialist provided chronic granulomatous diseases have been ruled out and nasal mucosa is healthy.

(d) Atrophic rhinitis.

(e) Any history/clinical evidence suggestive of allergic rhinitis/ vasomotor rhinitis will entail rejection.

(f) Any infection of the para-nasal sinuses will be declared unfit. Such cases may be accepted following successful treatment at the Appeal Medical Board.

(g) Current nasal polyposis is a cause for rejection. However, such cases may be accepted after Endoscopic Sinus Surgery provided there is no residual disease, mucosa is healthy and histopathology is benign and non-fungal. Such evaluation will be done minimum 04 weeks post-surgery.

### 3. **Oral Cavity**

- (a) **Unfit**
  - (i) Current/ operated cases of leukoplakia, erythroplakia, submucous fibrosis, ankyloglossia and oral carcinoma.
  - (ii) Current oral ulcers/ growths and mucous retention cysts.
  - (iii) Trismus due to any cause.
  - (iv) Cleft palate, even after surgical correction.
- (b) **Fit**
  - (i) Completely healed oral ulcers.
  - (ii) Operated cases of mucus retention cyst with no recurrence and proven benign histology. Evaluation in these cases should be done after minimum 04 weeks post-surgery.
  - (iii) Sub-mucous cleft of palate with or without bifid uvula not causing Eustachian tube dysfunction may be accepted by ENT specialist, provided PTA, tympanometry and speech are normal.

### 4. **Pharynx and Larynx**. The following conditions will entail rejection:

- (a) Any ulcerative/ mass lesion of the pharynx.
- (b) Candidates in whom tonsillectomy is indicated. Such candidates may be accepted minimum 02 weeks after successful surgery provided there are no complications and histology is benign.
- (c) Cleft palate.
- (d) Any disabling condition of the pharynx or larynx causing persistent hoarseness or dysphonia.
- (e) Chronic laryngitis, vocal cord palsy, laryngeal polyps and growths.

5. Obstruction or insufficiency of Eustachian tube function will be a cause for rejection. Altitude chamber ear clearance test will be carried out before acceptance in in-service candidates.

6. The presence of tinnitus necessitates investigation of its duration, localization, severity and possible causation. Persistent tinnitus is a cause for rejection, as it is liable to become worse through exposure to noise and may be a precursor to Otosclerosis and Meniere's disease.

7. Specific enquiry should be made for any susceptibility to motion sickness. An endorsement to this effect should be made in AFMSF-2. Such cases will be fully evaluated and, if found susceptible to motion sickness, they will be rejected for flying duties. Any evidence of peripheral vestibular dysfunction due to any cause will entail rejection.

8. A candidate with a history of dizziness needs to be investigated thoroughly.

### 9 **Hearing loss**.The following are not acceptable:

- (a) Any reduction less than 600 cm in CV/ FW.
- (b) Wherever PTA is indicated and thresholds are obtained, the audiometric loss greater than 20 db, in frequencies between 250 and 8000 Hz.
- (c) Free field hearing loss is a cause for rejection.

**Note:** In evaluating the audiogram, the baseline zero of the audiometer and the environmental noise conditions under which the audiogram has been obtained should be taken into consideration. On the recommendation of an ENT Specialist, an isolated unilateral hearing loss up to 30 db may be condoned provided ENT examination is otherwise normal.

10. **Ears**. A radical/modified radical mastoidectomy entails rejection even if completely epithelialised and good hearing is preserved. Cases of cortical mastoidectomy in the past with the tympanic membrane intact, normal hearing and presenting no evidence of disease may be accepted.

11. **External Ear.** The following defects of external ear should be declared unfit:
  - (a) Gross deformity of pinna which may hamper wearing of uniform/ personal kit/ protective equipment, or which adversely impacts military bearing.
  - (b) Cases of chronic otitis externa.
  - (c) Exostoses, atreisa/ narrowing of EAM or neoplasm preventing a proper examination of the ear drum.
  - (d) Exaggerated tortuosity of the canal, obliterating the anterior view of the tympanic membrane will be a cause for rejection.
  - (e) Granulation or polyp in external auditory canal.
  
12. **Middle Ear.** The following conditions of middle ear will entail rejection:-
  - (a) Current otitis media of any type.
  - (b) Attic, central or marginal perforation.
  - (c) Tympanosclerosis or scarring affecting >50 % of the Pars Tensa of TM is unfit even if PTA and tympanometry are normal. Evidence of healed chronic Otitis Media in the form of Tympanosclerosis or scarring affecting <50 % of Pars Tensa of TM will be assessed by ENT spl and will be acceptable if PTA and tympanometry are normal. A trial of decompression chamber may be carried out, if indicated, for aircrew, ATC/FC, submariners/divers.
  - (d) Any residual perforation in cases of old otitis media.
  - (e) Marked retraction or restriction in TM mobility on pneumatic otoscopy.
  - (f) Any hearing impairment on forced Whisper test.
  - (g) Deranged pure tone audiometry thresholds.
  - (h) Tympanometry showing patterns other than Type 'A' tympanogram.
  - (i) Any implanted hearing devices e.g. cochlear implants, bone anchored hearing aids etc.
  - (j) After middle ear surgeries viz. stapedectomy, ossiculoplasty, any type of canal-wall down mastoidectomy.

**Note:** Healed healthy scars of neo-tympanic membrane involving <50 % of Pars Tensa due to Type 1 Tympanoplasty (with or without Cortical Mastoidectomy) for Chronic Otitis Media (Mucosal type) and Myringotomy (for Otitis Media with Effusion) may be acceptable if PTA, Tympanoplasty are normal. Assessment of operated cases will be done only after a minimum of 12 weeks. A trial in Decompression Chamber may be carried out, if indicated, for aircrew, ATC/FC, submariners/ divers.
  
13. **Miscellaneous Ear Conditions.** The following ear conditions will entail rejection:-
  - (a) Otosclerosis.
  - (b) Meniere's disease.
  - (c) Vestibular dysfunction including nystagmus of vestibular origin.
  - (d) Bell's palsy following ear infection.

## **OPHTHALMIC SYSTEM**

1. Visual defects and medical ophthalmic conditions are amongst the major causes of rejection from flying duties. Therefore, a thorough and accurate eye examination is of great importance for all candidates, especially those for flying duties.
  
2. **Personal and Family History and External Examination**
  - (a) Squint and the need for spectacles for other reasons are frequently hereditary and a family history may give valuable information on the degree of deterioration to be anticipated. Candidates, who are wearing spectacles or found to have defective vision, should be properly assessed. All cases of squint should be made unfit by recruiting MO and by Specialist. Individuals with manifest squint are not acceptable for commissioning. However, small horizontal latent squint/ Phoria i.e. Exophoria/ Esophoria may be considered fit by the specialist along with Grade III BSV. Hyperphoria/ Hypophoria or cyclophoria are to be made unfit.

(b) Ptosis interfering with vision or visual field is a cause for rejection till surgical correction remains successful for a period of six months. Mild ptosis which is not affecting vision/ visual field in day or night may be considered fit. In such situations, the assessment in central 30 degree of visual field should be done properly.

(c) Candidates with uncontrollable blepharitis, particularly with loss of eyelashes, are generally unsuitable and should be rejected. Severe cases of blepharitis and chronic conjunctivitis should be assessed as temporarily unfit until the response to treatment can be assessed.

(d) These cases of Ectropion/ Entropion are to be made unfit. Mild ectropion and entropion which in the opinion of ophthalmologist will not hamper day to day functioning in any way, may be made fit.

(e) All cases of progressive pterygium to be made unfit by recruiting MO and specialist. Regressive non vascularised pterygium likely to be stationary occupying  $\leq 1.5$  mm of the peripheral cornea may be made fit by eye spl after measurement on a slit lamp.

(f) All cases of nystagmus are to be made unfit except for physiologic nystagmus.

(g) Naso-lacrymal occlusion producing epiphora or a mucocele entails rejection, unless surgery produces relief lasting for a minimum of six months and the post op syringing is patent.

(h) Uveitis (iritis, cyclitis, and choroiditis) is frequently recurrent, and candidates giving a history of or exhibiting this condition should be carefully assessed. When there is evidence of permanent lesions such candidates should be rejected.

(j) Corneal scars, opacities will be cause for rejection unless it does not interfere with vision. Such cases should be carefully assessed before acceptance, as many conditions are recurrent.

(k) Cases with Lenticular opacities should be assessed carefully. As a guideline any opacity causing visual deterioration, or is in the visual axis or is present in an area of 7 mm around the pupil, which may cause glare phenomena, should not be considered fit. The propensity of the opacities not to increase in number or size should also be a consideration when deciding fitness. Small stationary lenticular opacities in the periphery like congenital Blue Dot cataract, not affecting the visual axis/ visual field may be considered fit by specialist. (It should be less than 10 in number and central area of 4 mm to be clear).

(l) Visual disturbances associated with headaches of a migrainous type are not a strictly ocular problem, and should be assessed in accordance with para 3 of Central Nervous System Section mentioned above. Presence of diplopia or detection of nystagmus requires proper examination, as they can be due to physiological reasons.

(m) Night blindness is largely congenital but certain diseases of the eye exhibit night blindness as an early symptom and hence, proper investigations are necessary before final assessment. As tests for night blindness are not routinely performed, a certificate to the effect that the individual does not suffer from night blindness will be obtained in every case. Certificate should be as per **Appendix 'A'** to this notification. A proven case of night-blindness is unfit for service.

(n) Restriction of movements of the eyeball in any direction and undue depression/ prominence of the eyeball requires proper assessment.

(o) **Retinal lesions.** A small healed chorio-retinal scar in the retinal periphery not affecting the vision and not associated with any other complications can be made fit by specialist. Similarly a small lattice in periphery with no other complications can be made fit. Any lesion in the central fundus will be made unfit by the specialist.

**3. Visual Acuity/ Colour Vision.** The visual acuity and colour vision requirements are detailed in **Appendix 'B'** to this notification. Those who do not meet these requirements are to be rejected.

**4. Myopia.** If there is a strong family history of Myopia, particularly if it is established that the visual defect is recent, if physical growth is still expected, or if the

fundus appearance is suggestive of progressive myopia, even if the visual acuity is within the limit prescribed, the candidate should be declared unfit.

**5. Refractive Surgeries.** Candidates who have undergone Photo Refractive Keratotomy (PRK)/ Laser in-situ Keratomileusis (LASIK) may be considered fit for commissioning in the Air Force in all branches. Post PRK/LASIK candidates must meet the following criteria of visual requirements for the branch as laid down below:-

- (a) PRK/LASIK surgery should not have been carried out before the age of 20 years.
- (b) The axial length of the eye should not be more than 25.5 mm as measured by IOL master.
- (c) At least 12 months should have elapsed post uncomplicated stable PRK/LASIK with no history or evidence of any complication.
- (d) The post PRK/LASIK corneal thickness as measured by a corneal pachymeter should not be less than 450 microns.
- (e) Individuals with high refractive errors (>6D) prior to LASIK are to be excluded.

6. Radial Keratotomy (RK) surgery for correction of refractive errors is not permitted for any Air Force duties. Candidates having undergone cataract surgery with or without IOL implants will also be declared unfit.

### **OCULAR MUSCLE BALANCE**

7. Individuals with manifest squint are not acceptable for commissioning. The assessment of latent squint or heterophoria in the case of aircrew will be mainly based on the assessment of the fusion capacity. A strong fusion sense ensures the maintenance of binocular vision in the face of stress and fatigue. Hence, it is the main criterion for acceptability.

- (a) Convergence (as assessed on RAF rule)
  - (i) Objective Convergence. Average is from 6.5 to 8 cm. It is poor at 10 cm and above.
  - (ii) Subjective Convergence (SC). This indicates the end point of binocular vision under the stress of convergence. If the subjective convergence is more than 10 cm beyond the limit of objective convergence, the fusion capacity is poor. This is specially so when the objective convergence is 10 cm and above.

**(b)Accommodation.** In the case of myopes, accommodation should be assessed with corrective glasses in position. The acceptable values for accommodation in various age groups are given in Table 1.

Table 1 - Accommodation Values – Age wise

<b>Age in Yrs</b>	<b>17-20</b>	<b>21-25</b>	<b>26-30</b>	<b>31-35</b>	<b>36-40</b>	<b>41-45</b>
<b>Accommodation (in cm)</b>	10-11	11-12	12.5-13.5	14-16	16-18.5	18.5-27

8. Ocular muscle balance is dynamic and varies with concentration, anxiety, fatigue, hypoxia, drugs and alcohol. The above tests should be considered together for the final assessment. For example, cases just beyond the maximum limits of the Maddox Rod test, but who show a good binocular response, a good objective convergence with little difference from subjective convergence, and full and rapid recovery on the cover tests may be accepted. On the other hand, cases well within Maddox Rod test limits, but who show little or no fusion capacity, incomplete or no recovery on the cover tests, and poor subjective convergence should be rejected. Standards for assessment of Ocular Muscle Balance are detailed in **Appendix 'C'** to notification.

9. Any clinical findings in the media (cornea, lens, vitreous) or fundus, which is of pathological nature and likely to progress will be a cause for rejection. This examination will be done by slit lamp and ophthalmoscopy under mydriasis.

**Appendix 'A'**

[Refers to para 2 (m) Ophthalmology standards]

**CERTIFICATE REGARDING NIGHT BLINDNESS**

Name with initials \_\_\_\_\_  
Batch No. \_\_\_\_\_ Chest No \_\_\_\_\_

I hereby certify that to the best of my knowledge, there has not been any case of night blindness in our family, and I do not suffer from it.

Date: \_\_\_\_\_  
(candidate)

(Signature of the

Countersigned by  
(Name of Medical Officer)

**Appendix 'B'**

(para 3 above of  
Ophthalmology standards)

**VISUAL STANDARDS AT INITIAL ENTRY**

<b>Sl No.</b>	<b>Med Cat</b>	<b>Branch</b>	<b>Maximum Limits of Refractive Error</b>	<b>Visual Acuity (VA) with limits of maximum correction</b>	<b>Colour Vision</b>
1	A1G1	F (P) including WSOs , Flying Branch cadets at AFA	Hypermetropia: + 1.5D Sph Manifest Myopia: Nil Astigmatism: +0.75D Cyl (within +1.5 D Max) Retinoscopic myopia: Nil	6/6 in one eye and 6/9 in other, correctable to 6/6 only for Hypermetropia	CP-I

**Note 1:** Ocular muscle balance for personnel covered in Sl. Nos. 1 and 2 should conform to Appendix C to this Chapter.

**Note 2:** Visual standards of Air Wing Cadets at NDA and Flt Cdts of F (P) at AFA should conform to A1G1 F (P) standard (Sl. No. 1 of Appendix B)

**Note 3:** The Sph correction factors mentioned above will be inclusive of the specified astigmatic correction factor. A minimum correction factor upto the specified visual acuity standard can be accepted



**STANDARD OF OCULAR MUSCLE BALANCE FOR FLYING DUTIES**

Sl. No.	Test	Fit	Temporary Unfit	Permanently Unfit
1	Maddox Rod Test at 6 meters	Exo-6 Prism D Eso -6 Prism D Hyper-1 prism D Hypo- 1 prism D	Exo- Greater than 6 prism D Eso- Greater than 6 prism D Hyper- Greater than 1 prism D Hypo- Greater than 1 prism D	Uniocular suppression Hyper/ Hypo more than 2 prism D
2	Maddox Rod Test at 33 cm	Exo-16 Prism D Eso- 6 Prism D Hyper- 1 Prism D Hypo- 1 Prism D	Exo - Greater than 16 prism D Eso - Greater than 6 prism D Hyper Greater than 1 prism D Hypo Greater than 1 prism D	Uniocular suppression Hyper/ Hypo more than 2 prism D
3	Hand held Stereoscope	All of BSV grades	Poor Fusional reserves	Absence of SMP, fusion Stereopsis
4	Convergence	Up to 10 cm	Up to 15 cm with effort	Greater than 15 cm with effort
5	Cover test for Distance and Near	Latent divergence / convergence recovery rapid and complete	Compensated heterophoria/ trophia likely to improve with treatment / persisting even after treatment	Compensated heterophoria

**HAEMOPOIETIC SYSTEM**

1. History of easy fatiguability, general weakness, petechiae/ ecchymosis, bleeding from gums and alimentary tract, persistent bleeding after minor trauma and menorrhagia in case of females should be carefully elicited. All candidates should be examined for clinical evidence of pallor (anaemia), malnutrition, icterus, peripheral lymphadenopathy, purpura, petechiae/ ecchymoses and hepatosplenomegaly.

2. In the event of laboratory confirmation of anaemia (<13g/dl in males and <11.5g/dl in females), further evaluation to ascertain type of anaemia and aetiology has to be carried out. This should include a complete haemogram (to include the PCV MCV, MCH, MCHC, TRBC, TWBC, DLC, Platelet count, reticulocyte count and ESR) and a peripheral blood smear. All the other tests to establish the aetiology will be carried out, as required. Ultrasonography of abdomen for gallstones, upper GI Endoscopy/ proctoscopy and hemoglobin electrophoresis etc. may be done, as indicated, and the fitness of the candidate, decided on the merit of each case.

3. Candidates with mild microcytic hypochromic (Iron deficiency anaemia) or dimorphic anaemia (Hb < 10.5g/dl in females and < 11.5g/dl in males), in the first instance, may be made temporarily unfit for a period of 04 to 06 weeks followed by review thereafter. These candidates can be accepted, if the complete haemogram and PCV, peripheral smear results are within the normal range. Candidates with macrocytic/ megaloblastic anaemia will be assessed unfit.

4. All candidates with evidence of hereditary haemolytic anaemias (due to red cell membrane defect or due to red cell enzyme deficiencies) and haemoglobinopathies (Sickle cell disease, Beta Thalassemia: Major, Intermedia, Minor, Trait and Alpha Thalassemia etc.) are to be considered unfit for service.

5. In the presence of history of haemorrhage into the skin like ecchymosis/ petechiae, epistaxis, bleeding from gums and alimentary tract, persistent bleeding after minor trauma or lacerations/ tooth extraction or menorrhagia in females and any family history of haemophilia or other bleeding disorders a full evaluation will be carried out. These cases will not be acceptable for entry to service. All candidates with clinical evidence of purpura or evidence of thrombocytopenia are to be considered unfit for service. Cases of Purpura Simplex (simple easy bruising), a benign disorder seen in otherwise healthy women, may be accepted.

6. Candidates with history of haemophilia, von Willebrand's disease, on evaluation, are to be declared unfit for service at entry level.

### **DENTAL FITNESS STANDARDS**

1. The examiner should enquire whether the candidate has any past history of major dental procedures or alterations. Significant past history of ulceration or infection of the tongue, gums or throat should be documented. History suggestive of premalignant lesions or pathologies that are prone for recurrence should be elicited.

**2. Dental Standards.** The following dental standards are to be followed and candidates whose dental standard does not conform to the laid down standards will be rejected:-

(a) Candidate must have a minimum of 14 dental points and the following teeth must be present in the upper jaw in good functional opposition with the corresponding teeth in the lower jaw:-

(i) Any four of the six anterior

(ii) Any six of the ten posterior

(b) Each incisor, canine 1<sup>st</sup> and 2<sup>nd</sup> premolar will have a value of one point provided their corresponding opposite teeth are present.

(c) Each 1<sup>st</sup> and 2<sup>nd</sup> molar and well developed 3<sup>rd</sup> molar will have the value of two points, provided in good opposition to corresponding teeth in the opposing jaw.

(d) In case 3<sup>rd</sup> molar is not well developed, it will have a value of one point only.

(e) When all the 16 teeth are present in the upper jaw and in good functional opposition to corresponding teeth in the lower jaw, the total value will be 20 or 22 points according to whether the 3<sup>rd</sup> molars are well developed or not.

(f) All removable dental prosthesis will be removed during oral examination and not be awarded any dental points except in the case of ex-serviceman applying for re-enrolment, who will be awarded dental points for well fitting removable prostheses.

**3. Extra oral examination**

(a) **Gross facial examination.** Presence of any gross asymmetry or soft/ hard tissue defects/ scars or if any incipient pathological condition of the jaw is suspected, it will be a cause of rejection.

(b) **Functional examination**

(i) Temporomandibular joint (TMJ). TMJs will be bilaterally palpated for tenderness and/or clicking. Candidates with symptomatic clicking and/or tenderness or dislocation of the TML on wide opening will be rejected.

(ii) Mouth Opening. A mouth opening of less than 30 mm measured at the incisal edges will be reason for rejection.

**4. Guidelines for awarding dental points in special situations**

(a) **Dental caries.** Teeth with caries that have not been restored or teeth associated broken down crowns, pulp exposure, residual root stumps, teeth with abscesses and/or sinuses will not be counted for award of dental points.

(b) **Restorations.** Teeth having restorations that appear to be improper/broken/discolored will not be awarded dental points. Teeth restored by

use of inappropriate materials, temporary or fractured restorations with doubtful marginal integrity or peri-apical pathology will not be awarded dental points.

(c) **Loose teeth.** Loose/mobile teeth with clinically demonstrable mobility will not be awarded dental points. Periodontally splinted teeth will not be counted for award of dental points.

(d) **Retained deciduous teeth.** Retained deciduous teeth will not be awarded dental points.

(e) **Morphological defects.** Teeth with structural defects which compromise efficient mastication will not be awarded dental points.

(f) **Periodontium**

(i) The condition of the gums, of the teeth included for counting dental points, should be healthy, i.e. pink in colour, firm in consistency and firm in consistency and firmly resting against the necks of the teeth. Visible calculus should not be present.

(ii) Individual teeth with swollen, red or infected gums or those with visible calculus will not be awarded dental points.

(iii) Candidates with generalized calculus, extensive swollen and red gums, with or without exudates, shall be rejected.

(g) **Malocclusion.** Candidates with malocclusion affecting masticatory efficiency and phonetics shall not be recruited. Teeth in open bite will not be awarded dental points as they are not considered to be in functional apposition. Candidates having an open bite, reverse overjet or any visible malocclusion will be rejected. However, if in the opinion of the dental officer, the malocclusion of teeth is not hampering efficient mastication, phonetics, maintenance of oral hygiene or general nutrition or performance of duties efficiently, then candidates will be declared FIT. The following criteria have to be considered in assessing malocclusion:

(i) Edge to edge bite. Edge to edge bite will be considered as functional apposition.

(ii) Anterior Open Bite. Anterior open bite is to be taken as lack of functional opposition of involved teeth.

(iii) Cross bite. Teeth in cross bite may still be in functional occlusion and may be awarded points, if so.

(iv) Traumatic bite. Anterior teeth involved in a deep impinging bite which is causing traumatic indentations on the palate will not be counted for award of points.

(h) **Hard and Soft tissues.** Soft tissues of cheek, lips, palate, tongue and sublingual region and maxilla/mandibular bony apparatus must be examined for any swelling, discoloration, ulcers, scars, white patches, sub mucous fibrosis etc. All potentially malignant lesions will be cause for rejection. Clinical diagnosis for sub mucous fibrosis with or without restriction of mouth opening will be a cause of rejection. Bony lesion(s) will be assessed for their pathological/physiological nature and commented upon accordingly. Any hard or soft tissue lesion will be a cause of rejection.

(i) **Orthotic appliances.** Fixed orthodontics lingual retainers will not be considered as periodontal splints and teeth included in these retainers will be awarded points for dental fitness. Candidates wearing fixed or removable orthodontic appliances will be declared UNFIT.

(j) **Dental implants.** When an implant supported crown replaces a single missing tooth, the prosthesis may be awarded dental points as for natural teeth provided the prosthesis is in functional apposition and the integrity of the implant is confirmed.

(k) **Fixed Partial Dentures (FPD) / Implant supported FPDs.** FPDs will be assessed clinically and radiologically for firmness, functional apposition to opposing teeth and periodontal health of the abutments. If all parameters are found satisfactory, dental points will be awarded as follows:

(i) **Tooth supported FPDs**

(aa) **Prosthesis, 3 units.** Dental points will be awarded for the abutments and the pontic.

- (ab) Prosthesis, more than 3 units. Dental points will be awarded only to the abutments. No points will be awarded for the pontics.
- (ac) Cantilever FDPs. Dental points will be awarded only to the abutments.
- (ii) Implant supported FPDs
- (aa) Prosthesis, 3 units. Dental points will be awarded for the natural teeth, implant and the pontic.
- (ab) Prosthesis, more than 3 units. Dental points will be awarded only to the natural teeth. No points are to be awarded for pontics and implant(s).
- (ac) Two unit cantilever FPDs. Dental points will be awarded only to the implants.
- (m) A maximum of 02 implants will be permitted in a candidate. No points will be given for implants/implant supported prosthesis in excess of the 02 permissible implants. In the case of a candidate having 03 more implants/implant supported prosthesis, which 02 are to be awarded marks will be based on the clinical judgment of the dental officer.

5. **The following will be criteria for declaring a candidate UNFIT**

- (a) **Oral hygiene.** Poor oral health status in the form of gross visible calculus, periodontal pockets and/or bleeding from gums will render candidate UNFIT.
- (b) **Candidates reporting post maxillo-facial surgery/ maxillofacial trauma.** Candidates who undergo cosmetic or post-traumatic maxillofacial surgery/ trauma will be UNFIT for at least 24 weeks from the date of surgery/ injury whichever is later. After this period, if there is no residual deformity or functional deficit, they will be assessed as per the laid down criteria.
- (c) Candidate with dental arches affected by advanced stage of generalized active lesions of pyorrhoea, acute ulcerative gingivitis, and gross abnormality of the teeth or jaws or with numerous caries or septic teeth will be rejected.

1. Please visit [www.joinindianarmy.nic.in](http://www.joinindianarmy.nic.in) for Medical Standards and Procedure of Medical Examination of Officers' Entry into Army as applicable.

2. Please visit [www.joinindiannavy.gov.in](http://www.joinindiannavy.gov.in) for Medical Standards and Procedure of Medical Examination of Officers' Entry into Navy as applicable.

3. Please visit [www.careerindianairforce.cdac.in](http://www.careerindianairforce.cdac.in) for Medical Standards and Procedure of Medical Examination of Officers' Entry into Air Force as applicable.

**Note:** Permanent body tattoos are only permitted on inner face of forearm i.e from inside of elbow to the wrist and on the reverse side of palm/back (dorsal) side of hand. Permanent body tattoos on any other part of the body are not acceptable and candidates will be barred from further selection. Tribes with tattoo marks on the face or body as per their existing custom and traditions will be permitted on a case to case basis. Commandant Selection Centre will be competent authority for clearing such cases.

## APPENDIX-V

### (Brief particulars of service etc.)

#### Pay scale of Army Officers and equivalent ranks in Air Force and Navy

##### (i) Pay

Rank	Level	(Pay in Rs.)
Lieutenant	Level 10	56,100 -1,77,500
Captain	Level 10 B	61,300- 1,93,900
Major	Level 11	69,400 – 2,07,200
Lieutenant Colonel	Level 12A	1,21,200 – 2,12,400
Colonel	Level 13	1,30,600-2, 15,900
Brigadier	Level 13A	1,39,600-2,17,600
Major General	Level 14	1,44,200-2,18,200
Lieutenant General HAG Scale	Level 15	1, 82, 200-2,24,100

HAG+Scale	Level 16	2,05,400 – 2,24,400
VCOAS/Army Cdr/ Lieutenant General (NFSG)	Level 17	2,25,000/- (fixed)
COAS	Level 18	2,50,000/- (fixed)

MSP to the officer is as follows:-

Military Service Pay(MSP) to the officers from the rank of Lieutenant to Brigadier	Rs 15.500 p.m. fixed
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Fixed Stipend for cadet Training:-

Stipend to Gentlemen or Women Cadets during the entire duration of training in Service academies i.e. during training period at IMA and OTA.	Rs 56,100/-p.m.* (Starting pay in Level 10)
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\*On successful commissioning, the pay in the Pay matrix of the Officer commissioned shall be fixed in first Cell of Level 10 and the period of training shall not be treated as commissioned service and arrears on account of admissible allowances, as applicable, for the training period shall be paid to cadets.

(ii) **QUALIFICATION PAY AND GRANT**

(i) **Qualification Grant**

Abolished as a separate allowance. Eligible employees to be governed by newly proposed Higher Qualification Incentive (HQI). Order for HQI is yet to be issued by MoD.

(ii) **Flying allowance :-**

The Army Aviators (Pilots) serving in the Army Aviation Corps are entitled to flying allowance as under:-

Lieutenant and above	Level 10 and above	Rs 25,000/- p.m. fixed (R1H1 of Risk and Hardship Matrix)
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(iii) **Other Allowances:-**

(a)	Dearnes Allowance	Admissible at the same rates and under the same condition as are applicable to the civilian personnel from time to time
(b)	Kit maintenance allce	Subsumed into the newly proposed Dress Allowance i.e Rs 20,000/-per year

Depending upon rank and area of posting, officer posted to Field Areas will be eligible for the following Field Area allowance and/or Risk and Hardship Allowances payable as per MoD letter No. 8(3)/2017/D(Pay/Services) dated 21 Apr 2022 :-

Rank	Level	HAFA	Fd Area Allce	Mod Fd Area Allce
Lieutenant and above	Level 10 and above	16900 R1H2	10500 R2H2	6300 60%R2H2

(iv) **High Altitude Allowance**

Rank	Level	CAT-I (PM)	CAT-II (PM)	CAT-III (PM)
Lieutenant and above	Level 10 and above	3,400 (R3H2)	5,300 (R3H1)	25,000 (R1H1)

(v) **Siachen Allowance**

Siachen Allowance will be Rs. 42,500/- per month.

(vi) **Uniform allowance**

Subsumed into the newly proposed Dress Allowance i.e. Rs. 20,000/- per year.

(vii) **Free Rations**

**In Peace and Field areas**

(viii) **Transport Allce (TPTA).**

Pay Level	Higher TPTA Cities (Rs. Per month)	Other Places (Rs. Per month)
9 and above	Rs. 7200+DA thereon	Rs. 3600+DA thereon

**Note :-**

(a) **Higher Tpt Cities (UA).** Hyderabad, Patna, Delhi, Ahmadabad, Surat, Bengaluru, Kochi, Kozhikode, Indore, Greater Mumbai, Nagpur, Pune, Jaipur, Chennai, Coimbatore, Ghaziabad, Kanpur, Lucknow, Kolkata.

(b) The allowance shall not be admissible to those service personnel who have been provided with the facility of Government transport.

(c) Officers in Pay Level 14 and above, who are entitled to use official car, will have the option to avail official car facility or to draw the TPTA at the rate of Rs. 15,750+DA per month.

(d) The allowance will not be admissible for the calendar month(s) wholly covered by leave.

(e) Physically disabled service personnel will continue to be paid at double rate, subject to a minimum of Rs. 2250 + DA per month.

(ix) **Children Education Allowance.** Rs. 2250/- per month per child for two eldest surviving only. CEA is admissible from Nursery to 12<sup>th</sup> classes.

(i) Reimbursement should be done just once a year, after completion of the financial year (which for most schools coincides with the Academic year).

(ii) Certificate from the head of institution where the ward of government employee studies should be sufficient for this purpose. The certificate should confirm that the child studied in the school during the previous academic year.

In the case of allowances specific to Defence Forces, the rates of these allowances would be enhanced by 25% automatically each time the Dearness Allowance payable on the revised pay band goes up by 50% (GoI letter No. A-27012/02/2017-Estt(AL) dated 16 August 2017).

(iii) Please note that pay and allowances and rules/provisions thereof are subject to revision from time to time

**(A) FOR CANDIDATES JOINING THE INDIAN MILITARY ACADEMY, DEHRADUN:**

1. Before the candidate joins the Indian Military Academy.

(a) He will be required to sign a certificate to the effect that he fully understands that he or his legal heirs shall not be entitled to claim any compensation or other relief from the Government in respect of any injury which he may sustain. In the course of or as a result of the training or where bodily infirmity or death results in the course of or as a



result of a surgical operation performed upon or anaesthesia administered to him for the treatment of any injury received as aforesaid or otherwise.

(b) His parent or guardian will be required to sign a bond to the effect that if for any reason considered within his control, the candidate wishes to withdraw before the completion of the course or fails to accept a commission if offered; he will be liable to refund the whole or such portion of the cost of tuition, food, clothing and pay & allowances, received as may be decided upon by Government.

2. Candidates finally selected will undergo a course of training for about 18 months. Candidates will be enrolled under the Army Act as Gentlemen cadets. Gentlemen cadets will be dealt with the ordinary disciplinary purposes under the rules and regulations of the Indian Military Academy, Dehradun.

3. While, the cost of training including accommodations, books, uniforms, boarding and medical treatment will be borne by Government, candidates will be expected to meet their pocket expenses themselves. The minimum expenses at the Indian Military Academy are not likely to exceed Rs. 200.00 per month. If a cadet's parent or guardian is unable to meet wholly or partly even this expenditure financial assistance may be granted by the Government. Gentlemen/Women Cadets undergoing training at Indian Military Academy, Officers' Training Academy and corresponding training establishments in Navy and Air Force, in whose cases the income of parents/guardians does not exceed Rs. 1,500/- (under revision) per month are eligible for financial assistance. In case of parents/guardians whose income exceeds Rs. 1,500/- (under revision) per month but does not exceed Rs. 2,000/- (under revision) per month, the same financial assistance will be given in respect of all the sons/wards if there are more than one son/ward simultaneously undergoing training in one or more than one of the above institutions irrespective of the fact whether the institutions are under the same service or not. The immovable property and other assets and income from all sources are also taken into account for determining the eligibility for financial assistance.

The parent/guardian of a candidate desirous of having any financial assistance, should, immediately after his son/ward has been finally selected for training at the Indian Military Academy, submit an application through the District Magistrate of his District who will with his recommendation forward the application to the Commandant, Indian Military Academy, Dehradun.

4. Candidate finally selected for training at the Indian Military Academy will be required to deposit the following amount with the Commandant on arrival :

- (a) Pocket allowance for five months Rs. 1,000.00/-  
@ Rs. 200.00 per month.
- (b) For item of clothing and equipment Rs. 2,750.00/-

Total	Rs. 3,750.00/-
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Out of the amount mentioned above the following is refundable to the cadets in the event of financial assistance being sanctioned to them.

- Pocket allowance of five months Rs. 1,000.00/-  
@ Rs. 200.00 per month.

5. The following Scholarships are tenable at the Indian Military Academy :

- (i) PARSHURAM BHAI PATWARDAN SCHOLARSHIP—This scholarship is awarded to cadets from MAHARASHTRA AND KARNATAKA. The value of one scholarship is upto a maximum of Rs. 500.00 per annum for the duration of a cadet's stay at the Indian Military Academy subject to the cadet's making satisfactory progress. The cadets who are granted this scholarship will not be entitled to any other financial assistance from the Government.

(ii) COLONEL KENDAL FRANK MEMORIAL SCHOLARSHIP—This scholarship is of the value of Rs. 360.00 per annum and is awarded to an eligible Maratha cadet who should be a son of ex-serviceman. The Scholarship is in addition to any financial assistance from the Government.

6. An outfit allowance at the rate and under the general conditions applicable at the time for each cadet belonging to the Indian Military Academy will be placed at disposal of the Commandant of the Academy. The unexpended portion of the allowance will be :—

- (a) handed over to the cadet on his being granted a commission or
- (b) if he is not granted a commission refunded to the State.

On being granted a commission article of clothing and necessities purchased from the allowance shall become the personal property of the cadet. Such articles will, however be withdrawn from a cadet who resigns while under training or who is removed or withdrawn prior to commissioning. The article withdrawn will be disposed of to the best advantage of the State.

7. No candidate will normally be permitted to resign whilst under training. However, Gentlemen Cadet resigning after the commencement of training may be allowed to proceed home pending acceptance of their resignation by HQ ARTRAC. Cost of training, messing and allied services will be recovered from them before their departure. They and their parents/guardians will be required to execute a bond to this effect before the candidates are allowed to join Indian Military Academy. A Gentlemen Cadet who is not considered suitable to complete the full course of training may with permission of the Government, be discharged after paying the cost of Training laid down by the Govt of India. Service candidates under these circumstances will be reverted back to their parent Unit.

8. Commission will be granted only on successful completion of training. The date of commission will be that following the date of successful completion of training. Commission will be permanent.

9. Pay and allowances, pensions, leave and other conditions of service after the grant of commission will be identified with those applicable from time to time to regular officers of the army.

10. Training : At the Indian Military Academy Army Cadets, known as Gentlemen Cadets, are given strenuous Military training for a period of 18 months aimed at turning out, officers capable of leading infantry subunits. On successful completion of training Gentlemen Cadets are granted Permanent Commission in the rank of Lt. subject to being medically fit, in S.H.A.P.E.

11. Army Group Insurance: The Gentlemen/Women Cadets when in receipt of stipend are insured for One Cr (wef 01 April 2022) as applicable to officers of the regular Army. For those who are invalidated out by Invalidated Medical Board (IMB) on account of disability and not entitled to any pension will be provided Rs.25 lakhs for 100 percent disability. This will be proportionately reduced to Rs. 5 lakhs for 20 percent disability. However, for less than 20 percent disability an ex-gratia grant of Rs.50,000/- will be paid. Disability due to alcoholism, drug addiction and due to the diseases of pre-enrolment origin will not qualify for disability benefit and Ex-Gratia Grant. In addition, Gentleman/Women Cadets withdrawn on disciplinary grounds, expelled as an undesirable or voluntarily leaving the Academy will not be eligible for disability benefits and Ex-Gratia. Subscription at the rate of Rs. 10,000/- will have to be paid in advance on monthly basis by the Gentleman/Women Cadets to become members under the AGI Scheme as applicable to Regular Army Officers. The subscription for the relegated period would also be recovered at the same rate.

12. The following monetary benefits are available to the Cadets (Direct)/NoKs in the event of invalidment on medical grounds/death of a Cadet (Direct) due to causes attributable to or aggravated by military training :

- (A) In Case of Disablement
- (i) Monthly Ex-gratia amount of Rs. 9,000/- per month.
  - (ii) Ex-gratia disability award @ Rs. 16,200/- per month shall be payable in addition for 100% of disability during period of disablement subject to prorata reduction in case the degree of disablement is less than 100%. No disability award shall be payable in cases where the degree of disablement is less than 20%.
  - (iii) Constant Attendant Allowance (CAA) @ Rs. 6750/- per month for 100% disabled on the recommendation of invaliding Medical Board (IMB).
- (B) In Case of Death
- (i) Ex-gratia amount of Rs.12.5 lakhs to the NoK.
  - (ii) Ex-gratia amount of Rs. 9,000/- per month to the NoK.
- (C) The Ex-gratia awards to Cadets (Direct)/NoK, shall be sanctioned purely on ex-gratia basis and the same shall not be treated as pension for any purpose. However, dearness relief at applicable rates shall be granted on monthly ex-gratia as well as ex-gratia disability award. **(Authority : GOI/MOD letter No 17(01)/2017(01)D(Pension/Policy) dated 04 Sep 2017 as amended vide para 11 & 12 of GOI/MOD letter No. 17(02)/2016-D(Pen/Pol) dated 04 Sep 2017)**

### 13. Terms and Conditions of Service

#### (i) POSTING

Army officers are liable to serve anywhere in India and abroad.

#### (ii) PROMOTION

##### **Substantive promotions**

The following are the service limits for the grant of the substantive promotion to higher ranks.

By time scale :

Lt. (On completion of training)

Capt. 2 years of reckonable commissioned service

Major 6 years of reckonable commissioned service

Lt. Col. 13 years of reckonable commissioned service

Col (TS) 26 years of reckonable commissioned service

“The Qualifying service for consideration for promotion by Selection is as under”

Col. 15 years of reckonable commissioned service

Brigadier 23 years of reckonable commissioned service

Major Gen. 25 years of reckonable commissioned service

Lt. Gen. 28 years of reckonable commissioned service

General No restrictions

### **(B) FOR CANDIDATES JOINING THE INDIAN NAVAL ACADEMY, EZHIMALA, KERALA**

(i) Candidates selected for training at the Indian Naval Academy will be appointed as Cadets under the Graduate Cadet Special Entry Scheme (GSES) Course. The Selection of the cadets is based on the candidate qualifying in the Combined Defence Service Examination (CDSE), followed by SSB interview and Medical Examination. Meritorious candidates who are medically fit are appointed to the 32 vacancies of Executive Branch (General Service/ Hydro) (including 06 for Naval NCC ‘C’ certificate holding candidates under the NCC Special Entry Scheme).

(ii) Selection of Cadets from the National Cadet Corps. The eligibility, age-limits, educational qualifications for candidates applying under the NCC Special Entry Scheme are the same as the GSES candidates except for the following:-

a) A NCC Cadet must have served for not less than three academic years in the Senior Division, Naval Wing of the National Cadet Corps, and must be in possession of Certificate "C" (Naval). Those who have appeared or intend to appear for certificate "C"

examination are also eligible to apply but their final selection shall depend on producing the Certificate before the commencement of the course.

b) The NCC Cadet must be in possession of a certificate of good conduct and character from his University or Principal of his College.

c) A NCC Cadet shall not be eligible to apply after twelve months of leaving the Senior Division, Naval Wing of the National Cadet Corps

d) In order to apply, a cadet must submit his application to his Officer Commanding, N.C.C Unit, Naval Wing, who shall forward it through the Circle Commander concerned to the N.C.C. Directorate, Ministry of Defence, New Delhi. The N.C.C. Directorate will forward the applications to the Chief of the Naval Staff. The applications shall be submitted on the prescribed form. These forms will be available at all N.C.C. Units.

e) Candidates who are considered prima facie suitable shall be required to appear before a Service Selection Board for interview and other tests.

f) Candidates to be finally selected should at least secure the minimum qualifying marks at the Services Selection Board. Subject to this condition and to their being declared medically fit, successful candidates shall be placed in the order of merit based on the total marks secured in the written examination and the Service Selection Board interview. The final selection shall be made in the order of merit up to the number of vacancies available.

(iii) Candidates, finally selected for training at the Academy will be appointed as cadets in the Executive Branch of the Navy. A sum of Rs. 35,000/- should be brought by them and deposited in the bank account, which they would be opening at the State Bank of India, Ezhimala branch, on arrival. Since it is a large amount, it is advised that they carry a demand draft payable to self. The deposit money would be used to meet the following expenditures:—

- |   |  |
|---|--|
| (a) Pocket/Personal expenses  | Rs. 5,000/-<br>@ Rs. 1,000/- per month |
| (b) Expenses on Laundry, Civilian-bearer, Cinema, hair cutting and other sundry services  | Rs. 4,250/-<br>@ Rs. 850/- per month   |
| (c) Expenses on stitching/purchase of Academy Blazer, Academy tie, Academy Mufti, Academy Sportswear, Jogging shoes, Jungle boots, Swimming Trunk/suits and Satchels.   | Rs.20,000/-                            |
| (d) Travelling expenses for proceeding to next duty station/home station on leave on completion of Naval Orientation Course on return Journey at the end of the term.   | Rs. 2,000/-                            |
| (e) <b>Insurance:</b> The GSES cadets would have to pay Rs. 2303/- one time non-refundable contribution for an Insurance cover of Rs. 20,00,000/- (Rupees twenty lakh only) for a period of six months. Their disability cover and contribution if relegated would be at par with Non-GSES cadets (NGIF letter No. BA/GIS/215 dated 06 Nov 2018). |  |

(iv) Training: Selected candidates may be appointed as cadets on reporting at the Indian Naval Academy.

The candidates shall remain under probation till completion of initial training which is as follows:-

- |  |              |
|--|--------------|
| (a) Naval Orientation Course at INA, Ezhimala                        | 44 weeks     |
| (b) Officers Sea Training at Training Ship                           | 06 months    |
| (c) Sub-Lieutenant Afloat training                                   | 06 months    |
| (d) Sub-Lieutenant (Technical course) Afloat attachment for award of | 33 weeks     |
| (e) Full Naval watch-keeping Certificate                             | 06-09 months |

(v) Commissioning & Other Benefits The cadets shall be commissioned in the rank of Sub-Lieutenant after successful completion of approximately 18 months of training. The careers prospects, leave benefits, leave and travel concession, pensionary/retirements benefits and all such perks and privileges provided to officers in the Navy is similar to those being provided by the two services.

(vi) The cost of training including accommodation and allied services, books, uniform, messing and medical treatment of the cadets of the Indian Naval Academy will be borne by the Government. Parents or guardians of cadets will, however, be required to meet their pocket and other private expenses while they are cadets. When a cadet's parent or guardian has an income less than Rs. 1500 per mensem and is unable to meet wholly or partly the pocket expenses of the cadet financial assistance upto Rs. 140 per mensem may be granted by the Government. A candidate desirous of securing financial assistance may immediately after his selection, submit an application through the District Magistrate of his District, who will with his recommendations, forward the application to the Principal Director of Manpower Planning & Recruitment, Naval Headquarters, New Delhi-110011.

Note : Further information, if desired, may be obtained from the Directorate of Manpower, Planning & Recruitment, Naval Headquarters, New Delhi-110011.

### **(C) FOR CANDIDATES JOINING THE AIR FORCE ACADEMY**

1. There are three modes of entry in F(P) Course viz. CDSE/NCC Special Entry/AFCAT. Candidates who apply for Air Force through more than one source will be tested/ interviewed at Air Force Selection Boards as per type of entry. Common candidate who fail in Computer Pilot Selection System (CPSS) cannot be tested for flying branch in IAF.

**2. Detailing for Training**—Candidates recommended by the AFSBs and found medically fit by appropriate medical establishment are detailed for training strictly on the basis of merit and availability of vacancies. Separate merit list are prepared for Direct Entry candidates through UPSC and for NCC candidates. The merit list for Direct Entry Flying (Pilot) candidates is based on the combined marks secured by the candidates in the tests conducted by the UPSC and at the Air Force Selection Boards. The merit list for NCC candidates is prepared on the basis of marks secured by them at AFSBs.

**3. Training**—The approximate duration of training for Flying Branch (Pilots) at the Air Force Academy will be 74 weeks.

Insurance cover during Flying Training—(Rates are under revision).

Air Force Group Insurance Society would pay Rs. 1,00,000/- for a monthly contribution of Rs. 800/- pm as ex-gratia award to the next-of-kin of a flight cadet drawn from Civil life and undergoing flying training in an unfortunate eventuality. In case, flight cadet undergoing flying training is medically invalidated boarded out, he would be paid Rs. 20,000/- as ex-gratia award for 100% disability and this reduces proportionately upto 20%.

Cadets are authorised fixed stipend amounting to Rs. 21,000/- per month (Rs. 15,600/- pay in the pay band and Rs. 5,400/- as grade pay) during training. "On successful completion of training the stipend admitted will be converted as pay for all purposes. However, the period of training shall not be treated as commissioned service."

Once flight cadets are granted pay and allowances by government, the death cover would be Rs. 50,000/- and the disability cover would be Rs. 25,000/- for 100%

disability. This cover would be provided by AFGIS on payment of monthly non-refundable contribution of Rs. 76/- by each flight cadet undergoing flying training for which membership would be compulsory.

Conditions governing Financial Assistance:

(i) While the cost of training including accommodations, books, uniforms, boarding and medical treatment will be borne by Government, candidates will be expected to meet their pocket expenses themselves. The minimum expenses at the Air Force Academy are not likely to exceed Rs. 14,000/- (under revision) per mensem. If a cadet's parent or guardian is unable to meet wholly/partly even this expenditure, financial assistance may be granted by the Government. No cadet whose parent or guardian has an income of Rs. 750/- or above per month would be eligible for the grant of the financial assistance. The immovable property and other assets and income from all sources are also taken into account for determining the eligibility for financial assistance. The parent/guardian of a candidate desirous of having any financial assistance, should immediately, after his son/ward has been finally selected for training at the Air Force Academy, submit an application through the District Magistrate of his district who will, with his recommendations, forward the application to the Commandant, Pre Flying Training Courses, Begumpet.

(ii) Candidates finally selected for training at the Air Force Academy will be required to deposit the following amount (under revision) with the Commandant on arrival:—

(a) Pocket allowance for six months	Rs.840/-
@ Rs. 140/- per month	
(b) For item of clothing and equipment	Rs.1,500/-
Total	Rs.2,340/-

Out of the amount mentioned above the following amount is refundable to the cadets in the event of financial assistance being sanctioned.

Pocket allowance for the six months	
@ Rs. 140/- per month—	Rs. 840/-

#### **4. Career Prospects :**

After successful completion of training, the candidates pass out in the rank of Flying Officer and will be entitled to the pay and allowances of the rank. Time scale promotions to the rank of Flight Lieutenant, Squadron Leader, Wing Commander and Group Captain are granted on completion of 2 years, 6 years, 13 years and 26 years of successful service respectively. Grant of Group Captain (select) and higher ranks is only by selections. Promising officers have a fair chance of getting higher promotions to air ranks—Air Commodore, Air Vice Marshal and Air Marshal.

#### **5. Leave and Leave Travel Concession :**

Annual Leave—60 days a year.

Casual Leave—20 days a year.

Officers are authorised encashment of Annual Leave upto 10 days alongwith LTC to the extent of a total 60 days in a career span to cover incidental expenses on travel.

Officers when proceeding on annual/casual leave, irrespective of its duration, is entitled for free conveyance from place of duty (unit) to home town and back once in the second year of his service for the first time and thereafter every alternate year to any place in India in lieu of home town or selected place of residence without any distance restriction.

In addition officers of Flying branch employed on regular Flying Duties in vacancies in authorised establishment are allowed, while proceeding on leave once every year on warrant a free rail journey in the appropriate class upto a total distance of 1600 kms. for the forward and return journeys both inclusive.

Officers when travelling on leave at their own expenses are entitled to travel by entitled class or lower class on payment of 60 per cent of the fare for self, wife and children from unit to any place within India on 6 one-way journey Form 'D' in a calender year. Two of these Form 'D' may be availed of for the entire family. In addition



to wife and children family includes parents, sisters and minor brothers residing with and wholly dependent upon the officers.

#### **6. Other Privileges :**

The officers and their families are entitled to free medical aid, accommodation on concessional rent, group insurance scheme, group housing scheme, family assistance scheme, canteen facilities etc.

#### **(D) FOR CANDIDATES JOINING THE OFFICERS TRAINING ACADEMY, CHENNAI**

1. Before the candidate join the Officers Training Academy Chennai.

- (a) He/she will be required to sign a certificate to the effect that he/she fully understands that he/she or his/her legal heirs shall not be entitled to claim any compensation or other relief from the Government in respect of any injury which he/she may sustain in the course of or as a result of the training or where bodily infirmity or death results in the course of or as a result of a surgical operation performed upon or anaesthesia administered to him/her for the treatment of any injury received as aforesaid or otherwise.
- (b) His/her parent or guardian will be required to sign a bond to the effect that if for any reason considered within his/her control, the candidate wishes to withdraw before the completion of the course or fails to accept a commission if offered or marries while under training at the Officers' Training Academy, he/she will be liable to refund the whole or such portion of the cost of tuition, food, clothing and pay & allowances, received as may be decided upon by Government.

2. Candidates finally selected will undergo a course of training at the Officers' Training Academy, for an approximate period of 49 weeks. Candidates will be enrolled as Gentlemen/Women Cadets. Gentlemen/Women Cadets will be dealt with the ordinary disciplinary purposes under the rules and regulations of the Officers' Training Academy.

3. While, the cost of training including accommodations, books, uniforms, boarding and medical treatment will be borne by the government, candidates will be expected to meet their pocket expenses themselves.

The minimum expenses during the pre commission training are not likely to exceed Rs. 200/- per month but if the cadets pursue, any hobbies such as photography, hiking etc. they may require additional money. In case however, the cadet is unable to meet wholly or partly even the minimum expenditure, financial assistance at rates which are subject to change from time to time, may be given provided the cadet and his/her parent/guardian, have an income below Rs. 1500 per month. A candidate desirous of having financial assistance should immediately after being finally selected for training submit an application on the prescribed form through the District Magistrate of his/her district who will forward the application to the Commandant, Officers' Training Academy, Chennai alongwith his/her Verification report.

4. Candidates finally selected for training, at the Officers' Training Academy, will be required to deposit the following amount with the Commandant on arrival:

- (a) Pocket allowance for three month      Rs. 3,000/-  
    @ Rs. 1,000 per month
- (b) For items of clothing and                      Rs. 5,000/-  
    equipment
- (c) Group Insurance Coverage                  Rs. 10,000/-  
    for 02 months (AGIF)

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Total	Rs. 18,000/-
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Out of the amount mentioned above the amount mentioned in (b) above is refundable to the Cadets in the event of financial assistance being sanctioned to them.

5. Outfit allowance will be admissible under order as may be issued from time to time. On being granted a commission, articles of clothing and necessities purchased

from this allowance shall become the personal property of the cadet. Such articles, will however be withdrawn from a cadet who resigns while under training or who is removed or withdrawn prior to commissioning. The article withdrawn will be disposed of to the best advantage of the State.

6. No candidate will normally be permitted to resign whilst under training. However, Gentlemen/Women Cadets resigning after the commencement of training may be allowed to proceed home pending acceptance of their resignation by HQ ARTRAC. Cost of training, messing and allied services will be recovered from them before their departure. They and their parents/guardians will be required to execute a bond to this effect before the candidates are allowed to join Officers' Training Academy.

7. On joining OTA, cadets will be allowed to apply and proceed for civil central job interview/SSB in the first term of the Training only. However, no cost of training including messing charges will be recovered from these Gentlemen Cadets, who may resign from the Officers Training Academy, Chennai to undergo pre-commission training at the Indian Military Academy, Dehradun or corresponding cadet training establishment in Navy and Air Force, if so selected.

8. A Gentleman/Women Cadet who is not considered suitable to complete the full course of training may, with permission of Government, be discharged after paying cost of training laid down by the Government of India. An Army candidate under these circumstances will be reverted to his Regiment or Corps.

9. **Training :**

Selected candidates will be enrolled as Gentleman/Women Cadets and will undergo a course of training at the Officers' Academy for an approximate period of 49 Weeks. On successful completion of training Gentleman/Women Cadets are granted Short Service Commission in the rank of Lt. From the date of successful completion of training. University of Madras will award "Post Graduate Diploma in Defence Management and Strategic Studies" to all cadets who successfully complete Pre-commissioning training at Officers Training Academy, Chennai. Candidates withdrawn from Officers' Training Academy on disciplinary grounds are not eligible to apply.

10. **Terms and conditions of Services:**

(a) **Period of probation:**

An officer will be on probation for a period of 6 months from the date he/she receives his/her commission. If he/she is reported on within the probationary period as unsuitable to retain his/her commission, he/she may be terminated any time whether before or after the expiry of the probationary period.

(b) **Liability of Service:**

Personnel granted Short Service Commission is liable to serve anywhere in India and abroad on selected appointments as decided by IHQ MOD (Army) from time to time.

(c) **Tenure of Appointment:**

Short Service Commission will be granted to Male and Female in the regular Army for 14 years i.e. for an initial period of 10 years extendable by a further period of 04 years. Male and Female officers who are willing to continue to serve in the Army after the expiry of period of ten years of Short Service Commission may, if eligible and suitable in all respects, be considered for the grant of Permanent Commission in the 10<sup>th</sup> year of their Short Service Commission in accordance with the relevant policies as issued from time to time.

Those SSC officers (Male and Female) who are not selected for grant of PC but are otherwise considered fit and suitable, will be given options to continue as SSCOs for a total period of 14 years (including the initial tenure of 10 years) on expiry of which they will be released from the Army.

**(d) Special Provision for Release for SSC on completion of 5th Year of Service:**

SSC (Non-Tech) Male & Female Officers, other than those who undergone or are undergoing Degree Engineering Course or any other specialized course of such nature, who are desirous of leaving the service after completion of five years service may, during the fifth year of service, apply to the Army HQs. for release. Army HQ will consider the applications of such officers on merits and the decision of the Army HQ will be final and irrevocable. On approval of such officers will be released from service on completion of 5th year of service. Those SSC (Non-Tech) Male & Female Officers who have undergone or are undergoing Degree Engineering Course or any other specialised course of such nature, will not be released before expiry of full tenure of 14 years unless the cost of training of such specialized course as prescribed is recovered from them. The Combat Aviation Course which is mandatory for Aviators is specialized course for Short Service Commissioned Officers. They will be required to execute a bond to this effect on being nominated for undertaking Degree Engineering Course/Special Course of such nature. In addition to all instructions in force for various courses of instructions, the following restrictions would apply to all SSC Officers for all courses except mandatory course:-

- (i) All SSC Officers (Male & Women), less officers of Army Aviation Corps, will be required to give an undertaking before undergoing a 'Specialized/other category' course that they would be willing to serve for minimum five years beyond termination of the course.
- (ii) All SSCOs (Male & Women) of Army Aviation Corps will give an undertaking before commencement of the course that they will:-
  - (aa) Be willing to serve for minimum 12 years beyond termination of the course.
  - (ab) Be obliged to opt for PRC as well as seek extension when giving undertaking for specialized course.

**(e) Special Provisions during Extended Tenure:**

During extended tenure, they will be permitted to seek release from the Army on the following grounds:—

- (i) Taking up civil Job.
- (ii) Pursuing higher education.
- (iii) Starting own business/joining family business.

**(f) Substantive Promotion :**

SSCOs male and female granted Short Service Commission under these rules will be eligible for substantive promotion as under:—

- |       |                         |   |
|-------|-------------------------|---|
| (i)   | To the rank of Capt.    | on completion of 2 years reckonable commissioned service  |
| (ii)  | To the rank of Major    | on completion of 6 years reckonable commissioned service. |
| (iii) | To the rank of Lt. Col. | on completion of 13 years reckonable commissioned         |

service.

**(g) Mandatory Conditions:**

Mandatory conditions for grant of above substantive ranks laid down for Permanent Commissioned officers as well as the eligibility, time limit and penalties for promotions exam Part B and D as applicable to permanent commission officers also be similarly applicable to SSCOs male and female.

**h) Adjustment of Seniority:**

To make adjustment for shorter training of SSC male and female vis-a-vis PC officers, the seniority of SSC male and female officers will be depressed by the period corresponding to the difference in training period between the SSC course under

consideration and the training period of its equivalent PC Course. This adjustment of seniority will be carried out at the time of grant of first substantive rank of captain. The revised seniority will have no effect on the pay and allowances granted in the rank of Capt. Major and Lt.Col.

**(i) Reckonable Commissioned Service:**

Subject to provision of Para 10 (h) above, reckonable commissioned service for the purpose of these orders will count from the date of grant of Short Service Commission to an officer. The period of service forfeited by sentence of Court Martial or any summary award under the Army Act and the period of absence without leave will not be reckonable. The period during which furlough rates of pay are drawn and the period of captivity at POWs rates of pay, will be reckonable. The period of service for promotion lost by an officer in consequence of his/her having been granted leave without pay will also be reckonable. Such an officer will, however, become entitled to the pay and allowances of the higher substantive rank granted by the inclusion of this period only from the date on which he/she would have qualified by service if this period had not been so reckoned and not with effect from the date of grant of substantive rank.

**(j) Leave:** Leave will be admissible in accordance with the Leave Rules for the Service Vol. 1-Army as amended from time to time.

For leave, officers will be governed by rules applicable to short Service Commission officers as given in Chapter IV of the Leave Rules for the Service Vol.I-Army. They will also be entitled to leave on passing out of the Officers Training Academy and before assumption of duties under the provision of the Rule 69 *ibid*.

SSC Women Officers will also be eligible for following kinds of Leave:

- (i) Maternity Leave:** Woman officer of the Army – Rule 56 of Chapter-IV of Leave Rule for the Services Vol.I-Army, Fourth Edition.
- (ii) Child Care Leave :** Woman Officers of the Army – Rule 56A of Chapter-IV of Leave Rules for the Services Vol.I-Army, Fourth Edition as amended vide GOI MoD letter No.B/33922/AG/PS-2(b)/3080/D(AG-II) dated 19 Nov 2018.
- (iii) Child Adoption Leave :** Woman Officers of the Army – Rule 56B of Chapter-IV of Leave Rules for the Services Vol.I-Army, Fourth Edition.

**(k) Termination of Commission**

The Commission of an officer may be terminated at any time by the Government of India for the following reasons:-

- (i) For misconduct or if services are found to be unsatisfactory: or
- (ii) on account of medical unfitness; or
- (iii) if his/her services are no longer required or
- (iv) if he/she fails to qualify in any prescribed test or course.

An officer may on giving 3 months notice be permitted to resign his/her commission on compassionate grounds of which the Government of India will be the sole judge. An officer who is permitted to resign his/her commission on compassionate grounds will not be eligible for terminal gratuity.

**(l) Terminal Gratuity:**

SSCO recruited from civil side are entitled to terminal gratuity @ 1/2 months emoluments for each completed six monthly period of service.

**(m) Reserve Liability:**

On being released on the expiry of contractual length of service of Short Service Commission or extension thereof (as the case may be) they will carry a reserve liability for a period of five years plus two years on voluntary basis or upto the age of 40 years in case of Male Officers and 37 years in case of Women Officers which is earlier.

(n) **Miscellaneous:**

All other terms and conditions of service where not at variance with the above provisions will be the same as for regular officers.

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## Review Article

# Prospects for the application of aptamer based assay platforms in pathogen detection



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## ABSTRACT

Aptamer-based diagnostics platforms for animal, human, plant and environmental pathogens are gaining importance as they are rapid, user-friendly, sensitive and selective. However, most of the aptamer-based platforms have not yet become commercially available. The increasing number of publications signifies the applications of aptamer-based platform and their potential. Herein, the present review is to describe, a brief overview of the development of various aptamer-based platforms and their applicability for the sensitive detection of pathogens. In this review, several aptamer-based platforms such as Enzyme linked immunosorbent assay (ELISA)-like assay, Aptamer blot, Aptamer Polymerase Chain Reaction (PCR), Aptamer array, Aptamer-based Lateral Flow Assays (LFA), Aptamer based fluorescence assay, Flowcytometry-based assay, Aptamer affinity chromatography, microfluidics-based platforms, and various aptasensor have been discussed. Most of the platforms are highlighted will encourage researchers to focus on developing pathogen detection platform for various applications.

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## 1. Introduction

Diseases caused by pathogenic organisms pose huge challenges for society and the health care system worldwide in terms of mortality, morbidity and economic losses [1]. Pathogens widely exist in nature and have always been a serious threat to the environment, human and animal health [2]. For successful treatment of pathogenic infections, development of rapid and accurate detection platform is of great

importance. The technology and methodology underlying with diverse platforms for detecting pathogens have their own limitations in terms of availability, sensitivity, specificity and cost. Therefore, the need of hour is to develop novel, innovative and low-cost platform for detection of pathogenic organisms.

In the past decades, researchers have extensively focused on aptamers as alternative promising bio-recognition ligands for the detection of the pathogens. Over antibodies, aptamers

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possess enormous advantages like stability at different temperature and pH, ease of production, longer shelf life, fast production and low batch variability [3]. Moreover, the aptamer can be generated against a complex target without any knowledge of a specific target molecule or without purifying the known target molecule [4]. Hence, aptamer studies became a blooming area for the development of novel detection platform and therapeutics for various pathogens and replacing conventional use of antibodies in a variety of bioanalytical assays [5].

Aptamers are short oligonucleotides (ssDNA or RNA) molecules variable in length from 25 to 90 bases and capable of binding strongly, specifically to target molecules. The binding specificities and affinities are based on their sequence-specific 3D structures and their dissociation constant ( $K_d$ ) (1 pM to 1 mM) which rely on Van der Waals forces, hydrogen bonds or electrostatic interactions [6]. Aptamer can be selected from a library containing  $10^{13}$ – $10^{16}$  random sequences through an *in-vitro* process called Systemic Evolution of Ligands by Exponential Enrichment (SELEX) [7]. The first *in-vitro* selection of aptamer was reported in 1990 by three independent groups namely Ellington and Szostak, 1990; Robertson and Joyce, 1990 and Tuerk and Gold, 1990 [8].

Compared to antibody-based applications, aptamer research is still in its infancy. Nevertheless, due to its wide application in analytical, bio-analytical, diagnostic and therapeutic fields [9] aptamer-based products offer the same promise as their antibody counterparts. Aptamer ligands bind their respective targets with comparable affinities and in contrast to antibodies [10]. Moreover, aptamer production process does not require any live animal immunizations and is therefore easier, faster and more humane [11]. Additionally, while antibodies are typically susceptible to changes in pH and temperature, aptamers are more stable across a broader range of pH and temperature [12]. Among other advantages, aptamers on account of their smaller size are preferred for biosensing applications over bulky antibodies. The emerging integration of aptamers with chemical biology and nanotechnology has

opened a newly emerging field to stimulate further new diagnostic and therapeutic for various pathogens and provided significant potential for many research and clinical applications. The present review provides brief information regarding various aptamer-based assay platforms for the detection of pathogens from various sources.

## 2. Selection of aptamer against pathogen

The process for the generation of aptamers via an iterative process is termed as SELEX [10]. The method comprises of a selection of target-specific random oligonucleotide sequences through iterative cycles of *in-vitro* selection and enzymatic amplification (Fig. 1) [11,12]. Briefly, each selection round includes three steps: In the first step (library generation), a library consists of single-strand random sequence (30–90 mers) regions, usually, flanked by the primer binding site. In the second step, partitioning (binding and separation), the target-bound library components are separated from the unbound components. This step is generally coupled with several other methods to make a selection of the target-specific aptamer easy and rapid. In the third step (amplification), the target-bound aptamers are eluted and amplified by PCR with a library-specific primer which is then used as a library for the next round of selection. Finally, the fourth step is sequencing, the selected aptamer pool from the final round is used to clone and it is sequenced to find out the aptamer sequences [13,14]. Besides DNA libraries, RNA libraries have also been successfully used for SELEX. The differences in the majority of RNA SELEX protocols are the requirement of the protection of RNA from RNases, amplification by T7 RNA polymerase and reverse transcription before PCR [15]. To date, no universal protocol is available for the selection of aptamers against various targets. The design of SELEX methods depends on the target and partitioning platform. So far, various SELEX-based methods have been developed and are listed in Table 1 [4–8,15–17].

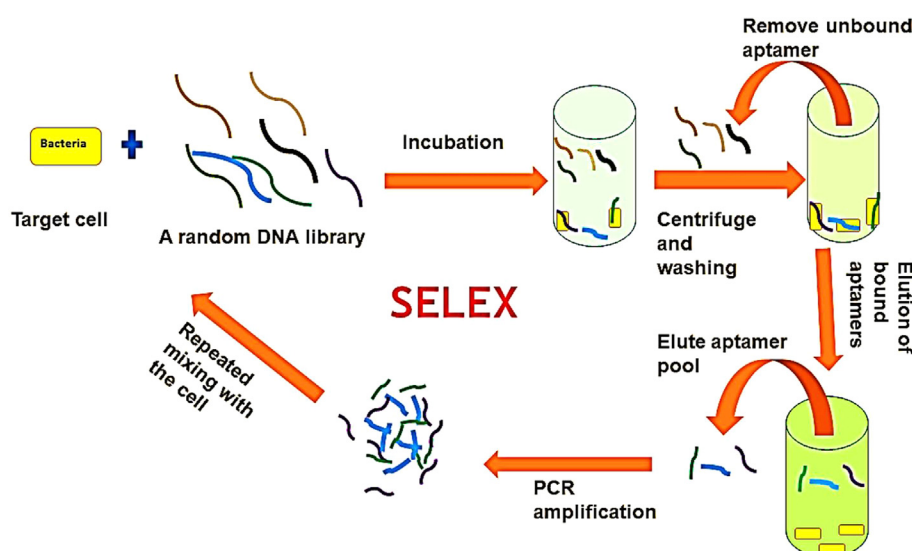


Fig. 1 – SELEX protocol Adopted and modified from Ramlal et al., 2017 [65].

**Table 1 – Modifications to the SELEX technology and their brief description Table has adopted and modified from McKeague et al., 2012.**

Serial No.	Method	Description	References
1	Cell-SELEX	Cell-SELEX or whole Cell SELEX is carried out to select aptamers against particular cell surface receptor. Here the whole bacterial cells or cell lines is used as the target for selection of aptamers.	[4,17]
2	Capillary electrophoresis (CE)-SELEX	Capillary electrophoresis is carried out to perform the separation of bound and unbound aptamer pool during selection.	[4,8,16,17]
3	Fluorescence-activated cell sorting (FACS) SELEX	This method separates and differentiates fluorescence labelled aptamer-bound cells by the use of fluorescence-activated cell sorting.	[5,7,8,17]
4	Automated SELEX	Automated SELEX uses mechanized system for selection of aptamer by subsequently lessening the time and work.	[8,15–17]
5	Electrophoretic mobility shift assay (EMSA)-SELEX	The SELEX method employ electrophoretic mobility shift assay (EMSA) at every round for selection of highly specific aptamer.	[5,17]
6	Counter selection/subtractive SELEX	Counter SELEX is carried out to screen the highly specific aptamer sequences and eliminate the nonspecific sequences by using other closely related target during selection process.	[7,8,17]
7	Atomic force microscopy (AFM)-SELEX	This method employs atomic force microscopy tip for selection and visualization of aptamer-target. Only one round of selection is required in this SELEX method.	[7,16,17]
8	Chimeric SELEX	Chimeric SELEX uses two or more different aptamer libraries with more than one desired feature or functionality. First, selection of aptamers from each of the parent libraries with distinct feature will be used. Later the selected aptamers will be fused together.	[8,15–17]
9	Covalent/Cross linking SELEX	This SELEX method is based on the reactive group aptamers which are covalently linked to target proteins.	[7,8,16,17]
10	FluMag SELEX	In FluMag SELEX, the target is used to immobilize the magnetic beads instead of agarose and for the quantification purpose fluorescence modified library is used as an alternative to radiolabels.	[7,8,16,17]
11	Deconvolution SELEX	Deconvolution SELEX is used to perform on a complex mixture (or a cell) to generate aptamers. After generation of aptamer, second part of SELEX involves discrimination of aptamers that binds to different parts of the complex mixture.	[8,15–17]
12	Genomic SELEX	An organism's genome used to construct SELEX library to explicate meaningful interactions. Target proteins and metabolites from the same organism are used for selection.	[8,15–17]
13	Monolex	Monolex employ affinity chromatography step for aptamer selection, followed by physical segmentation of the affinity material to obtain the highest affinity aptamers.	[8,15–17]
14	Photo SELEX	Aptamers with photo-reactive groups are used, which can photo cross-link to a target and/or photo activate a target molecule.	[7,15,17]
15	Non-SELEX (NCEEM)	This process does not involve amplification steps, only repetitive steps of partitioning are carried out.	[16,17]
16	Next generation SELEX	The pool of oligonucleotide libraries that tile through a pre-mRNA sequence which are partitioned into bound and unbound fractions during selection. Further selection efficiency can be quantified by a two-colour microarray.	[15,17]
17	Negative selection	Negative selection is performed to remove sequences having affinity towards the selection matrix. This additional step performed typically at the beginning of selection.	[8,15–17]
18	Multi-stage SELEX	A modified version of chimeric SELEX is Multi-stage SELEX. The fused aptamer components undergo additional selection with the targets for selection of specific aptamer.	[7,17]
19	Spiegelmer technology	The aptamer selection is carried out with the natural D-nucleic acids but on the opposite enantiomer of the chiral target molecule. After selection, aptamers are sequenced and synthesized as L-isomers for binding to the chosen enantiomer of the target.	[7,8,17]

Table 1 – (continued)

Serial No.	Method	Description	References
20	Primer-free SELEX	Primer-free SELEX involves removal of the primer-annealing sequences from the library prior to selection. It minimizes the affinity interference of primer-based secondary structures.	[15–17]
21	Target expressed on cell surface (TECS) SELEX	Recombinant proteins on the cell surface are used directly as a target for selection of aptamer.	[15–17]
22	Slow off-rate modified Aptamers (SOMAmer)	SOMAmer based selection employ oligonucleotide libraries that are uniformly functionalized at the 5' position.	[15,17]
23	Yeast Genetic SELEX	Preliminary in-vitro selection carried out using a degenerate aptamers library. Further, secondary selection performed using in-vivo yeast three (one)-hybrid system.	[7,17]
24	Toggle-SELEX	The selection used to perform on different targets in alternating rounds.	[16,17]
25	Animal SELEX	Aptamer libraries are first injected into the target animal (mice). Following inoculation, the organs of interest are harvested from animal. The selected aptamers are isolated and amplified by PCR. The method can be performed for selection of disease-specific aptamers.	[7,8,17]
26	Artificially expanded genetic information system (AEGIS) SELEX	This SELEX utilizes modified libraries with the artificially expanded genetic code. This includes incorporation of hydrophobic base 7-(2-thienyl) imidazo (4,5-b) pyridine (Ds) nucleotides into a random library to obtain aptamers with the increased affinity.	[4,15–17]
27	Microfluidic-SELEX (M-SELEX)	This SELEX protocol uses microfluidic platform for fast aptamer screening. A separation device like sol-gel technique, bead-based acoustophoresis technique and microarray-integrated microfluidic chip technique is used to increase the efficiency of aptamer selection.	[15–17]
28	Immuno-precipitation-Coupled SELEX (IP-SELEX)	In IP-SELEX, cells harboring the native protein of interest are incubated with ssDNA library for enrichment of target specific aptamer. Subsequently, cells are lysed, and the target protein is immunoprecipitated using antibody-coated beads and incubated with pre-enriched aptamer pool. Protein-aptamer complexes are eluted from the beads and are PCR amplified.	[8,15–17]

### 3. Aptamer based assay platforms

Aptamers possess a high affinity towards their targets, as they have adopted the capability of folding upon binding with their target molecules (Fig. 2). The factors contribute to the binding between aptamers and their targets are hydrogen bonding, structure compatibility, stacking of aromatic rings, electrostatic, hydrophobic interactions, and Van der Waals force [18]. Due to high affinity and selectivity, the aptamers are replacing conventional ligands in various assay platforms. The aptamer-based assay platforms developed for detection of various pathogens are described in this review (Fig. 3).

### 4. ELISA like assay

Enzyme-linked immunosorbent assay (ELISA) is a plate-based assay which is most widely used in two formats namely, direct ELISA and sandwich ELISA (Fig. 4) [18]. In direct ELISA, a target molecule immobilized on a microtiter plate, blocked with BSA or skim milk and then incubated with enzyme or fluorophores labelled probe. In a sandwich assay, the target capture antibody is immobilized on a microtiter plate. After blocking, the plate is incubated with target analytes and a secondary detection antibody conjugated with enzyme or fluorophores is used for detection of target [19]. In aptamer-

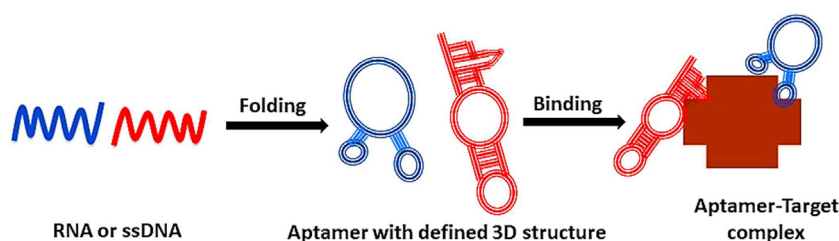


Fig. 2 – Binding of aptamer with targets.

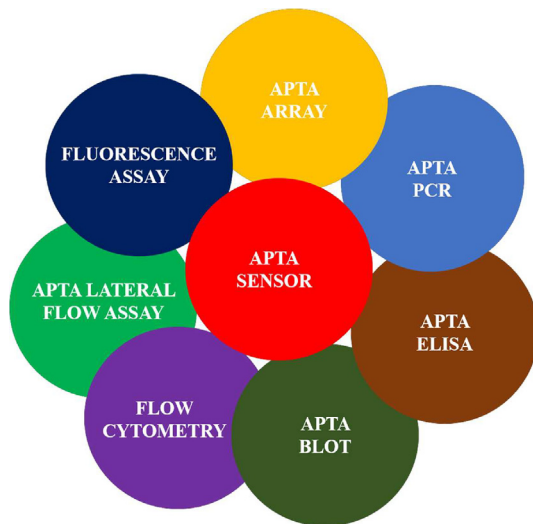


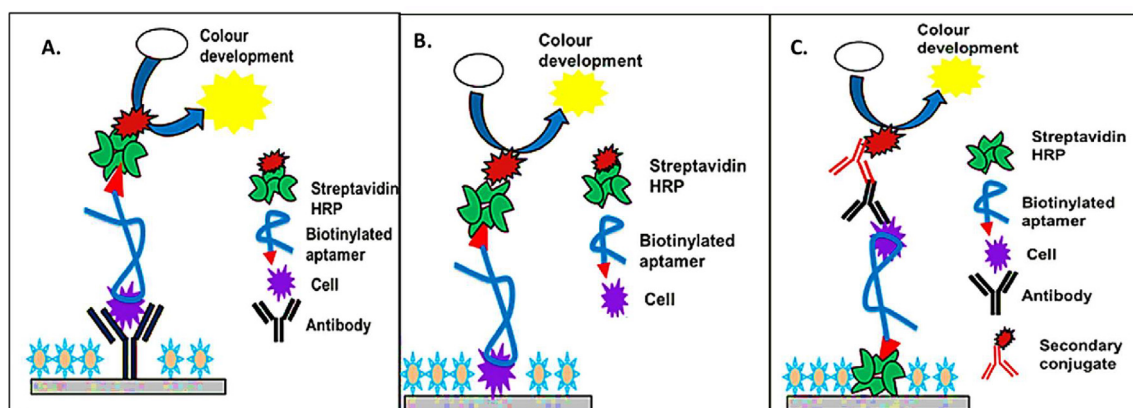
Fig. 3 – Aptamer based assay platforms.

based Enzyme-Linked Oligonucleotide Assay (ELONA), antibodies can be substituted with specific aptamers for target capturing and subsequent detection by employing single aptamer for specific epitopes or two separate aptamers for different epitopes [20,21]. To date, various Enzyme-linked aptamer assay (ELAA) are available for the detection of bacterial, viral and protozoa whole-cell and antigens [22]. For example, an Enzyme-Linked Oligonucleotide Assay (ELONA) was developed and tested for *Salmonella enterica* serovars typhimurium [23] and *Shigella sonnei* [24,25] from food and environmental samples. This assay was performed employing biotinylated aptamer to bind with cell and a colorimetric signal was developed using streptavidin HRP conjugate. The specificity and sensitivity of selected aptamer against *Francisella tularensis* antigen [26] and *Vibrio alginolyticus* whole cell

[27] was tested employing Enzyme-Linked Aptamer Sorbent Assay (ELASA). In another study, the ssDNA aptamers population for *Leishmania infantum*, histone H2A protein were screened with the help of purified recombinant H2A-coated microtiter plate wells [28]. An Enzyme-Linked Aptamer Assay (ELAA) was used for the detection of the influenza A virus H5N1 targeting the hemagglutinin (HA) protein [29]. The lower limit of detection reached 0.1 µg/well. Various other modified ELAAs have been used to detect HCV [30], human norovirus [31] and Zika virus [32]. In developing the Zika virus detection platform, different pairs of capturing agent and detection agent were tested. Among them, the aptamer/antibody combination showed the best detection limit.

## 5. Aptamer blotting

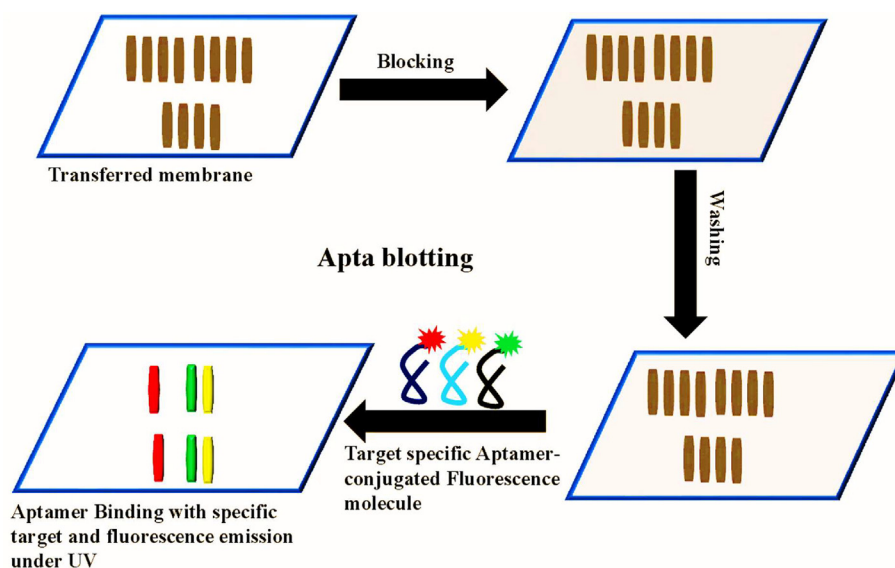
Western blot analysis is a commonly used technique to quantify specific proteins. However, the assay has elaborate steps and requires two types of antibodies (primary antibody and secondary conjugated antibody) for visual monitoring. Aptamer blotting is a modified version of Western blotting, in which aptamer is employed instead of the primary antibody [33]. This technique involves electrophoretically transfer of proteins from the gel to the nitrocellulose membrane. After transfer, the membrane is blocked with blocking reagents such as BSA or skim milk [34]. After blocking, the membrane is incubated with a labelled aptamer and to anticipate aptamer-target complexes (Fig. 5). In a study, Mondal and co-worker selected aptamer against *staphylococcal Enterotoxin B* (SEB) using combinatorial SELEX, where binding affinity of the selected aptamer with target in native and denatured condition was validated by western blot analysis [35]. However, the assay can be performed in one step by using only highly specific fluorescence-labelled aptamer [36]. Moreover, the use of QDs labelled aptamer has certain benefits, as it reduces



- Antibody and aptamer-based sandwich assay: Polyclonal antibody used as capturing probe and specific biotinylated antibody used as revelling antibody
- Direct aptamer-based assay: Highly specific biotinylated aptamer used as capturing of precoated antigen
- Aptamer-antibody based sandwich assay: Highly specific aptamer as capturing probe and polyclonal antibody as revelling probe

Fig. 4 – ELISA like assay format.





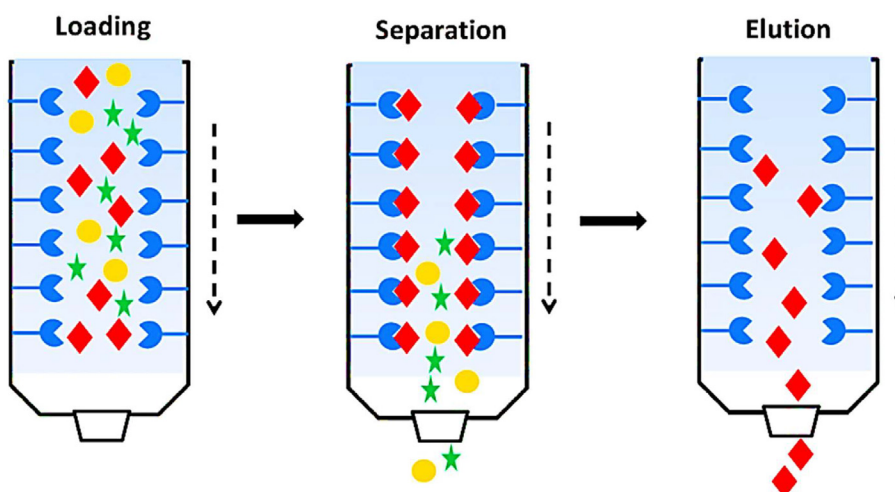
**Fig. 5 – Aptamer blotting platform. A. Antibody and aptamer-based sandwich assay: Polyclonal antibody used as capturing probe and specific biotinylated antibody used as revelling antibody. B. Direct aptamer-based assay: Highly specific biotinylated aptamer used as capturing of precoated antigen C. Aptamer-antibody based sandwich assay: Highly specific aptamer as capturing probe and polyclonal antibody as revelling probe.**

the duration of incubation and increases sensitivity [37]. On the other hand, aptamer blotting is performed either for target molecule elucidation or aptamer selection. During aptamer selection, the desired target specific bound aptamer can be selected by cutting out the desired band from the nitrocellulose membrane, which was incubated with a labelled randomized aptamer library. Ogasawara and co-workers have successfully selected aptamers performing aptamer blotting against mouse prion protein PrP only in 4 rounds of SELEX [19].

## 6. Aptamer based affinity chromatography assay

Ligands used in affinity chromatography can be substituted with aptamer due to small size, flexibility, and good attach-

ment chemistry which provides greater attachment density and less harsh elution in comparison with the antibody. Packed columns or capillaries coated with aptamers are used as an immobilized matrix for aptamer-based chromatography [38] (Fig. 6). Recombinant human L-selectin-Ig fusion protein was purified from the ovary cell medium by using DNA aptamers [39]. The immobilization of aptamers was carried out via biotin-streptavidin interaction and the column was connected to an HPLC system. Similar studies had been carried out for purifications of RNA polymerase of Hepatitis C virus [40], yeast replicase and telomerase [41]. Aptamer chromatography can also be used to separate, closely related proteins such as isomers and enantiomers. A successful study has been performed by using a fused silica capillary coated with DNA aptamers on the inner surface for the separation of casein, lactalbumin and 6 isoforms from bovine milk [42].



**Fig. 6 – Aptamer-based affinity chromatography-based assay platform.**

## 7. Aptamer arrays

Typically, antibody-based arrays are used to discover novel biomarkers and diagnose disease through the detection of certain illness-associated proteins in biological samples. Most of the antibody-based array uses labelled secondary antibodies for visualization of the target. Recently, due to certain properties of aptamers such as they can be modified conveniently; hence, their attachment and detection chemistries are flexible and exhibit lower cross-reactivity and false-positive results making them enticing ligands for different array format [43]. Moreover, aptamers have decreased liability, that can be stored for a longer period and are potentially reusable. Microarrays have been used to characterize the aptamer candidates after selection [44] (Fig. 7). Selected aptamers were immobilized onto a microarray surface and incubated with labelled target. After incubation, the affinity of the candidates is estimated by monitoring the signal. The Microarray technique has been employed to determine the binding site of an aptamer by incubating different truncated variations sequences of aptamer with a target [45]. Further-

more, Knight and co-workers and Platt and co-workers have demonstrated SELEX procedure employing microarray chips [46]. During Microarray chip-based selection, a randomized *in-silico* generated library was synthesized at distinct places on a microarray and incubated with target. The binding was monitored and new sequences for the next round of selection were generated via a genetic algorithm. The multiplex aptamer arrays are being synthesized through *in-situ* DNA synthesis and these arrays can fulfil the limitation in the diagnostics field. Most recently, Photo aptamer technology and Photo aptamer arrays are discovered by Soma Logic Inca Company founded by SELEX co-discoverer, Larry Gold for a simultaneous sensitive, specific analysis of thousands of proteins [47].

## 8. Apta PCR assay

The high affinity and specificity of aptamer make them an ideal probe in a variety of applications for the development of diagnostics platform for pathogen. The DNA aptamers can be used as recognition element for target cells as well as a template for PCR amplification which eliminates the

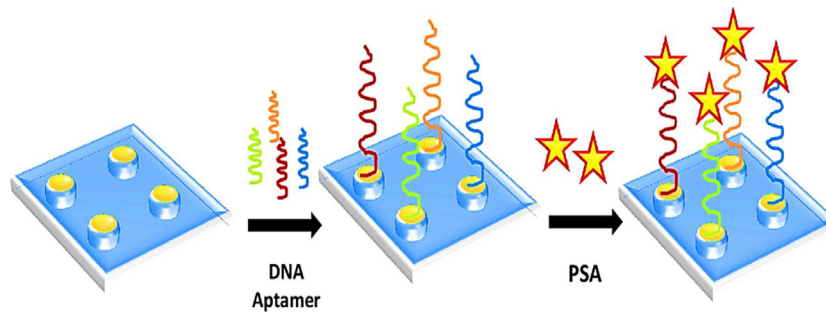


Fig. 7 – Aptamer microarray-based assay platform.

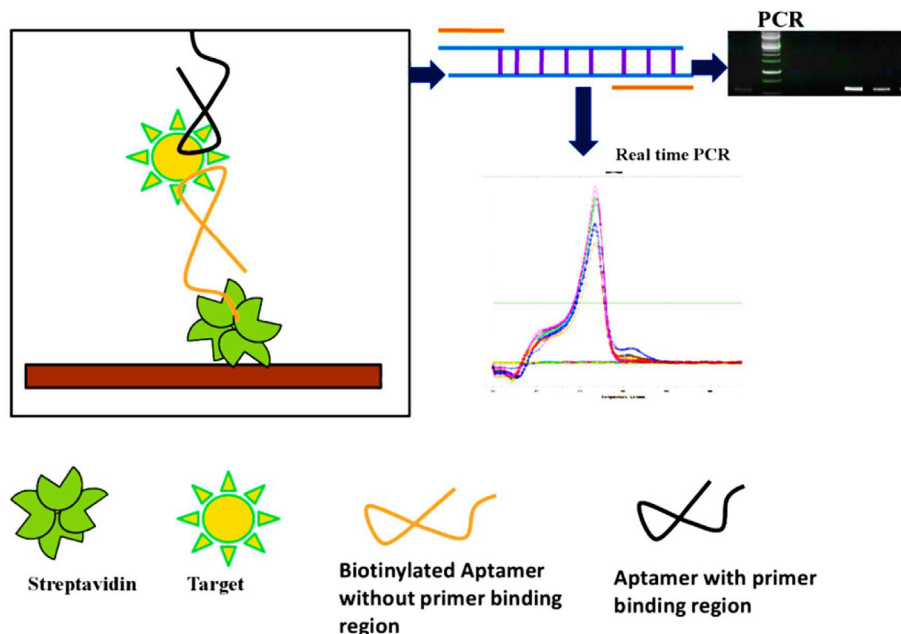


Fig. 8 – Apta PCR assay.



need for intense labelling and separation process. Combining the advantages of PCR for amplifying specific DNA sequences and DNA aptamers that binds specifically to target molecules was demonstrated for the rapid detection of pathogens known as Apta-PCR assay (Fig. 8). The researcher also developed real-time Apta-PCR which represents a progression and simplification of Immuno-PCR, where a single aptamer molecule specific for the target replaces the cumbersome antibody-DNA complex [48]. Recently, a number of assays have been developed which combined specificity aptamer and sensitivity of qPCR for the ultrasensitive detection of proteins including nuclease protection assay [49] and a proximity ligation assay [50]. Similar to ELISA like platform, different types of real-time Apta-PCR have been developed, which includes direct or indirect sandwich and competitive Apta-PCR assays [51,52]. A real-time based apta-PCR has been reported for detection of thrombin, where the thrombin specific aptamer act as a recognition ligands and amplification via real-time PCR [53]. In sandwich Apta-PCR, a capture affinity molecule (aptamer/antibody) is immobilized to capture the target analyte, which is sandwiched with a reporter aptamer. This format is highly specific as each of the capture and reporter ligands bind to a specific region on the target. In another study, a competitive Apta-PCR for gliadin exploits where competition for the aptamer takes place between the surface-immobilised gliadin and gliadin in the target samples. Following competition, aptamer bound to the immobilised gliadin was eluted and amplified using real-time PCR. The sensitivity of the assay was approximately 2 nM [54].

## 9. Aptamer based Lateral flow assay (LFA)

Paper-based LFA platforms have gained importance in the diagnostics field due to its potential to provide results in less

time and required only addition of sample by end-user. Due to the low development cost, ease of production, LFAs have been widely used in several fields which include pharma, environmental testing, animal health, food and feed testing, plant and crop health testing etc., (Fig. 9). The assay can be performed by a healthcare professional or even by the patient in a laboratory, clinic or home. Aptamer-based lateral flow assays (ALFAs) are an emerging field of aptamer applications due to its infinite potential applicability in various fields [55].

Several lateral flow assay formats have been developed exploiting aptamers as the bio-recognition ligands, with the majority being based on either sandwich or competitive assays. The most popular developed method for immobilization of aptamer as a capture ligand is based on biotin-streptavidin interactions, where the aptamer is modified with a biotin molecule which binds to a nitrocellulose strip-immobilized streptavidin [56]. The direct immobilization of aptamer to the nitrocellulose membrane via an amino-terminal group using UV treatment is known to have a huge effect on assay performance as it leads to slow flow rate which can result in non-specific binding or false positives results and also produce lower sensitivity. However, a major concern for developing aptamer-based LFAs for the detection of cells, as low sample volume conventionally applied to LFAs, typically contain low concentrations of target cells which decreases the chance to detect any cells without pre-concentration steps. Le and coworker developed sandwich-like LFA for the detection of the influenza H3N2 strain by using a highly specific biotin-modified aptamer with a less specific antibody conjugated to AuNPs. The LFA showed high selectivity and good sensitivity with a LOD of  $2 \times 10^6$  virus particles [57]. Frohnmeyer and coworker have developed a LFA for the detection of cholera toxin employing a novel combination of aptamer as capturing agent and GM1 cell

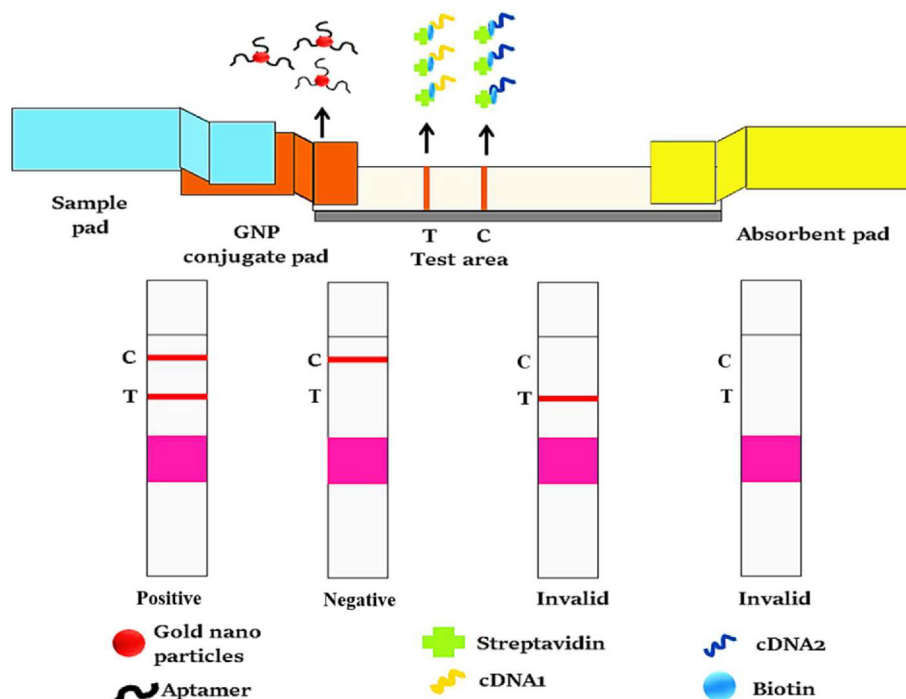


Fig. 9 – Aptamer based lateral flow assay (LFA).

receptor-labelled liposomes for cholera toxin detection [58]. In another study, Fang and co-worker have developed an extraction-free Nucleic Acid-Based Lateral Flow Assay (NALFA) using aptamer for rapid detection of *Salmonella enteritidis*. In these assays aptamer binding to the outer membrane of *S. enteritidis* is used as a template for nucleic acid amplification and subsequent detection by NALFA [59].

## 10. Fluorescence based assay

Applications of nucleic acid aptamers as a new class of molecular recognition probes in bio-analysis and biosensor development are increasing with time. The development of general and simple signalling strategies to transduce aptamer target binding events into detectable signals is most demanding. Aptamers can be integrated with diverse nanomaterials, manifesting advantages of both aptamers and nanomaterials for development of various pathogen detection platforms [60]. Quantum dots (QDs) are unique and effective fluorescent nanomaterials that are widely used in biomedical, environmental and food safety applications with respect to development of detection assays [61]. In comparison with fluorescence dyes, QDs show many advantages for development of fluorescence-based assay, including stable fluorescence, high quantum yields, narrow and symmetric signal emission bands and prolonged detention of the analyte under flow conditions. Several aptamer-based fluorescence assays have been developed (Fig. 10). Ikanovic and co-worker have developed QDs with carbon nanotubes (CNTs) based fluorescence biosensor for detection of *Bacillus thuringiensis* spores with a sensitivity of  $10^3$  CFU/mL [62]. In another study, Ren and co-worker have developed an aptamer-based fluorescence assay for the determination of *Salmonella typhimurium*. The detection and quantification of *S. typhimurium* is carried out by employing a combination of aptamer-coated  $\text{Fe}_3\text{O}_4$  magnetic particles (Apt-MNPs) and QD-labelled ssDNA2 (complementary strand of the aptamer) where Apt-MNPs are used for the capture of *S. typhimurium* and CdTe QD-labelled ssDNA2 was used as a signal indicator probe [63]. Zhang and co-worker employ bi-functional DNA aptamer-QDs to detect H1N1 from clinical samples [64]. In another study, Ramlal and co-workers has developed dual labelled fluorescence assay for detection of *S. aureus* from food samples.

The assay employs two different aptamers for selective capture and fluorescence signal generation with a sensitivity of  $10^2$  CFU/mL [65].

Nuo and co-workers has reported dual fluorescence resonance energy transfer (FRET) detection platform for *Vibrio parahaemolyticus* and *Salmonella typhimurium* based on green-emitting quantum-dots (g QDs) and red-emitting quantum-dots (r QDs) as donors, and novel amorphous carbon nanoparticles (CNPs) as acceptor. The assay able to detect as low as 25 cfu/mL and of 35 cfu/mL simultaneously [66]. In another study, Weng and co-worker describes the detection of noroviruses from clinical sample employing norovirus-specific aptamer labelled with 6-carboxyfluorescein, multi-walled carbon nanotubes (MWCNT) and graphene oxide (GO) [67]. Another advance field for aptamer is bio-imaging using conjugated aptamer to a fluorophore. Sajal and co-workers developed Smartphone-based detection platform for multi-drug resistant *Staphylococcus aureus* from minimally processed samples using fluorescent magnetic nanoparticles [68]. Additionally, aptamers have high specificity and accurate targeting that makes them attractive ligands thus increase their applicability in diagnosis or clinical analysis [36].

## 11. Flow cytometry-based assay

Flow cytometry is a bio-analytical technique which employs fluorescence and light scattering to measure the interaction of individual cells and particles in a capillary and often used as a diagnostic platform in hospitals and diagnostic laboratories. During flow cytometry analysis cells are suspended in a fluid stream and sheath fluid used to hydro-dynamically focus the cell suspension through a small nozzle. Thus, singular cells pass through a laser beam one after another and data can be collected up to a throughput of many thousands of cells per second. The parameters analysed during flow cytometry analysis are light scatter caused by the cell and the fluorescence emitted from probes used to label the cell [69]. The ability to immediately analyse enormous quantities of pathogens and increasing automation of the process makes it a promising technology for the era of diagnostic microbiology and system biology. Now a days, the Flow Cytometry platform is widely used for the detection and analysis of pathogen populations in clinical, environmental and

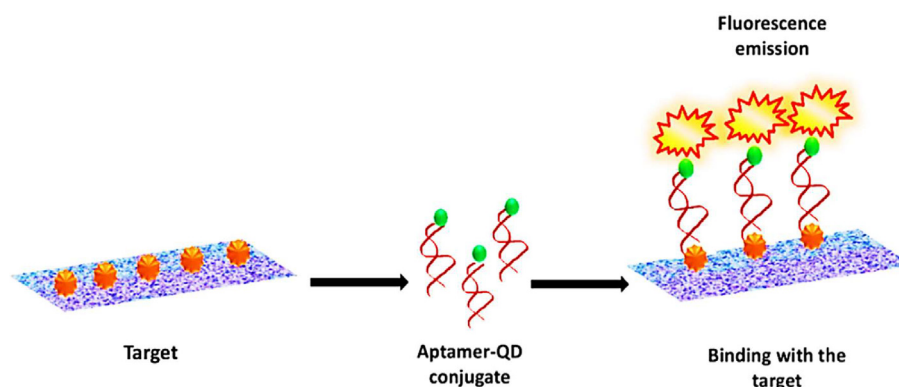
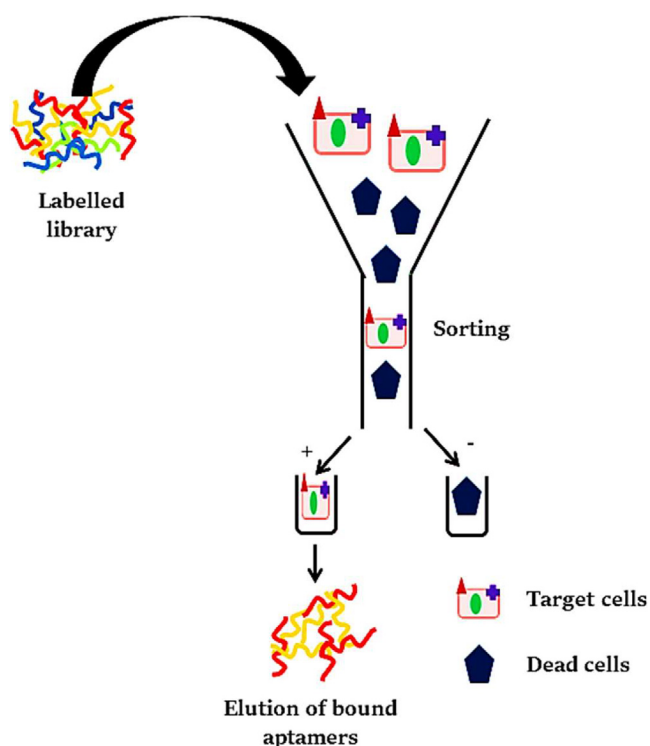


Fig. 10 – Aptamer fluorescence-based assay platform.



**Fig. 11 – Whole-cell SELEX in conjunction with cell sorting.**

research applications. Aptamers can be used to specifically label certain cell surface molecules of the pathogen for subsequent analysis and detection of the pathogens (Fig. 11). Lavu and co-workers employed flow cytometry-based analysis to evaluate the specificity of selected aptamers against *S. flexneri* [70]. In a study, Dwivedi and co-worker employed flow cytometry for characterization of aptamer against *Campylobacter jejuni* [71] and in another study against *Salmonella typhimurium* using a whole-cell SELEX was performed in conjunction with cell sorting to generate highly specific aptamer [72]. In a study, Hibi and co-worker characterized and validated their aptamer against *Listeria* sp. through flow cytometry analysis for the development of an aptamer-based detection platform [73]. In another study, Nuo and co-workers has demonstrated flow cytometry-based method for the detection of *Vibrio parahaemolyticus* and *Salmonella typhimurium* using quantum dots (QDs) as a fluorescence marker coupled with aptamers as

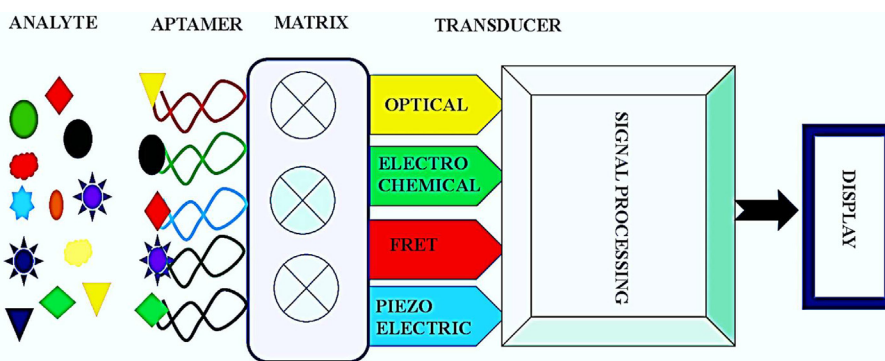
the molecular recognition [74]. Therefore, the applicability indicates flow cytometry could be an attractive viable platform for selection of aptamer and aptamer-based diagnosis for pathogens.

## 12. Aptamer based biosensors platform

Over the past two decades, nucleic-acid aptamers-based pathogen detection biosensors have attracted major attention due to good selectivity, specificity and sensitivity of the platform [9] (Fig. 12).

A wide range of biosensor platforms have been developed, most of which have employed electrochemical, optical and mass-sensitive analytical techniques, where each strategy can be coupled with various signalling methods [75]. Aptamers exhibit many advantages as recognition elements in biosensing when compared to traditional antibodies therefore, many antibody detection platforms for pathogen have been replaced by improved performance-based aptamer sensors [75]. Surface plasmon resonance (SPR) is the most promising optical biosensor platform for the detection of pathogens where measurement of signal is carried out based on the changes in the refractive index caused by structural alterations in the vicinity of a thin film gold surface [76]. Bai and co-workers have described a SPR Apta-sensor for quickly detecting avian influenza virus (AIV) H5N1 [77]. Similarly, Tombelli and co-workers have developed a SPR sensor for the detection of Tat protein in HIV-1 [78]. Another promising field of a biosensor is surface-enhanced Raman scattering (SERS) as the platform possesses high sensitivity, fingerprinting capability and has been applied in various fields [79]. The detection and identification of pathogenic microorganisms by SERS based biosensors have recently gained attention because the sensor can detect even a single-cell from the sample matrix [80]. Wang and co-worker have developed SERS based sensor platforms for specific and sensitive detection of *S. aureus* [81]. In another study, Negri and co-workers have described a label-free SERS-based Apta-sensor to detect the nucleoprotein of influenza [82].

A study has been carried out for the development of aptamer gold nanoparticle-based colorimetric biosensor employing colorimetric property of AuNPs in presence of salt and structural flexibility of aptamer for sensitive detection of target by spectrophotometrically/naked eyes [83].



**Fig. 12 – Aptamer based various biosensors strategy.**

Electrochemical biosensor platform became attractive measurement method as it poses some advantages over optical-biosensor like operated in turbid media, offer equivalent instrumental sensitivity, easy, fast and are more amenable to miniaturization. Hence, electrochemical Aptabiosensors have wide applications in the field of biomedical detection and diagnostics, environmental monitoring and homeland security [84]. In electrochemical Aptasensors, aptamer is immobilized on the surface of the electrode as capturing ligands and categorized based on their method of producing electrical signals [85]. Among these, Aptasensors without enzymes /with enzyme-based electrochemical platform gain attention as it is simple, low cost and the binding of aptamers to targets directly in electrode surface leads to generate a measurable electrical signal. Based on impedance various Aptasensor have been described to detect influenza A virus [86] and vaccinia virus [87]. Karash and co-workers designed an analogous Aptasensor to detect H5N1 in chicken tracheal samples [88]. In another study, Sergi and co-workers describe sensitive, specific label-free impedimetric aptasensor for detection and quantification of pathogenic *E. coli* O157:H7 with a short detection time [89]. Similarly, label-free potentiometric sensor has described for detecting *Salmonella typhi* [90], *S. aureus* [91] and *E. coli* using single-walled carbon nanotubes [92]. Abbaspour and co-workers have developed a highly selective dual-aptamer-based sandwich anodic stripping voltammetry Aptasensor for the detection of *S. aureus* [93]. In a recent study, Idili and co-workers has developed an electrochemical aptamer-based (EAB) sensor for the rapid, reagentless, and quantitative measurement of the SARS-CoV-2 spike (S) protein [94]. Various enzyme-based electrochemical Aptasensor also have been developed for rapid and sensitive detection of various pathogens. Luo and co-workers have described dual aptamer-based sensor using DPV for the rapid detection of *E. coli* O111 in milk [95]. In another study, electrochemical sensing platform have been demonstrated for detection of avian influenza virus (H5N1) gene sequence using a DNA aptamer immobilized onto a hybrid nanomaterial-modified electrode. Further, to enhance the selectivity and sensitivity of the biosensor, the electrode was modified and assembled with multi-wall carbon nanotubes (MWNT), polypyrrole nanowires (PPNWs) and gold nanoparticles [96]. Field-effect transistors (FETs) are a type of voltage-controlled semiconductor device that regulates electrical behaviours with an electric field. Ruslinda and co-workers describe FET Aptasensors to detect HIV-1 Tat protein from clinical samples by measuring the distribution of the change after binding of aptamers and target molecules in FET surface [97]. Quartz crystal microbalance (QCM) is a type of a piezoelectric transducer which uses piezoelectric properties of quartz crystals to measure the changes in charges on crystal electrode surface [98]. In QCM Aptasensors, employ immobilize aptamer on the quartz crystal electrode for capturing of target. After capturing the combination of the aptamer and target changes the quality of the pole, which is then transduced into a measurable signal [99]. Minunni and co-workers describe aptamer-based QCM biosensors for the detection of Tat protein of HIV-1 from the clinical sample [100]. In other studies, Wang and his group developed ssDNA cross-linked polymeric hydrogel-based QCM Aptasensor for

the rapid detection of H5N1 [29]. Another QCM-based Aptasensor have been demonstrated by Wang and co-workers for sensitive detection of *S. typhimurium*. The assay able to detect  $10^3$  CFU/mL of *S. typhimurium* cells in less than 1hr [101]. Scanning probe microscopy with excellent resolution can detect the interactions between the sample and the aptamer probe. In a study by Pleshakova and co-workers described an aptamer specific to the HCV core antigen using atomic force microscopy scanning for mass spectral analysis [102].

### 13. Aptamer based microfluidics platform

Recently, Microfluidics technology has been widely applied in various fields including biology, nanotechnology, biotechnology, chemistry, physics, and engineering [103]. Microfluidics chips are a device or micro-channel that incorporates a fluidic system comprising steps for preparing, mixing, transporting and detecting a sample. Microfluidics handles small volumes of fluids, which are constrained to channels with dimensions of ten to hundreds of micrometres and control liquid and particles in microchannels [104]. Moreover, microfluidics can be integrated with multiple sensor arrays to increase the throughput which is closely associated with miniaturization, integration, and automation to many research areas [105]. For these reasons, microfluidics devices offer an attractive alternative with conventional systems as they can greatly reduce the time and cost for detection and diagnostics. There are three classes of microfluidics: (i) continuous-flow (ii) droplet-based and (iii) digital microfluidics. Continuous microfluidic devices consist of etched micro channels and peripheral devices which are used to manipulate a stream of fluid. In droplet-based microfluidics, micro-channels droplets are created using two or more immiscible fluids at a T-junction. Digital microfluidic systems are fundamentally different as they provide motion and control of discrete droplets on an array of planar electrostatically [106]. Microfluidics technology have thoroughly enhanced its application in aptamer-based technologies, from aptamer selection to the development of aptamer-based biosensors. Several aptamer-based Microfluidics platforms have been developed for the generation of aptamers and the detection of pathogens (Fig. 13). Zhang and co-workers described the detection of *E. coli* by employing flow cytometry-based characterized specific aptamer which integrated into a microfluidic device for selective capture of *E. coli* cells [107]. In another study, the Microfluidics device is described for multiplexed detection of the envelope proteins of Zika and Chikungunya viruses. The sensitivity and specificity of the platform depends on the formation of a protein-mediated sandwich with an aptamer-functionalized gold nanoparticle (AuNP). The colorimetric signal is obtained upon the addition of silver reagents in the channel [108]. Lum and co-workers have developed microfluidics integrated impedance-based electrochemical biosensor for rapid detection of AIV H5N1 [109]. In another study, Wang and co-workers demonstrated a fluorescent-based microfluidics device for the rapid detection of influenza viruses (influenza A-H1N1, H3N2, and influenza B) in 20 mins [110]. Zuo and co-workers developed



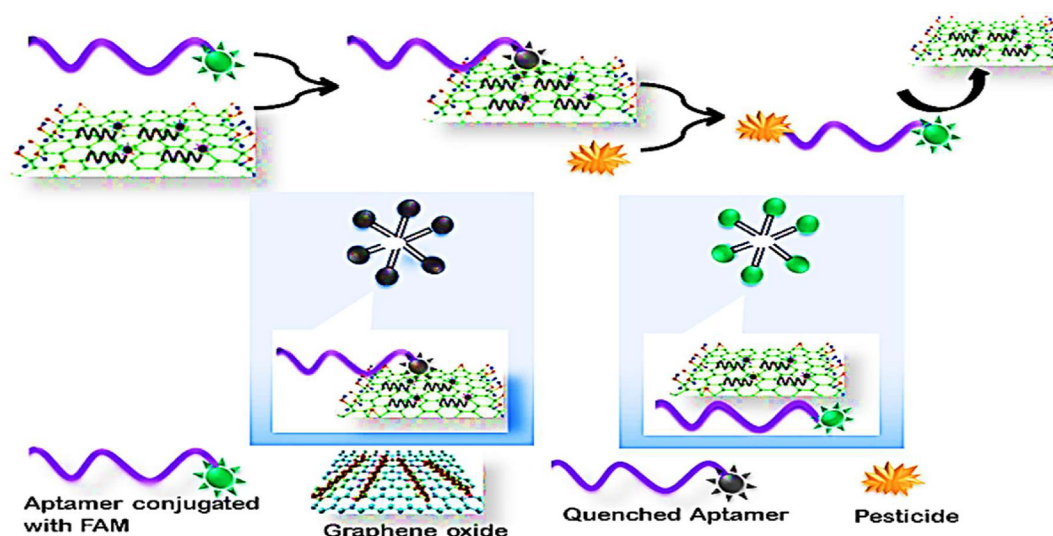


Fig. 13 – Aptamer microfluidics based assay platform. The picture adopted and modified from Weng et al., 2016 [114].

ready-to-use microfluidic Aptasensor to detect multiple bacteria (*Lactobacillus acidophilus*, *Staphylococcus aureus* and *Salmonella enterica*) with a detection limit of 11 CFU/mL in 10 mins [111]. Amongst potential applications, nanopore sensors (nano-scale pore with the voltage applied across) can be readily incorporated with aptamer technology, thus allowing for real-time observation of the aptamer interactions with their respective targets. In summary, emerging fields such as microfluidic-based pathogen sensing systems are still young and extensive research is required to make it a universal acceptable platform for pathogen detection.

#### 14. Conclusion and future perspective

The ever-expanding spectrum of pathogens continues to pose a great threat to human health and world markets. To overcome these problems, successful pathogen-diagnostic systems with enhanced multiplex capacity, sensitivity, selectivity, speed and cost-effectiveness need to be developed. Aptamers are a new generation of affinity molecules that can serve as suitable ligands and are being increasingly applied in research for the development of diagnostics. Aptamer based products are gaining traction and a few aptamers-based products are already available in the clinic [111]. While there are undeniable advantages to using aptamers over antibodies, there remain challenges associated with its generation and wide usage. In general, while antibodies represent a tried and tested modality for diagnosis and treatment of virtually every clinical application [3]. Moreover, aptamer generation requires specialized expertise and the success rate for generating targeted aptamers with pre-defined avidities and affinities remains low relative to antibodies. Indeed, there are major gaps in developing aptamers for clinical and diagnostics applications that must be overcome for the technology to reach its true potential [5,112]. Applications of aptamers in pathogen detection can be improved by (I) improving aptamer selection technologies; (II) understanding the 3D modelling of aptamers and other important parameters influence binding affinity of an aptamer to its target.

Apart from diagnostics, aptamers are being tested for numerous other applications such as cancer immunotherapy, antiviral therapy, targeted drug delivery and drug discovery among others [113]. Truly aptamers represent the next wave of “synthetic antibodies” in the field of molecular diagnostics [114].

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#### Informed consent

NA.

#### Consent to participate

NA.

#### Consent to publish

NA.

#### Authors contributions

Ms. Kauser Banu was involved in writing manuscript, picture designing and literature searches. Bhairab Mondal has designed and drafted the manuscript. Ms. Bhawana Rai wrote the first draft of the manuscript with the tables and figures. Ms. Monica N wrote the final draft and references correction. Dr. Raju H involved in reference correction and final drafting of the manuscript. All authors read and approved the final manuscript.

## Availability of data and materials

NA.

## Author's statement

Dr. Bhairab Mondal has designed and drafted the manuscript. Ms. Kauser Banu was involved in writing manuscript, picture designing and literature searches. Ms. Bhawana Rai wrote the first draft of the manuscript with the tables and figures. Ms. Monica N. wrote the final draft and references correction. Dr. Raju H involved in reference correction and final drafting of the manuscript. All authors read and approved the final manuscript.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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**Department of Industrial Engineering and Management**

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# **Skill Lab Report On Volvo Process Room**

**5<sup>th</sup> Semester  
Batch-B1  
2023-24**

## SCHEDULE

<b>Timing</b> <b>Date (Day)</b>	<b>9.30 am - 11.00 am</b>	<b>11.30 am - 1.00 pm</b>	<b>2.00 pm - 5.00 pm</b>
26 Feb 2024 Monday	Orientation and Team Formation	Product Ideation	Brain storming
27 Feb 2024 Tuesday	Product Engineering	Prototype Development	Clay Modelling
28 Feb 2024 Wednesday	Production Preparation	Prototype Iteration and Feedback	Flow Process Chart
29 Feb 2024 Thursday	Production and Logistics	After market & warranty	Excel and Open Tabs
01 Mar 2024 Friday	Pitch Development and Practice	Final Prototype Refinement	Group Activity

## **Theme & Goals**

- The theme of the hackathon was "manufacturing in the automobile sector," and students were tasked with addressing problems related to products and processes in this industry. The specific goals of the skill lab were:
- To equip IEM department students with a comprehensive understanding of the product development process in the automotive industry, from ideation to after-sales service.
- To develop critical thinking and problem-solving skills by challenging students to address real-world manufacturing challenges.
- To foster teamwork, communication, and creativity through collaborative activities and interactive sessions.
- To provide students with exposure to industry practices and expertise through guest speakers and potential collaborations with Volvo.



# SUMMARY REPORT OF VOLVO PROCESS ROOM SKILL LAB

The RV Volvo process room skill lab was conceptualized in the month of February 2023. The entire experience lasted for about a week during which students from Industrial Engineering were involved with various activities and interactive sessions, in the form of a hackathon focusing on Volvo's themes and the automobile sector in general. The outcome is the presentation of the teams addressing various problems prominent under the theme "Manufacturing in the automobile sector".



## DAY 1 : Monday (26<sup>th</sup> February)

### Product Ideation:

**Session Focus:** Brainstorming potential problems and solutions related to "manufacturing in the automobile sector." Techniques like mind mapping, double diamond structure and SCAMPER were taught.

**Activities:** Group discussions, interactive exercises, faculty guest speakers sharing real-world challenges from the industry.

### 9-11am - Intro & Ideation:

The day began with an introduction to the skill lab, setting the tone for the week ahead. Participants were briefed on the objectives of the lab and were divided into groups of four. Later were introduced to the ideation process.

### 11:30 - 1:30 - Intro to Process Room & briefing:

Participants were given a walkthrough of the process room, familiarizing them with the equipment and resources available for their projects. A detailed briefing was provided on how to effectively utilize the facilities.

### 2-3:30 - Phase Introduction:

The afternoon session focused on introducing the different phases of the skill lab process. Participants gained an understanding of the sequential steps involved in the project, laying the groundwork for the days to come.

**101 session:** The day concluded with a highly enriching one-on-one session facilitated by trained Volvo members, consisting of both mechanical and industrial engineering department. This brought an exchange of knowledge and insights between students.



## Day 2: Tuesday (27<sup>th</sup> February)

### Product Engineering

**Session Focus:** Understanding the technical aspects of designing and developing a product, including materials, components, and systems. **Activities:** Lectures on engineering principles, workshops on using design software, and rapid prototyping and clay mockups was addressed by mechanical dept.

#### 9-11am - Product Engineering:

The day started with a deep dive into engineering principles relevant to the projects at hand. Participants explored concepts such as design optimization, material selection, and structural analysis.

#### 11:30 - 1:30 - Phase Intro:

Building on the previous day's phase introduction, participants delved into the specifics of the engineering phase. They learned about the key tasks and challenges they would encounter in this stage of the project.

#### 2-3:30 - Rapid Prototyping-I:

The afternoon session focused on rapid prototyping techniques, equipping participants with the skills to quickly iterate and refine their designs. Hands-on exercises allowed them to put theory into practice.



## Day 3: Wednesday (28<sup>th</sup> February)

### Product Preparation & Production:

**Session Focus:** Learning about the processes involved in preparing a product for production, such as prototyping, testing, and quality control and exploring the different stages of manufacturing a product, including assembly, logistics, and supply chain management.

**Activities:** discussions on quality control procedures, case studies of product development challenges and simulations on product flow and production through Arena software.

### 9-11am - Preparation & Production:

Participants were introduced to the preparation and production phase, where they would bring their designs to life. Topics such as manufacturing processes, supply chain management, and quality control were covered.

### 11:30 - 1:30 - Phase Intro:

A detailed overview of the preparation and production phase was provided, highlighting the importance of efficiency and precision in execution. Participants were encouraged to start planning their production processes.

### 2-3:30 - Arena Simulation-I:

The afternoon session focused on utilizing Arena simulation software to model and optimize production processes. Participants learned how to simulate various scenarios and identify bottlenecks in their workflows.





## Day 4: Thursday (29<sup>th</sup> February)

### Logistics & Aftersales

#### 9-11am - Logistics & Aftersales:

The day began with a focus on logistics and aftersales support, essential components of any successful project. Participants learned about inventory management, distribution strategies, and customer service.

#### 11:30 - 1:30 - Phase Intro:

Participants received a detailed introduction to the logistics and aftersales phase, emphasizing the need for seamless coordination and responsiveness to customer needs. Strategies for building long-term customer relationships were discussed.

#### 2-3:30 - AnyLogic Simulation-I:

The afternoon session introduced participants to AnyLogic simulation software, offering them another tool for modeling complex systems.

Practical exercises allowed them to explore different simulation scenarios.



## Day 5: Friday (1<sup>st</sup> March)

### Pitch Development and Practice

#### 9-11am - Conclusion, Closing:

The final day of the skill lab began with a reflection on the week's activities and achievements. Participants shared their learnings and insights gained from the experience.

#### Presentation:

Participants had the opportunity to showcase their projects and present their findings to their peers and faculty members. Each group highlighted their approach, challenges faced, and solutions implemented.

#### Faculty address:

The skill lab concluded with a closing address from the faculty, who commended the participants for their hard work and dedication throughout the week. Final words of encouragement and advice were shared as participants prepared to apply their newfound skills in their respective fields.





## RESULTS OBTAINED:

At the end of the hackathon cum skill lab, teams presented a final presentation on the product/ideas based on:

### 1. Active Bending LED Headlights with Shadow Technology:

This product aims to combine active bending headlights with shadow technology to improve nighttime visibility and safety for both drivers and oncoming traffic.

#### Active Bending Headlights:

- Utilize micro-motors to adjust the direction of the headlights in real-time.

#### Benefits:

- Improved illumination of curves and bends in the road.
- Reduced risk of blinding oncoming drivers.

#### Shadow Technology:

- Integrates micro-projectors or LED arrays into the headlights.
- Projects a shadow around oncoming vehicles, excluding them from the high beam while still illuminating the surrounding area.

#### Benefits:

- Maintains high visibility for the driver without dazzling other drivers.
- Increases overall safety on the road.

### 2. Crash Detection Based Alert System based on IoT:

This system utilizes Internet of Things (IoT) technology to detect potential collisions and alert drivers in real-time

#### Components:

**Sensors:** Installed in the vehicle (radar, LiDAR, cameras) to monitor surroundings.

**Connectivity:** Cellular or satellite connection to transmit data to a central server.

**Alerts:** Visual and/or audio warnings displayed on the dashboard or transmitted through connected devices.

#### Benefits:

- Provides drivers with crucial seconds to react and potentially avoid a collision.
- Integrates with existing safety features like automatic emergency braking.
- Can be used to collect data for accident analysis and future improvements.

### 3. Addressing the Global Chip Shortage:

This project doesn't propose a specific product but rather explores solutions to the global chip shortage impacting the automotive industry.

#### Potential Approaches:

**Supply Chain Diversification:** Identify and collaborate with alternative chip manufacturers to reduce reliance on a single source.

**Inventory Management:** Optimize inventory levels to minimize disruptions and ensure critical components are readily available.

**Innovation in Chip Design:** Explore alternative materials or more efficient chip designs to reduce reliance on specific components facing shortages.

#### **4. Use of Engineered Components to Reduce Traction and Drag for Overall Efficiency:**

This concept focuses on developing engineered components that minimize traction and drag on vehicles, leading to increased efficiency and fuel economy.

##### **Potential Components:**

**Low-friction materials:** Coatings or treatments for tires and other parts to reduce rolling resistance.

**Aerodynamic enhancements:** Streamlined designs for exterior components to minimize air resistance.

**Active drag reduction systems:** Deployable wing elements or other mechanisms that adjust to optimize aerodynamics at different speeds.

##### **Benefits:**

- Reduced fuel consumption and emissions. Improved overall vehicle performance.
- Potential cost savings for drivers and manufacturers.

## **CONCLUSION:**

The RV Volvo Process Room Skill Lab proved to be a successful platform for IEM department students at RVCE to showcase their creativity and problem-solving skills in addressing challenges faced by the automotive manufacturing sector. The week-long hackathon, themed "manufacturing in the automobile sector," yielded a diverse range of innovative product ideas and potential solutions to real-world problems.

The proposed solutions, including active bending LED headlights with shadow technology, an IoT-based crash detection alert system, strategies to address the global chip shortage, and the use of engineered components to reduce traction and drag, demonstrate the students' ability to think critically, apply their knowledge, and collaborate effectively.

This skill lab not only equipped students with valuable insights into the complexities of automotive manufacturing but also fostered their potential to become future leaders in the industry. By continuing to provide such opportunities for experiential learning and collaboration, institutions can empower students to develop innovative solutions and contribute meaningfully to the advancement of the automotive sector.



## FEEDBACK

USN \*

1RV21IM021

Your Feedback \*

During our skill lab it was very informative and it covered product ideation and product engineering . overall it was good sessions and good skill development.

1RV21IM005

Your Feedback \*

The sessions were informative and interactive. Gave us a good perspective on how the actually industry works.

USN \*

1RV21IM001

Your Feedback \*

The volvo skill lab has helped us gain knowledge in the fields of product engineering, supply chain, logistics etc which are IEM core. These have helped in understanding proper sequence of processes and will be helpful for our academics and placements.

USN \*

1RV21IM018

Your Feedback \*

The sessions were helping in bridging gap between academia and industry practices. Would appreciate addition of models and videos for better understanding.



## **Women in Cloud Center of Excellence in India**

Women in Cloud is a community-led economic development organization taking action to generate \$1B in net new global economic access for women entrepreneurs by 2030 through partnerships with corporations, community leaders, and policymakers. RVCE in collaboration with the Women in Cloud network has established a Center of Excellence with the main objective of empowering women on cloud technological skills and accelerating employability options established in March 16<sup>th</sup> 2022 in the RVCE campus.

The WiC CoE in India work towards majorly in the following aspects:

- Digital Skilling which encompasses skilling of underprivileged and economical background students for the computer fundamentals knowledge.
- Internship which spans for either 1 or 2 month period based on the requirements for both Undergraduate and Postgraduate engineering students for enriching their technical skills for industry readiness.
- Facilitates hands on sessions using the maximum of open source tools like Docker, Kubernetes, Github and IBM cloud.

The following events are organised and attended as a part of Women in Cloud CoE in India:

<b>AY: 23-24</b>			
<b>Sl No</b>	<b>Event Description</b>	<b>Date</b>	<b>Participants</b>
1	Internship Training for both UG and PG students of RVCE and outside colleges	03.12.23 – 03.01.2024	100
2	Interndhip Training for UG students	22.10.2023 to 22.11.2023	20
3	empowHERaccess at VEEAMON 2023 Industry Tour Bangalore Sep8th 2023- Panel discussion and awards ceremony	08.09.2023	200+ Academia & Industry
4	Internship Training for UG and PG students	22.11.2022 – 20.01.2023	20



## **Women in Cloud Center of Excellence in India**

<b>AY: 22-23</b>			
6	Boeing Women in Cloud Year End Event – 2022- facilitated faculty and students from RVCE at Boeing campus	21.12.2022	15
7	Internship Training for RVITM- UG students	Oct to Nov 2023	35
8	Interaction with Women in Cloud, Global Delegation at RV College of Engineering, Bengaluru, India	10.08.2022	50
9	Certification Training for RVITM	April 2022	32
10	Digital skilling Training for Diploma Students- training for free with 1000\$ worth corsera certification	April 2022	42
11	Boeing WiC Interaction Event – facilitated faculty and students from RVCE at Leela Palace, Bangalore	12.04.2022	50
12	WiC, CoE in India Inception program at RVCE campus	22-03-2022	50-
13	WiC CoE in India launch program at Vikasa sowdha, Bangalore	08-03-2022	100- Industry & Academis

**Glimpses of the WiC CoE events :**





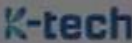



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## Department of Information Science & Engineering


# Women in Cloud Center of Excellence in India









**WIC**  
**WOMEN IN CLOUD**  
**CENTRE OF EXCELLENCE IN INDIA**  
**08 MARCH 2022**



**Basavaraj Bommai**  
Hon'ble  
Chief Minister of Karnataka



**Dr. C N Ashwath Narayan**  
Hon'ble Minister for Higher Education,  
Electronics, IT & DT, Science & Tech,  
and Development, Entrepreneurship



RV College of Engineering, Bengaluru

- Train and empower women on cloud technological skills and accelerate employability
- Promote internship and applied research in academia program
- Coordinate with Government and private organizations for Digital skilling, Sustainable partnerships and Substantial opportunity.



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## **Women in Cloud Center of Excellence in India**





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## **Women in Cloud Centre of Excellence in India**



Chaitra Vedullapalli, USA



Karen Fassio, USA



Erin Northern, USA



Debbie Uttecht, USA



Eunice Raquintan, Philippines



Maria Defante, USA



Aarati Singh, India

**RVCE Welcomes Women in Cloud Global Delegation**

 **10th August 2022**

 **RVCE Campus**



**Department of Information Science & Engineering**  
**Women in Cloud Center of Excellence in India**





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Placement RVCE <placement@rvce.edu.in>

---

## Fwd: Expert Lecture from Secure Meters

---

**Piyush Padliya** <Piyush.Padliya@securemeters.com>

Thu, Sep 9, 2021 at 1:08 PM

To: "Nagendra Guptha C. K." <nagendragupta@rvce.edu.in>

Cc: Placement RVCE <placement@rvce.edu.in>, Sanjay Shrivastava <Sanjay.Shrivastava@securemeters.com>, "Subramanya K.N." <subramanyakn@rvce.edu.in>, Kamal Pagaria <Kamal.Pagaria@securemeters.com>

Sir,

Please find attach presentation as desired by you

Regards

Piyush Padliya

Production Planning & Control

Secure Meters Limited

Ext. no. 3108

Mob: 9829079073

---

**From:** Nagendra Guptha C. K. [mailto:nagendragupta@rvce.edu.in]

**Sent:** Thursday, September 9, 2021 12:27 PM

**To:** Piyush Padliya

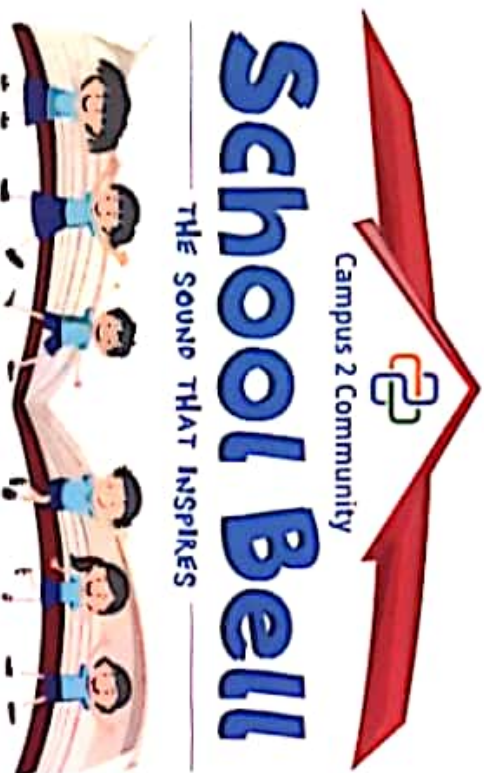
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THE SOUND THAT INSPIRES

Rejuvenation of

75 Govt. Schools

on the Occassion of

75 years of Independence



# Certificate of Appreciation


This certificate is hereby presented to


**RV College of Engineering,  
Bengaluru**


for your outstanding dedication and continuous support  
to the mass campaign of School Bell 75

Thank you for bettering the lives of our community  
members and younger generations.

Presented on March 29th, 2023

  
**Nagaraj Reddy**  
General Secretary  
Yuvaka Sangha

  
**Dr. M K Ramesh**  
Honble Vice-Chancellor  
RGUHS

  
**Dr. Prathap Lingaiah**  
State NSS Officer,  
Govt. of Karnataka





## **15) School Bell- Tumkur**

Date & Timings: 7 PM, 5<sup>th</sup> March – 7 PM, 7<sup>th</sup> March 2021.

No. of Volunteers: 14

### **Proceedings:**

The National Service Scheme (NSS) unit of RV College of Engineering, participated in a 2-day camp aimed at rejuvenating the Government School at Brahmāsandra Grama, in Sira Taluk of Tumkur District. The campaign was conducted from 5<sup>th</sup> March to 7<sup>th</sup> March 2021.

The campaign was organized as a part of the School Programme, an initiative by Campus2Community under which 150 government schools are planned to be rejuvenated to inspire the kids in rural regions of Karnataka. This campaign happened to be the 138<sup>th</sup> school to be given a new look under the programme. A total of 14 volunteers from the college participated in the event.

The volunteers were asked to assemble at the local office of Campus2Community in Bengaluru, at 7 PM on 5<sup>th</sup> March. Once all the volunteers had assembled, we were given basic instructions about the programme, and we left for Tumkur at 8 PM. Some of the enthusiastic volunteers started discussing ideas for the designs even before reaching the venue. We reached Tumkur at around 11 PM.

On the next day i.e., 6<sup>th</sup> March, we all reached the school at around 7 AM and started off with the immediately. Some of the artists from Campus2Community who had also accompanied us, drew some beautiful sketches, which were later painted by the volunteers. The group of Aerospace Engineering students, who were part of the campaign, decided to put up an inspiring and innovative painting. After some discussion, the group came up with an idea for a beautiful design, which can be found in the attached pictures. It consisted of an astronaut, a rocket developed by ISRO and some of planets in our solar system. Some of the volunteers continued with the design and the rest contributed to painting the others sketches in the campus.

The organizers had also invited students from college within Tumkur and the Principal of the Tumkur Arts College, who created some exquisite painting on the walls of





the school. The volunteers took breaks in between for food and resting at times. We worked till late in the night. After which we enjoyed for a while in front of the camp fire that was setup and some of the volunteers also participated in antakshari, which was conducted by the organizers.

We started early on the next day as well, the organizers had planned for some more beautiful sketches towards the entrance of the campus, including a sunset scenery. The volunteers from NSS, contributes to all these with great enthusiasm. Another noteworthy aspect of the second day was the abstract painting that was painted by our volunteers, which had taken up quite some time to reach a conclusion the previous night. We worked till around 4 PM on the day.

The camp ended with all of the volunteers and organizers coming together for a group photo and some of the volunteers sharing their experience on the camp and thanking Campus2Community for the opportunity they had provided us with. We left Brahmasandra at around 5 PM and reached Bengaluru by 7:30, after which the volunteers left for their places.

We would like to acknowledge and thank the whole team of Campus2Community for giving NSS RVCE this wonderful opportunity.



Image



Figure 59

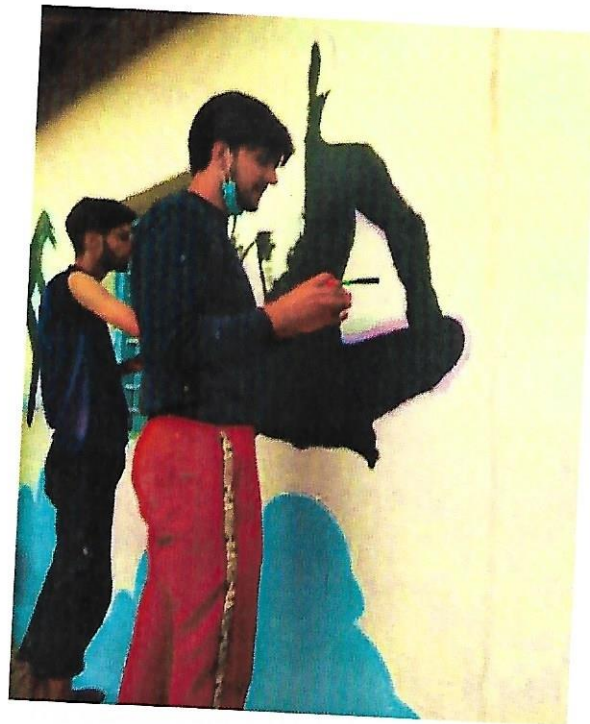


Figure 60



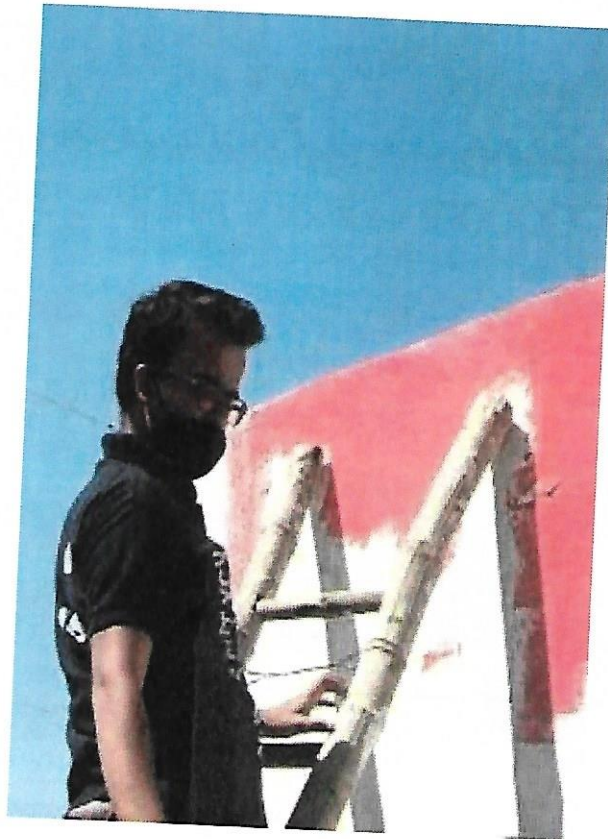


Figure 61

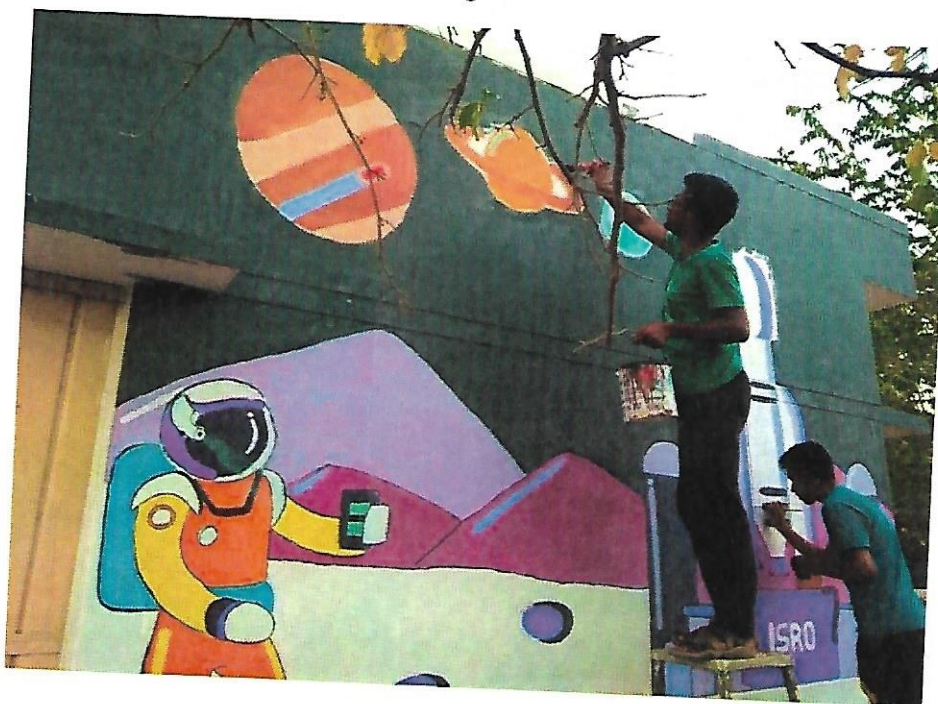


Figure 62





Figure 63



Figure 64



List of Volunteers

Sl No.	NAME	USN	SEMESTER/BRANCH
1	Arjun R Adiga	1RV18AS006	5th/AS
2	Arpan Mondal	1RV18AS007	5th/AS
3	Govardhan K	1RV18AS018	5th/AS
4	Jayasurya M	1RV18AS020	5th/AS
5	Karan H Baliga	1RV18AS021	5th/AS
6	Mohammad Hasnain Raza	1RV18AS027	5th/AS
7	Mohankumar M S	1RV18AS030	5th/AS
8	Pruthvik AM	1RV18AS042	5th/AS
9	Suresh Gowda S	1RV18AS056	5th/AS
10	Akash Kumar Singh	1RV18AS067	5th/AS
11	Narasimhamurthy H	1RV18CV068	5th/CIVIL
12	Zaffar Gani	1RV19ME412	5th/MECH
13	Shahid Bashir Malik	1RV19CV410	5th /CIVIL
14	Umer Nazir Ganie	1RV19CV414	5th /CIVIL





## 16) School Bell- Vidyagama

### Proceedings

School students are one of the most affected due to the Covid-19 pandemic. In order to help fill the gaps in their education, School Bell started a state-wide campaign- Vidyagama, to teach kids either in schools or by free private tuitions. Volunteers throughout Karnataka were recruited for this program.

Initially, a meeting was held between the NSS-RVCE core team and the School Bell team, in which more details about the program were discussed. Later, the School Bell team demonstrated the portal being used for the program. All volunteers had to register on the platform and upload details about the kids they would teach. Each volunteer could add a minimum of 3 and a maximum of 10 kids. Details such as name, age, blood group, address about the kid had to be filled on the platform. The volunteers had to update the status of the sessions as and when they were conducted. Study material prescribed by the Karnataka government were made available on the portal, for the benefit of volunteers. The material was available in both English and Kannada.

During the month of March, the students of RVCE were advised to take part in this program for the fulfilment of activity points as prescribed by AICTE & VTU. NSS RVCE organised orientation sessions for circuit and non-circuit department students. The students were made aware of the program and encouraged to take part in it. After this, an offline meeting was also organised with all the counsellors who further encouraged their students to take part in the program.





## Images

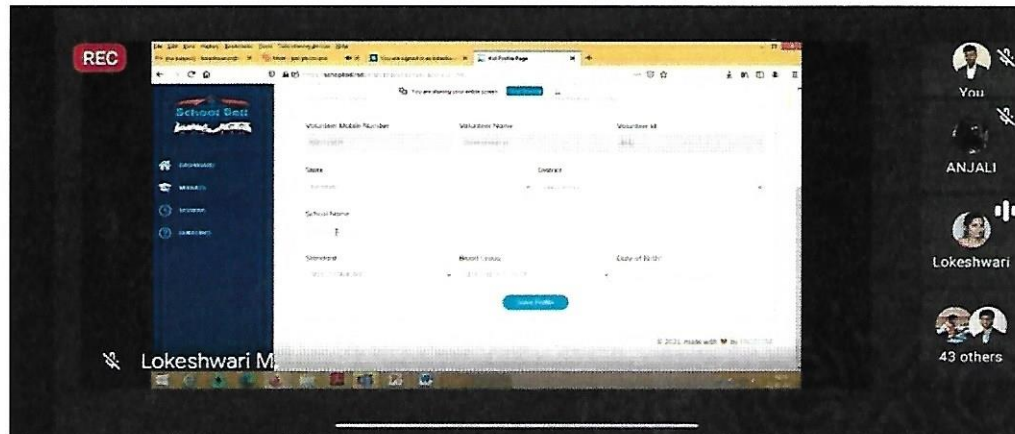


Figure 65

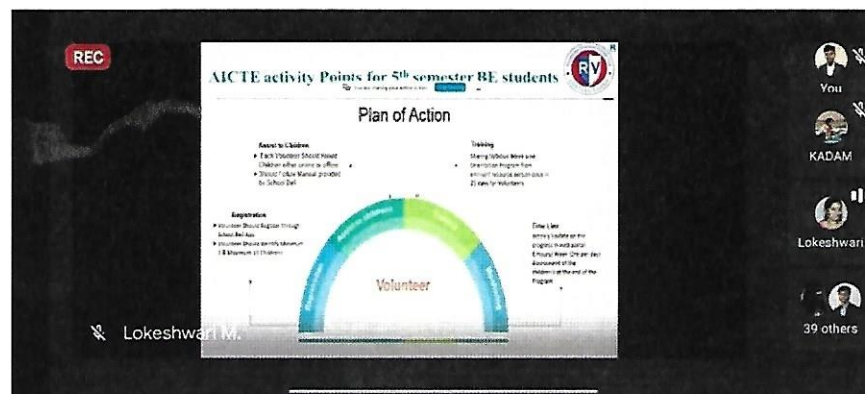


Figure 66

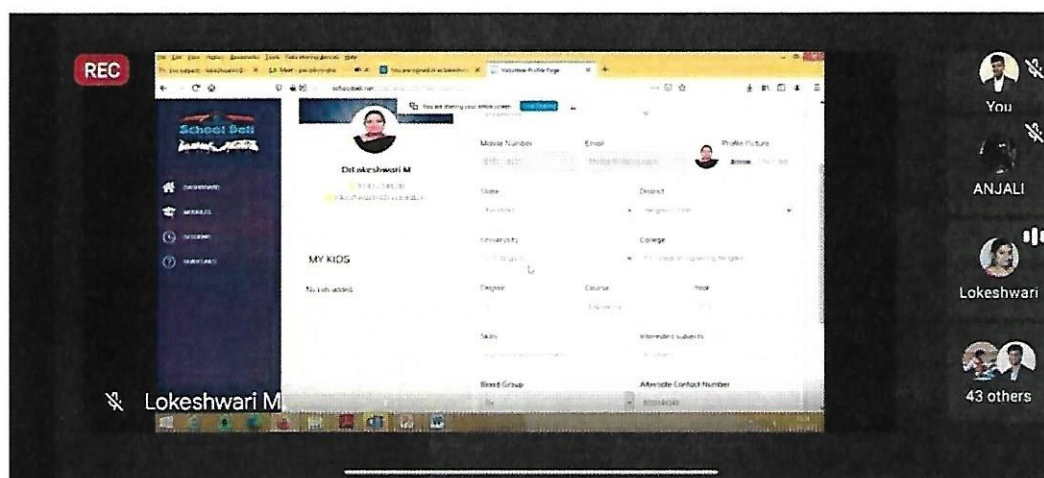


Figure 67

**Coordinator's list**

NSS program Officer Dr. M Lokeshwari appointed as coordinator for VTU affiliated colleges. She conducted separate orientation session department wise for counsellors and students. To assist the students, NSS core team members were appointed as student coordinators for each department. The student coordinators held separate sessions for their department volunteers and briefed them about the procedure to be followed.

COORDINATORS				
Sl no.	Name	USN	Year of study	Department of study
1	Thathvesh J	1RV18CV115	3rd	CV
2	Avulapati Niranjan	1RV18CS032	3rd	CS
DEPARTMENT COORDINATORS				
Sl no.	Name	USN	Year of study	Department of study
1	Abhishek Baheti	1RV18AS001	3rd	AS
2	Akash Kumar Singh	1RV18AS067	3rd	AS
3	Sunidhi Salwadgi	1RV18AS055	3rd	AS
4	Ravikrishna T	1RV18AS043	3rd	AS
5	Sarvesha Babu M	1RV19BT039	2nd	BT
6	Dhrithi Harish	1RV18CS052	3rd	CS
7	Hrishika Rai	1RV18CS065	3rd	CS
8	Karunatharaka B	1RV18CS068	3rd	CS
9	Soumya Saxena	1RV18CS168	3rd	CS
10	Venjan	1RV19CS182	2nd	CS
11	Sindhu K N	1RV18CV104	3rd	CV
12	Siri N	1RV18CV105	3rd	CV
13	A. Vaishnavi	1RV19EC035	2nd	EC
14	Anubha Mittal	1RV19EC024	2nd	EC
15	Navyashree B R	1RV18EC094	3rd	EC
16	Neha Daoo	1RV18EC096	3rd	EC
17	R Vibha Narayan	1RV18EC121	3rd	EC
18	Rutu Kiran	1RV18EC133	3rd	EC
19	Yashwanth G	1RV18EC188	3rd	EC
20	Rahul Kejriwal	1RV18TE037	3rd	ET
21	Deeraj	1RV18IM013	3rd	IM
22	Jayath S	1RV18IM019	3rd	IM
23	Sourabh R Alabanoor	1RV18ME107	3rd	ME
24	Sudhanva Joshi	1RV18ME108	3rd	ME





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## School Bell - Maddur

Date: 07/08/2021 to 08/08/2021

Number of Participants: 15.

### Proceedings:

The NSS unit of RVCE participated in a 2-day campaign aimed at rejuvenating the Government School at Bannahalli, Maddur of Mandya District. The campaign was conducted from 7<sup>th</sup> August to 8<sup>th</sup> August 2021. The campaign was organized as a part of the School Bell Programme, an initiative by Campus2Community under which 150 government schools are planned to be rejuvenated to inspire the kids in rural regions of Karnataka. This campaign happened to be the 143<sup>rd</sup> school to be given a new look under the programme. A total of 15 volunteers from the college participated in the event.

On 7<sup>th</sup> of August around 5 pm, a group of 15 volunteers left RVCE and reached the village at around 9 pm. After having dinner volunteers started sketching on the walls of the two classrooms and the compound with the guidance of a School Bell volunteer and continuously worked without sleep. The next day, on 9<sup>th</sup> of August, all volunteers started working from sharp 7 am and were involved completely in planning, sketching, painting and giving their ideas for sketching. Each one of them worked till 5 in the evening and satisfyingly painted all the walls and made the school look beautiful and better and brought a smile on the face of the school students and the villagers. The camp ended with all of the volunteers and organizers coming together for a group photo and some of the volunteers sharing their experience on the camp and thanking Campus2Community for the opportunity they had provided.

Main intention of this programme was to make those rural children happy and make learning even more fun for them in that small Govt School. Also, Govt Schools are at the edge of closure due to lack of children. This initiative has helped for the development and survival of the government schools. The satisfaction that one gets from the children's happiness when they saw their school's new look is beyond comprehension.



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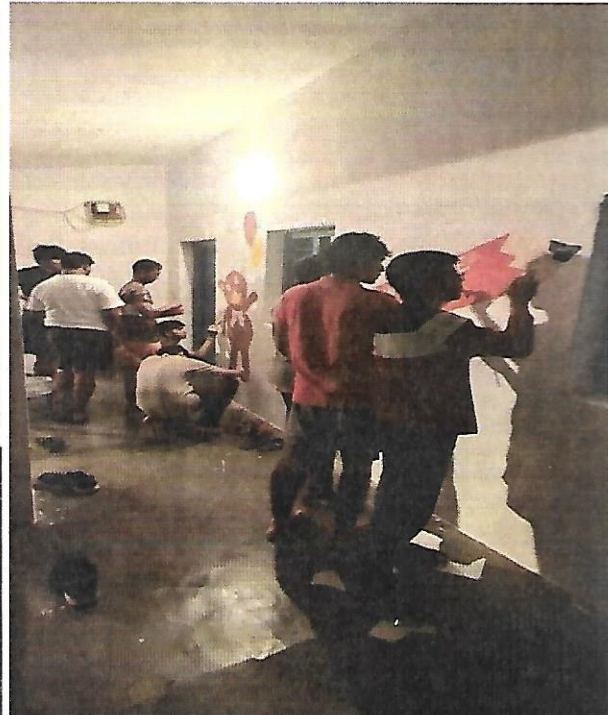
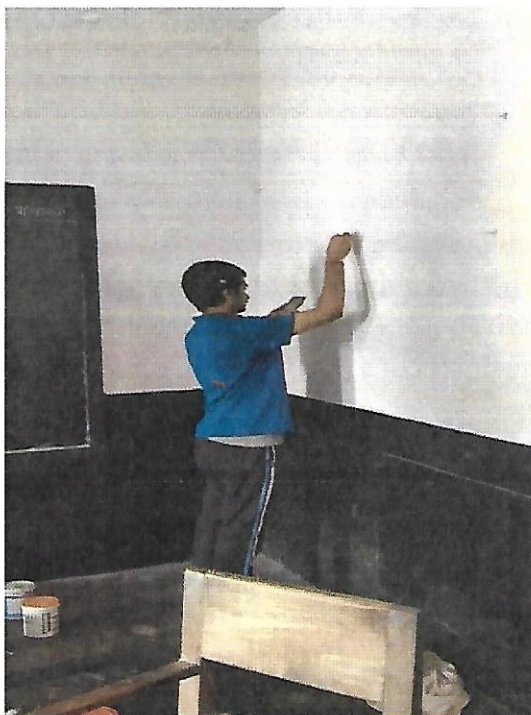
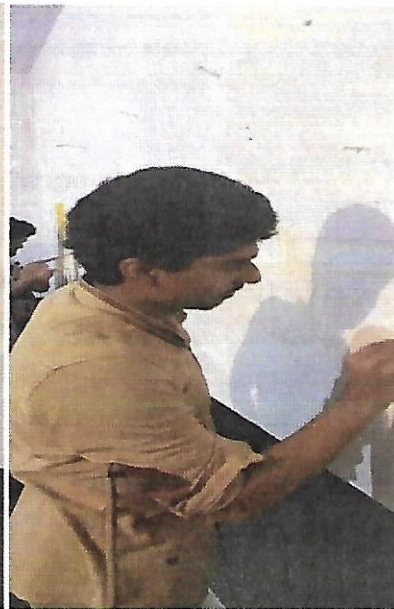
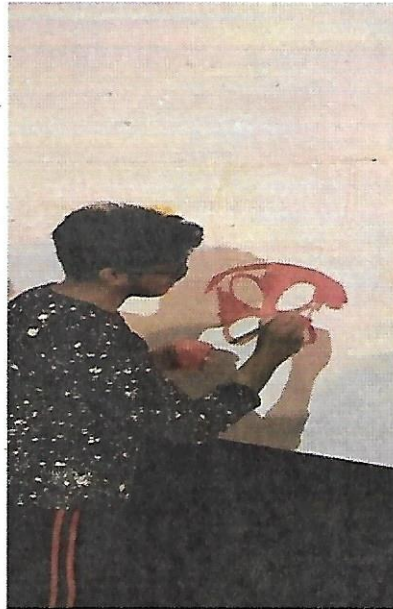
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## School Bell - Rajajinagar

**Date:** 14/08/2021

**Number of Participants:** 25

### Proceedings

The NSS unit of RVCE participated in a 1-day campaign aimed at rejuvenating the Government High School at Jugana Halli, Rajajinagar, Bengaluru. The campaign was conducted on 14<sup>th</sup> 2021. The campaign was organized as a part of the School Bell Programme, an initiative by Campus2Community under which 150 government schools are planned to be rejuvenated to inspire the kids in rural regions of Karnataka.

On 14<sup>th</sup> August around 8 am, a group of volunteers from RVCE reached the school location. Under the guidance of School Bell, volunteers started their work of colouring the outer walls of the school, compound and inside classrooms. Outer part of the compound was painted with many attractive cartoons and slogans which conveyed messages like save plants, keep surroundings and school clean etc. Inner part of the compound was painted relating folk and village theme. Classroom walls were painted with pictures of human heart, neurons, dissection of hibiscus plants and other informative paintings to make learning fun and interesting. Later, on behalf of 75<sup>th</sup> Independence Day, School Bell had organized an event to launch a programme with an aim of rejuvenating 75 Government Schools across Karnataka. Around 4 pm in the evening painting work was finished and the volunteers had that satisfaction of doing something good for the society and those children.

The campaign ended with all of the volunteers and organizers coming together for a group photo and some of the volunteers sharing their experience on the camp and thanking Campus2Community for the opportunity they had provided. Main intention of this programme was to make those school children happy and make learning even more fun for them in the government school. Also, govt schools are at the edge of closure due to lack of children. This initiative has helped for the development and survival of the government schools.

### Images:





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## School Bell – Bengaluru

**Date:** 02/10/2021 to 03/10/2021

**Number of Participants:** 20

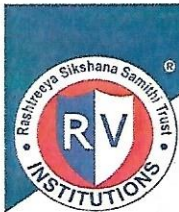
### Proceedings:

NSS unit of RVCE involved in a 2-day campaign aimed at rejuvenating the Government School near M S Ramaiah Institute of Technology, Bengaluru District. The campaign was conducted from 2<sup>nd</sup> October to 3<sup>rd</sup> October 2021. The campaign was organized as a part of the School Bell Programme, an initiative by Campus 2 Community under which 150 government schools are planned to be rejuvenated to inspire the kids in rural regions of Karnataka. This campaign happened to be the 145<sup>th</sup> school to be given a new look under the programme. A total of 20 volunteers from the college participated in the event.

October 2<sup>nd</sup>, a group of 20 volunteers left RVCE and reached the school at 11 AM. Volunteers started sketching on the walls of the two classrooms and the compound with the guidance of School Bell volunteers. The next day, on 3<sup>rd</sup> of October, all volunteers started working from sharp 7 AM and were involved completely in planning, sketching, painting and giving their ideas for sketching. Each one of them worked till 5PM in the evening and satisfyingly painted all the walls and made the school look beautiful and better and brought a smile on the face of the school students and the villagers. The camp ended with all of the volunteers and organizers coming together for a group photo and some of the volunteers sharing their experience on the camp and thanking Campus2Community for the opportunity they had provided.

Main intention of this programme was to make those rural children happy and make learning even more fun for them in that small Government School. Also, Government Schools are at the edge of closure due to lack of children. This initiative has helped for the development and survival of the government schools. The satisfaction that one gets from the children's happiness when they saw their school's new look is beyond comprehension.





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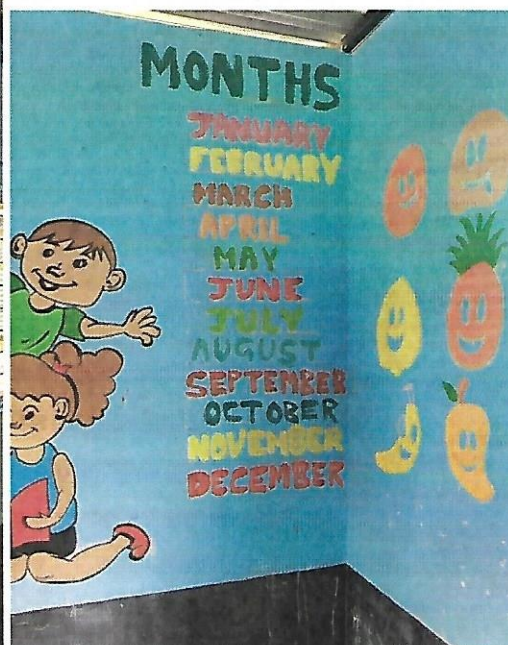
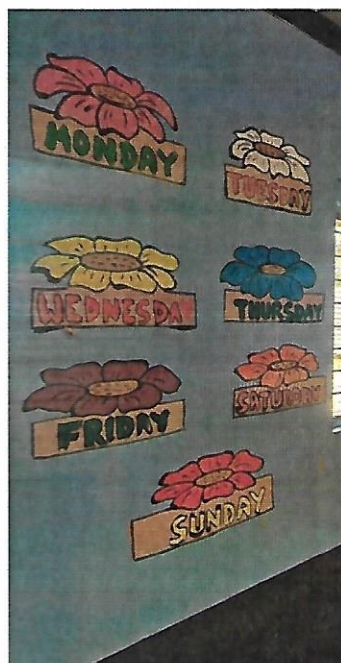
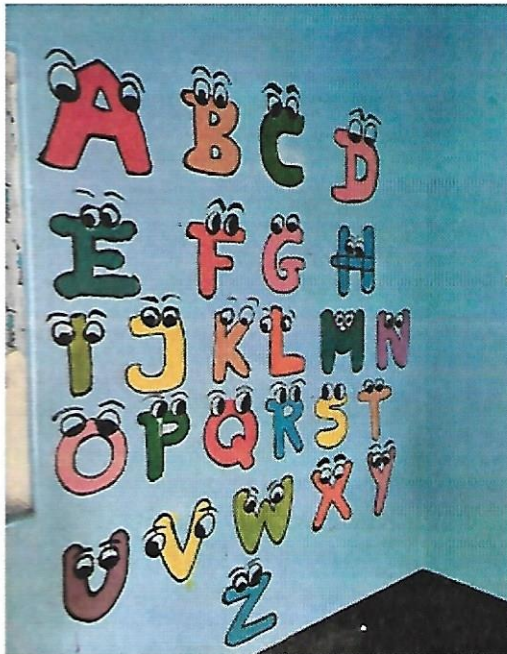


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## **School Bell - Konnapura**

**Date: 09/10/2021 to 10/10/2021**

**Number of Participants: 16**

### **Proceedings:**

The NSS unit of RVCE participated in a 2-day campaign aimed at rejuvenating the Government School at Konnapura, Malavalli of Mandya District. The campaign was conducted from 9<sup>th</sup> October to 10<sup>th</sup> October 2021. The campaign was organized as a part of the School Bell Programme, an initiative by Campus 2 Community under which 150 government schools are planned to be rejuvenated to inspire the kids in rural regions of Karnataka. This campaign happened to be the 146<sup>th</sup> school to be given a new look under the programme. A total of 16 volunteers from the college participated in the event.

On 9<sup>th</sup> of October around 8 am, a group of 16 volunteers left RVCE and reached the village at around 11 am. After having breakfast volunteers started sketching on the walls of the two classrooms and the compound with the guidance of School Bell volunteers. The next day, on the 10<sup>th</sup> of October, all volunteers started working from sharp 7 am and were involved completely in planning, sketching, painting and giving their ideas for sketching. Each one of them worked till 4 in the evening and satisfyingly painted all the walls and made the school look beautiful and better and brought a smile on the face of the school students and the villagers. The camp ended with all of the volunteers and organizers coming together for a group photo and some of the volunteers sharing their experience on the camp and thanking Campus2Community for the opportunity they had provided.

Main intention of this programme was to make those rural children happy and make learning even more fun for them in that small Govt School. Also, Govt Schools are at the edge of closure due to lack of children. This initiative has helped for the development and survival of the government schools. The satisfaction that one gets from the children's happiness when they saw their school's new look is beyond comprehension.





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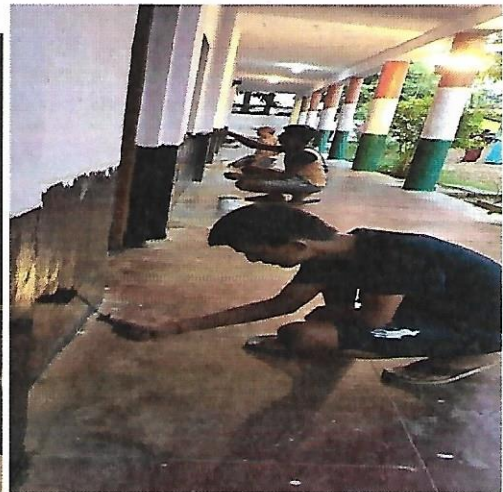
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**Images:**



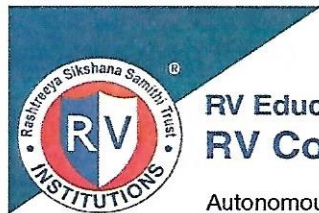
Wysore Road, RV Vidyaniketan  
Post, Bengaluru - 560059,  
Karnataka, India

080 - 68188100 / 8112

principal@rvce.edu.in  
rvce.edu.in

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## **School Bell - Bethamangala**

Date: 29/04/2022 to 01/05/2022

Number of Participants: 18

Description:

NSS unit of RVCE participated in a 3-day campaign aimed at rejuvenating the Government School at Bethamangala Town, K.G.F Taluk of Kolar District. The campaign was conducted from 29<sup>th</sup> April to 1<sup>st</sup> May 2022. The campaign was organized as a part of the School Bell Azadi ka Amrit Mahotsav Programme, an initiative by Campus 2 Community under which 75 government schools were planned to be rejuvenated to inspire the kids in rural regions of Karnataka. A total of 18 volunteers from the college participated in the event.

On 29<sup>th</sup> of April around 5 pm, group of 18 volunteers left RVCE and reached the village at around 10 pm. After having dinner volunteers started sketching on the walls of the two classrooms and the compound with the guidance of School Bell volunteers. The next day that is on 30<sup>th</sup> of April, all volunteers started working from sharp 7 am and were involved completely in planning, sketching, painting and giving their ideas for sketching. Each one of them worked till 5pm of 1<sup>st</sup> May and satisfyingly painted all the walls and made the school look beautiful and better and brought a smile on the face of the school students and the villagers. Food arrangements were as expected and the students appreciated it. The camp ended with all of the volunteers and organizers coming together for a group photo and some of the volunteers sharing their experience on the camp and thanking Campus2Community for the opportunity they had provided.





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Main intention of this programme was to make those rural children happy and make learning even more fun for them in that small Govt School. Also, Govt Schools are at edge of closure due to lack of children. This initiative has helped for the development and survival of the govt schools. The satisfaction that one gets on from the children's happiness when they saw their school's new look is beyond comprehension.





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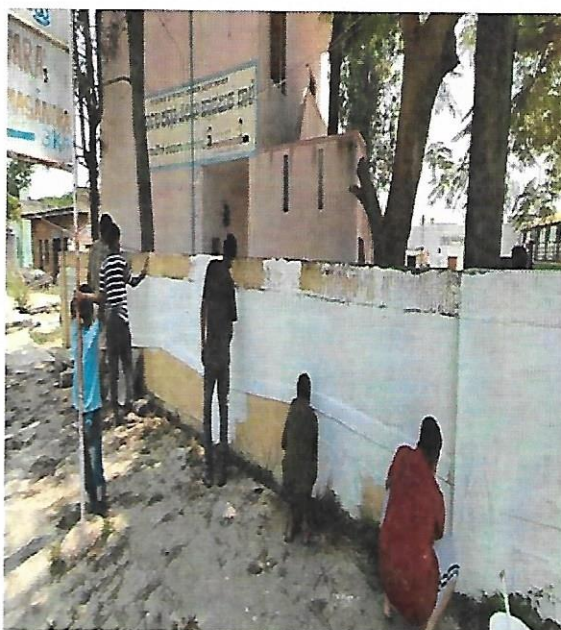
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### Images:







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## **Azadi ka Amrit Mahotsav - School Rejuvenation Program**

### **School Bell - Malavalli**

Date: 13/05/2022 to 15/05/2022

Number of Participants: 24

### **Proceedings**

NSS unit of RVCE participated in a 3-day campaign aimed at rejuvenating the Government School at Malavalli Town of Mandya District. The campaign was conducted from 13<sup>th</sup> May to 15<sup>th</sup> May 2022. The campaign was organized as a part of the School Bell Azadi ka Amrit Mahotsav Programme, an initiative by Campus 2 Community under which 75 government schools were planned to be rejuvenated to inspire the kids in rural regions of Karnataka. A total of 24 volunteers from the college participated in the event.

On 13<sup>th</sup> of April around 5 pm, group of 24 volunteers left RVCE and reached the village at around 10 pm. After having dinner volunteers started sketching on the walls of the two classrooms and the compound with the guidance of School Bell volunteers. The next day that is on 14<sup>th</sup> of May, all volunteers started working from sharp 7 am and were involved completely in planning, sketching, painting and giving their ideas for sketching. Each one of them worked till 5pm of 15<sup>th</sup> May and satisfyingly painted all the walls and made the school look beautiful and better and brought a smile on the face of the school students and the villagers. Food arrangements were as expected and the students appreciated it. The camp ended with all of the volunteers and organizers coming together for a group photo and some of the volunteers sharing their experience on the camp and thanking Campus2Community for the opportunity they had provided. Main intention of this programme was to make those rural children happy and make learning even more fun for them in that small Govt School. Also, Govt Schools are at the edge of closure due to lack of children. This





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initiative has helped for the development and survival of the govt schools. The satisfaction that one gets on from the children's happiness when they saw their school's new look is beyond comprehension.

Images:



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## R.V. COLLEGE OF ENGINEERING INTERDISCIPLINARY RESEARCH CENTER

### REQUEST FORM FOR CHARACTERIZATION OF SAMPLES

Date: 29/03/2022

Name	MR. Harini & Dr. Manjunatha Reddy, Sri Bopalan
Mobile No. & Email ID	7760126585, 9844573692
Department/Institute	Biotechnology, Sri Bopalan
Project/Requirements	GCMS of the sample
No. of sample's/Sample details	15
Test conditions	—
Additional information	—
Amount paid & Bank receipt No.	13000/- Receipt no. 670090755, 12/4/2022 (online)

### CHARGES PER SAMPLE

Instrument	Internal (RS.)	External (RS.)	Remarks
XRD Analyzer	150	500	
Scanning Electron Microscope	150	500	
NSOM/RAMAN/AFM	600/300/600	1200/1200/2400	
UV VIS NIR Spectrophotometer	250	1000	
FTIR Spectrophotometer	250	1000	
Nano Indenter	250	1000	
Thickness Profiler	100	300	
Semiconductor device Analyzer	150	600	
Solar Simulator	100	300	
Zetatrac Particle Analyser	100	300	
DSC	250	600	
AFM	600	2000	
GCMS	500	1200 x 15 (due)	18000 + 3240

**Note:** Amount to be deposited to Principal's account (The Principal, R.V. College Engineering) with service tax as per norms and receipt must be enclosed to the request form. Testing will be conducted within 4-7 working days; CD must be provided to save data for your samples.

Approved by PRINCIPAL

In-Charge  
V. N. Vidya Narayanan  
M. Sankar

APPROVED

X



## YOUR AUTHORIZATION SUCCESSFUL

Transaction with reference id 670090755 approved and processed successfully

### PAYMENT DETAILS

Ref ID	BENEFICIARY NAME	BENEFICIARY A/C
670090755	RVCE	136010112055
BENEFICIARY IFSC	AMOUNT	FREQUENCY
KKBK0008053	₹ 13,000.00	One Time

REQUESTED BY	REQUESTED DATE	TRANSACTION DATE
CHARATH	2022-04-12 03:19:33	2022-04-12 12:00:00
BENEFICIARY NICK NAME	REMARKS	
RVCE	A	





**R.V. COLLEGE OF ENGINEERING  
INTERDISCIPLINARY RESEARCH CENTER**

**REQUEST FORM FOR CHARACTERIZATION OF SAMPLES**

Date:

Name	Vishakhini V. Dr A.H. Manjunatha Reddy
Mobile No. & Email ID	9844573697 960126585 * vishakhini@sal-bioscience
Department/Institute	Sal Bioscience Pvt. Ltd
Project/Requirements	
No. of sample's/Sample details	4
Test conditions	
Additional information	
Amount paid & Bank receipt No.	Rs 4000/- Ref No. 666550673, Dt. 15.03.2022.

**CHARGES PER SAMPLE**

Instrument	Internal (RS.)	External (RS.)	Remarks
XRD Analyzer	150	500	
Scanning Electron Microscope	150	500	
NSOM/RAMAN/AFM	600/300/600	1200/1200/2400	
UV VIS NIR Spectrophotometer	250	1000	
FTIR Spectrophotometer	250	1000	
Nano Indenter	250	1000	
Thickness Profiler	100	300	
Semiconductor device Analyzer	150	600	
Solar Simulator	100	300	
Zetatrak Particle Analyser	100	300	
DSC	250	600	
AFM	600	2000	
GCMS	500	1200 1000 x 4	

**Note:** Amount to be deposited to Principal's account (The Principal, R.V. College Engineering) with service tax as per norms and receipt must be enclosed to the request form. Testing will be conducted within 4-7 working days; CD must be provided to save data for your samples.

In-Charge

Approved by PRINCIPAL



## YOUR AUTHORIZATION SUCCESSFUL

Transaction with reference id 666550673 approved and processed successfully

### PAYMENT DETAILS

Ref ID	666550673	BENEFICIARY NAME	RVCE	BENEFICIARY A/C	136010112055
BENEFICIARY IFSC	KKBK0008053	AMOUNT	₹ 4,000.00	FREQUENCY	One Time
REQUESTED BY	SHARATH	REQUESTED DATE	15-03-2022 03:21:30	TRANSACTION DATE	15-03-2022 12:00:00
BENEFICIARY NICK NAME	RVCE	REMARKS	A		



## RV College of Engineering

Department of Biotechnology

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New Delhi, Accredited  
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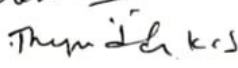
Ref: RVE/BT/406/2021-22

Date: 23.03.2022

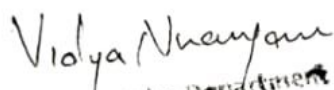
Submitted:

With reference to the above, one consultancy work has been carried out and the money (Rs. 4000) has been transferred by Sal Bioscience Ltd to Principal Account on 15.03.2022. The reference no is 666550673. Hence, kindly the invoice. The details of the company were provided earlier. The following are the faculty coordinated for the consultancy.

Hence the incentives may be equally offered to all the members along with HoD, Dept. of Biotechnology.

1. Dr. A.H. Manjunatha Reddy, Associate Professor 
2. Dr. Sumathra Manokaran, Assistant Professor 
3. Dr. Lingayya Hiremath 
4. Dr. Thippareddy K.S. Instructor 

Kindly do the needful

  
Head of the Department  
Dept. of Bio-Technology  
R.V. College of Engineering  
BANGALORE - 560 051





Rashtriya Sikshane Samithi Trust  
**RV College of Engineering**

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**Purchase Order**

Vendor Details				Purchase Order			
Vendor Name & Address: <b>Modtech</b> No. 95 KIADB Plot, Behind Omex Auto Jigani Post Bommasandra jigani link road Bengaluru-560105 Karnataka		Vendor Code : 15000807 Vendor GST Number : 29AALFM0521D2ZK Vendor PAN : AALFM0521D Kind Attention		PO No. / Version : 3200003420 / 0 Purchase Order Date : 23.03.2023 GST Number : 29AATR0758A1ZP PAN : AATR0758A Order Currency : INR Delivery Place Details : R V College of Engineering, R V Vidyanikethan Post, Bengaluru-560059			

Dear Sir / Madam,

With reference to your quotation, you are requested to supply the below mentioned items

Sl No.	Material Code Description/Specification	HSN Code	Delivery Date	Quantity	UOM	Price	Warranty (in months)	Price		GST				Total
								Rate/Unit	Amount	SGST		CGST		
										Rate (%)	Amount	Rate (%)	Amount	
1	60005278 Fuel Injection System Instruction board for electronic fuel injection system of diesel engine (CRDI)		29.04.2023	1.00	No		000	349,272.25	349,272.25	9.00	31,434.50	9.00	31,434.50	412,141.25
2	60005279 Mock Layout of Car Wiring Cut section model of mock layout of a car wiring (Vehicle body electrical system) working (comprehensive type)		29.04.2023	1.00	No		000	84,236.50	84,236.50	9.00	7,581.29	9.00	7,581.29	99,399.08
3	60005280 Reverse Camera and Parking Assist System Instruction board for reverse camera and parking assist system		29.04.2023	1.00	No		000	31,066.90	31,066.90	9.00	2,796.02	9.00	2,796.02	36,658.94

Sl No.	Material Code Description/Specification	HSN Code	Delivery Date	Quantity	UOM	Warranty (in months)	Price		GST			Total	
							Rate/Unit	Amount	SGST		CGST		
									Rate (%)	Amount	Rate (%)		Amount
4	60000702 MUSIC SYSTEM Instruction board for infotainment and music system		29-04-2023	1.00	EA	000	92,816.90	92,816.90	9.00	8,353.52	8,353.52	109,523.94	
5	60003824 Attenuator 6db Panel board containing important sensors with their functions and specifications		29-04-2023	1.00	EA	000	100,225.00	100,225.00	9.00	9,020.25	9,020.25	118,265.50	
							Order Value (INR)						775,988.71
							Round off						0.00
							Total Value						775,999.00

Amount in Words: Rupees Seven Lakh Seventy Five Thousand Nine Hundred Eighty Nine

Terms & Conditions :

1. Total value of purchase order is inclusive of all taxes.
2. Warranty As mentioned above in purchase order for each item.
3. Delivery Date As mentioned above in purchase order for each item.
4. Delivery Place As per details mentioned in purchase order.
5. TDS will be deducted as per the standard.
6. Invoice should be submitted in triplicate.
7. In case of any delays in supplies or replacements, the under signed reserves the right to cancel the purchase order.
8. Any deviation or departure from norms has to be brought to the notice of the undersigned .
9. Years warranty from the date of supply and installation

For ( R V College of Engineering )

  
Authorized Signatory  
PRINCIPAL

RV COLLEGE OF ENGINEERING  
BENGALURU - 560 059



**The Principal,**  
RV College of Engineering,  
Mysore Road, RV Vidyaniketana Post,  
Bengaluru – 560059

7<sup>th</sup> Mar'22

Kind Attention: Dr. K N Subramanya

Dear Sir,

**Subject: Amendment to the Memorandum of Understanding executed between us on the 21<sup>st</sup> of June, 2018.**

This is with reference to the Memorandum of Understanding ("Original Agreement") effective from the 21<sup>st</sup> of June, 2018 signed between Toyota Kirloskar Motor Pvt. Ltd. ("TKM") and R V College of Engineering. ("RVCE").

TKM and RVCE (hereinafter referred to collectively as the "Parties") have agreed to amend the Original Agreement to add the details of vehicle engines and chassis mentioned in Original Agreement. Now based on the revised understanding reached between both the Parties, the Original Agreement is amended, only with respect to adding Annexure-B, with effect from the 2<sup>nd</sup> day of February, 2022,

To give effect to the above change, the Original Agreement shall stand amended to the following effect with effect from the date mentioned hereinabove:

**ANNEXURE – B** to this document shall be added to the Original Agreement entirely.

Kindly affix your seal and signature to this document and return one set to us, which shall be deemed to be a valid amendment in accordance with Clause 7 of the Original Agreement.

For **Toyota Kirloskar Motor Pvt. Ltd.**Accepted the above amendment:  
For **R V College of Engineering**

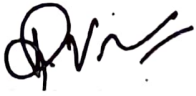
Name: R Venkatakrishnan  
Designation: Vice President  
EA State, CSR, PR & BIA

Name: Dr. K N Subramanya  
Designation: Principal



**ANNEXURE - B**

Sl. No.	Model	Engine No.	Chassis No.
1.	Innova Crysta	2GD A439567	MBJAB3EM802540107





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Academic Year 2022-23



Overview on

Industry Based Special Skill Tr

(Sponsored by IOAC and ASME)



DEPARTMENT OF  
MECHANICAL ENGINEERING

# Executive Summary

Nine out of ten jobs in developing countries are provided by private-sector companies. Yet globally, 38% of private-sector employers report difficulties in filling vacant positions owing to the unavailability of adequately trained staff. The result is a serious mismatch: on the one hand, all those job vacancies; on the other, vast numbers of jobseekers who do not have the skill set employers are looking for. These so-called skills gaps – the difference between the skills needed for a job and those possessed by a worker – represent a major constraint on development.

It is the aim of the initiative "Let's Work" to provide effective solutions to the global job crisis, by harnessing the potential of private sector to create more and better jobs in emerging and developing countries. In that spirit, this training, which involves special skills from the private sector, has the following objectives:

- to present good practises, and examples of their application, by and for industry-sector companies on three different levels: the current and prospective workforce, along the value chain, and in the local community.
- to present and showcase hands-on methods for assessing the costs and benefits of initiatives to bridge skill gaps;
- to provide concrete recommendations for identifying and addressing skills gaps step-by-step, by means of a practitioners' guide based on good practises that are applicable in various sectors and regions.

All courses are industry accredited and taught by fully qualified consultants or faculty with practical and on-site experience. The department arranged their training programs in different areas such as Automation and Robotics (Fanuc), Hydraulics and Pneumatics (Rexroth) , Automotive Mechatronics (Toyota), EV Technology (MG), 3D Experience (Dassault) and Lazer & 3D printing (ORLaser). The training programmes were conducted from May 29 to June 9, 2023 in respective labs. Well trained faculty and technical staff during training program.

The progress of participants is evaluated during the course through their participation in workshops, practical exercises, and discussion sessions where each module is discussed before proceeding to the next stage of the course. Depending on the length of the course and the specific objectives, a more exhaustive evaluation process is initiated. The best performer was selected in each training module to promote the interest of the students. At the conclusion of the training, the participants expressed their thanks and appreciation to the department leadership, faculty, and supporting staff for supporting the workshop and their concern with holding such a training session.

**Department Staff have a Strong Sense of Commitment and Ownership**



## HYDRAULICS AND PNEUMATICS SKILL TRAINING PROGRAM

Department of Mechanical Engineering at RVCE hosted an alternative skill training program in COE and COC for second-year students. As part of this initiative, the RVCE-BOSH Centre of Excellence in Automation Technologies organized a training program for two batches (34 Students) on Hydraulics and Pneumatics. The training program was conducted by Dr. S. K. Harisha, Dr. Keshav M, and Mrs. Hemalatha H. N., who are faculty members of the department. The training covered various topics, including the basic components of the system, the design and analysis of hydraulic circuits, and simulating circuits for different applications. Throughout the program, the students were actively involved and gained hands-on experience in building eight hydraulic circuits and six pneumatic circuits. To assess their understanding, a circuit simulation test and quiz were conducted at the end of the training program, and the students performed admirably well.

### Glimpse of the Training Program:





## Skill lab -3D Experience

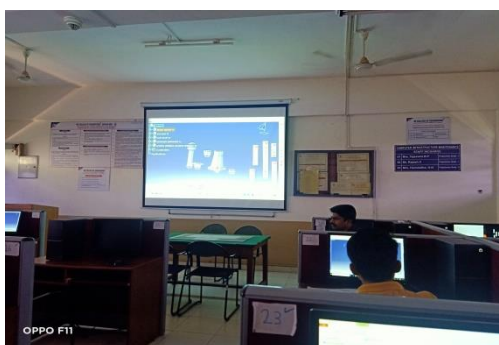
Skill lab training 3D modeling in CATIA delivers the unique ability not only to model any product, but to do so in the context of its real-life behavior. CATIA, powered by Dassault Systems 3 DEXPERIENCE platform, delivers a design environment built on a powerful 3D dashboard that drive business intelligence, real-time concurrent design and collaboration across all stakeholders including mobile workers.

An Instinctive 3D EXPERIENCE provides the students with world-class 3D modeling and simulation capabilities that optimize the effectiveness. An Inclusive product development platform that is easily integrated with existing processes & tools. This enables multiple disciplines to leverage powerful and integrated specialist applications across all phases of the product development process.

The course has been designed in stages where it will help one understand and start with the design in CATIA. It is designed such that it will enhance one's hands-on experience over the Design Software and improve CAD knowledge. The course is created in such a way that it will help gain knowledge on how to approach the design, how to understand the 2D drawings and developing a 3D model

1. Sketching
2. Part Design
3. Advanced part design and Drafting
4. Assembly Design
5. Surface design

### Glimpse of the Training Program:



## **RV-Toyota Centre of Excellence in Automotive Engineering**

RVCE in association with Toyota has been constantly involved in training students in the domain of Automotive Engineering since its inception in 2018. The objective of the training was to encourage experiential learning coupled with critical thinking and problem solving abilities. The present batch of students were trained on the modern systems of a passenger vehicle. The entire training was classified into the following modules: (i) Engine Module (ii) Power transmission and (iii) body electricals.

**Engine module:** This module involved identification of tools and dis-assembly of a Toyota engine followed by performing studies on various sub-systems that encompasses and supports the functionality of an internal combustion engine. (i) Intake system (ii) Turbocharger (iii) Cam shaft operation (iv) Fuel injection (v) Ignition (vi) Catalytic converter (vii) Drive train (viii) Lubrication & coolant system

**Power Transmission module:** This module involved identification of tools and dis-assembly of a Toyota 5 speed transmission followed by performing studies on various sub-systems that encompasses and supports the functionality of a transmission unit. The concept of (i) clutch assembly for engaging/dis-engaging with fly wheel (ii) Driver & driven gear (iii) Concept of gear ratios for high torque/low speed & low torque/high speed (iv) Torque vs speed characteristics (v) Sleeve, synchromesh, synchroniser, countershaft for smooth gear transition

**Body Electricals:** This module involved the skill sets for various electrical components of a passenger vehicle. (i) Assessment of battery condition (ii) fuse box configuration (iii) Assessment of faulty fuse condition (iv) Inspection of a relay switch (v) Cable harness continuity (vi) Fault diagnosis - Horn, Head light, wiper system etc.

### **Training Objectives**

- Modern vehicle engine technology along with its sub-systems
- Transmission system and types
- Material requirements and its properties for various components of an automobile
- Manufacturing methods and fabrication techniques used in making of a automobile components
- Mechatronics systems used in an automobile and principle of varieties of sensors and their importance.
- Fault detection and diagnosis

### **Training Outcomes**

- Usage of industry based standard tools
- Understand & demonstrate functionality of sub-systems & components of an engine and transmission unit
- Justify material properties, design, manufacturing techniques of automotive components
- Application of mechatronics system – sensors, actuators, control unit and wiring harness
- Demonstrate skills to assess battery, fuse & relay condition
- Problem solving skills in the diagnosis of faults on a real time passenger vehicle









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## DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

**A Report on**

**“Suryamitra Upskilling Training”**

**under**

**IRISE Project**



*2021-2022*

**Sponsored by**

**GIZ/RENAC Germany**



Indian Rooftop PV  
Installers Skilling & Employment

**SCGJ**



**SKILL COUNCIL FOR  
GREEN JOBS**



**R. V. COLLEGE OF ENGINEERING**  
**Autonomous Institution affiliated to VTU**  
**Department of Electrical & Electronics Engineering**

**IRISE – Suryamitra Upskilling Programme**  
**Report**

Title of the Program	<b>IRISE – Suryamitra Upskilling Programme</b>
Objectives	(Mentioned below)
Duration	10 days
Target Participants	Successful Suryamitra from various training institutes across Karnataka can apply.
Contents of the Programme	(Given Below)
Photos	(Attached Below and Certificates)
Sponsoring Agency	GIZ funded project
Financial Amount Received(Total)	
Total No. of Batches trained	3 BATCH
Total No. of Candidates Trained	10+23+17=50
No. of Candidates placed	
Any other information	---

## Introduction

I-RISE Suryamitra Upskilling Training Program Sponsored by RENAC/GIZ, Germany, under NISE for training 50 Suryamitra Certified Candidates.

## Mission & Goals

To upgrade technical and business skills of course participants (trainees) generally, with specific emphasis being placed on installing and marketing the ‘PV-Port’ solar system.

**The specific objectives will be:**

- To develop practical skills
- To enable them to Perform sizing and design calculations correctly
- To upgrade them and fill gaps in technical theoretical knowledge
- To develop entrepreneurial/business skills.

## Admission:

**Essential qualification:** Successful Suryamitra from various training institutes across Karnataka can apply.

### Fees:

No Registration Fees for the course. Free hostel accommodation and food will be provided on first come first serve basis.

**Programme Duration:** Under this Program Suryamitra Certified Students will be trained in-house for 10 days.

# COURSE CONTENTS

DATE/DAY	Topics on which ‘Theory and Practical Lessons’ were delivered	Brief description of Group Exercises Undertaken	Lessons Learnt by Trainees
Day 1	<p>Course introduction: PV port</p> <p><b>Theory :</b> Types of circuits/ system configurations, Solar radiation – Sunpath diagram, Parallel/serial connection of solar cells</p> <p><b>Practical:</b> Ohm`s law / Instruments / measurements /cables ,PV modules, Test and measurements</p>	<p>Divided the students into two batches, with each batch comprising of 5 students.</p> <ul style="list-style-type: none"> <li>Measurement of resistance, voltage DC and AC using Multi meter. Then to measure power Calculation of Energy.</li> <li>Solved problems on Energy calculations and electricity bill for residential loads.</li> </ul>	<ul style="list-style-type: none"> <li>Trainees have learnt the difference between grid-connected and off-grid PV systems, its applications in low as well as high power.</li> <li>Advantages and challenges of solar photovoltaic Energy Conversion.</li> <li>Understand the difference between solar irradiance and irradiation.</li> <li>Usage of multi meter for various Electrical parameters.</li> </ul>
Day 2	<p><b>Theory :</b> Types of batteries Parallel/series connection of cells/battery capacity, DOD, C rates.</p> <p><b>Practical:</b> Battery connection in series and parallel</p>	<ul style="list-style-type: none"> <li>Wiring diagram assignment of a system with 24V battery inverter</li> <li>Demonstration of safety, first aid and personal protective equipments.</li> <li>Role play on Health and safety devices.</li> <li>Illustration of series and parallel Battery connections</li> </ul>	<ul style="list-style-type: none"> <li>Parameters of Batteries such as SOC, DOD, life cycle in years.</li> <li>Applications of batteries in Solar PV Systems. Types of battery</li> </ul>
Day 3	<p><b>Theory:</b> Mounting structures for PV modules. Cable sizing /voltage drop</p> <p><b>Practical:</b> Use of Clamp meter, Battery bank Installation</p>	<ul style="list-style-type: none"> <li>Mounting System Types</li> <li>Problems on measurement of Cable resistance.</li> <li>Group activity on identifying various parts of clamp meter</li> </ul>	<ul style="list-style-type: none"> <li>Different types of mounting structures for off-grid PV systems</li> <li>Wire Sizing</li> <li>Current measurement using DC clamp meter</li> </ul>
Day 4	<p><b>Theory:</b> PV-Port Installation, Charge controllers, Inverters, MPPT</p> <p><b>Practical:</b> PV IV characteristics of a solar cell, Shading effect on</p>	<ul style="list-style-type: none"> <li>To plot VI and PV graphs on SPV module by changing intensity say 260 V and 190V</li> <li>To measure Voc, Isc,</li> </ul>	<ul style="list-style-type: none"> <li>Reading PV module parameters from IV curve</li> <li>Various</li> </ul>

	Solar cell efficiency	Pm, Fill factor and efficiency.	Parameters of solar cells <ul style="list-style-type: none"> <li>• Need of MPPT</li> </ul>
<b>Day 5</b>	<b>Theory:</b> System design and sizing, Commissioning, Earthing , Lightning& surge protection, Maintenance schedule /cleaning, Monitoring /risk mitigation. <b>Practical:</b> Orientation, tilt angle	<ul style="list-style-type: none"> <li>• Site survey to collect information on system loads.</li> <li>• To calculate solar cell efficiency by varying tilt angle</li> </ul>	<ul style="list-style-type: none"> <li>• Various steps involved in off-grid PV system design and sizing</li> <li>• Different types of lightning/surge protection used in PV systems</li> <li>• Necessity of earthing</li> </ul>
<b>Day 6</b>	<b>PV port Physical Installation</b> :Introduction and connections of Energy Meter ET112 with wireless connection via Zigbee , How to access VRM Portal using WiFi key and to observe power flow by connecting loads to the inverter and to analyze the output in real time.	<ul style="list-style-type: none"> <li>• Mechanical Structure Installation</li> <li>• Mounting of 6 Panels in series and parallel combination.</li> <li>• Electrical Connection of inverter and battery</li> <li>• Measurement of DC current from module output with clamp meter with load</li> </ul>	<ul style="list-style-type: none"> <li>• To prepare inspection checklist to ensure maximum safety.</li> <li>• To know the operation of VRM inverter by connecting to utility</li> </ul>
<b>Day 7</b>	PV Port Marketing: About the Product: USP What are the differences? Who are the potential Customers?	<ul style="list-style-type: none"> <li>• Role play on marketing of PV panel</li> </ul>	<ul style="list-style-type: none"> <li>• Marketing Strategy</li> </ul>
<b>Day 8</b>	<b>Entrepreneur Skills:</b> Cost Estimate of PV Rooftop Energizer Session – Volley ball	<ul style="list-style-type: none"> <li>• Group Work with Collage</li> <li>• Multiple-choice test on the learnings</li> </ul>	<ul style="list-style-type: none"> <li>• To know the cost of various components of Solar Plant</li> <li>• To explain the Government Subsidies and depreciation impact on cost estimate to the customers</li> </ul>
<b>Day 9</b>	<b>Entrepreneur Skills:</b> Development of a business model	<ul style="list-style-type: none"> <li>• Proposal – Technical / Commercial</li> </ul>	<ul style="list-style-type: none"> <li>• How to write technical and commercial proposals</li> </ul>
<b>Day 10</b>	<b>Entrepreneur Skills:</b> Project Management, Communication with prospective customers <b>Assessment</b>	<ul style="list-style-type: none"> <li>• MC Exam</li> </ul>	<ul style="list-style-type: none"> <li>• How to communicate with customers</li> </ul>

**Batch-1 Dates:23.08.2021 to 02.09.2021**

**Batch -2 Dates:04.10.2021 to 13.10.2021**

**Batch-3 Dates:29.11.2021 to 09.12.2021**

Few Photos for reference

**Photos of Batch 1:**



Theory Sessions





**Practical Sessions**





**PV Port Rooftop Installation**





**Group Activities and Role Play**



**Demonstration of Electrical Accessories**





**Energizer Session**



**Assessment and Group Photo of Batch 1**



## Photos of Batch 2:









**Theory Sessions**



## Practical Sessions & PV Port Rooftop Installation







**Group Activities and Role Play**







**Photos of Batch 3:**



## Theory Sessions







**Practical Sessions & PV Port Rooftop Installation**

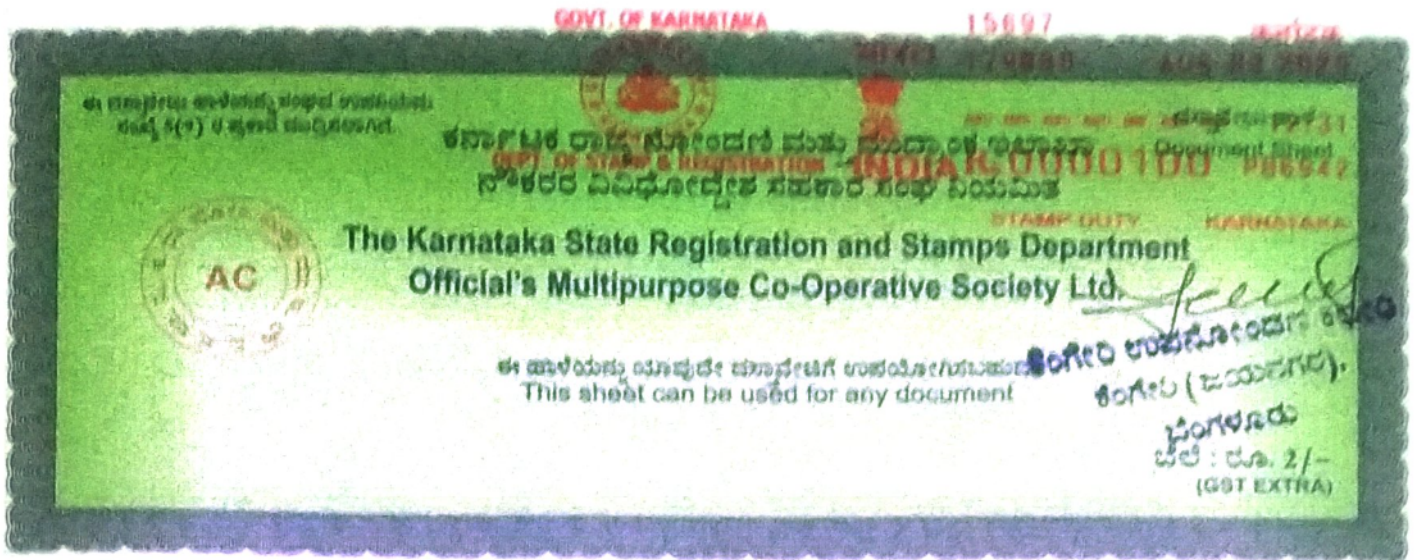


**Group Activities and Role Play**





**Assessment and Group Photo of Batch 3**



## GIZ

### COOPERATION AGREEMENT UNDER I-RISE SURYAMITRA UPSKILLING PROGRAM

Ministry of New and Renewable Energy (MNRE), Government of India has assigned GIZ to execute upskilling of the Suryamitras in the Solar sector. GIZ had received funds for a pilot project from BMZ, the German Federal Ministry of Economic Cooperation and Development for Implementing IRISE program which is currently being carried out at pilot stage. Ministry of Skills Development and Entrepreneurship (MSDE), Government of India is supporting the rapid development of the solar sector specialists across the country as skilled workers are identified as the key element for qualitative solar installations and education.

This Cooperation agreement is executed on the 3<sup>rd</sup> day of August, 2020, at New Delhi, between:

GIZ is a globally acting federal enterprise that supports the German Government in achieving its objectives in the field of international cooperation for sustainable development and international education. GIZ has been commissioned with the project "Indian-German Solar Partnership – Photovoltaic Rooftop Systems" to bring the market forces for an accelerated expansion of PV Rooftop systems for deployment. This project brings forward the Suryamitra upskilling training program initiative. The project is being acted through Mr. Joerg Gaebler, Principal Advisor, GIZ;

And

Skill Council for Green Jobs (SCGJ), a society, registered under section under the Societies Registration Act XXI of 1860, and having its registered office at "23 – Institutional Area, Lodhi Road, New Delhi – 110003", is a nominated entity will ensure and promote skill development and vocational education in the Renewable Energy Sector & Other Green Areas (hereinafter referred to as the Skill Council for Green Jobs, which expression shall, unless it be repugnant to the subject or context thereof, include its successors and permitted assigns) acting through Dr. Praveen Saxena, CEO, SCGJ, authorized by Governing Board of SCGJ;

...2)





ಕರ್ನಾಟಕ ರಾಜ್ಯ ನೋಂದಣಿ ಮತ್ತು ಮುದ್ರಾಂಶ ಇಲಾಖೆ  
H.No. 2(2) ೨ ನೇ ಹಂತ ಬೆಂಗಳೂರು

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And

RV College of Engineering\*, 8<sup>th</sup> Mile, Mysore Road, Bengaluru – 560059, an entity registered as RSST( as per Trust Act), having its registered office at "Jayanagar, Bengaluru- 560011", in the area/s of Education acting through Dr. K.N Subramanya, Principal of RV College of Engineering\*(herein after referred to as RVCE).

Whereas, GIZ and SCGJ and RVCE are hereinafter individually referred to as "Party" and collectively known as "Parties".

Under the guidance of MNRE, GIZ is supporting the GOI's program to generate electricity from the widespread installation of Rooftop Photovoltaic solar systems by bringing the market forces for an accelerated expansion for rooftop solar deployment. Skill Development of the workforce by information dissemination through short-term and long-term trainings and upskilling programs will boost the growth of solar industry. Under the skill development initiatives of the MNRE, National Institute of Solar Energy (NISE) is mandated as the nodal agency for implementation of "Suryamitra Skill Development Program" (SSDP). The SSDP is also designed to prepare the candidates to become new entrepreneurs in Solar Energy Sector.

IGEN-solar under I-RISE skilling project aims to do **upskilling** of Suryamitra Trainers and Trainees. The curriculum for Suryamitras will include the upskilling on installation, operation, maintenance and entrepreneurship skills for residential rooftop PV systems using the PV Port & Store system as a high-quality sample solution. An introduction to PV Port & Store concept is attached as Annexure-1. A complete and modular training concept with all required training material will be provided to the Training Partner.

...3)





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ಸಂಖ್ಯೆ 5(9) ರ ಪ್ರಕಾರ ಮುಕ್ತವಾಗಿದೆ.

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ಸೌಕರದ ವಿವಿಧೋದ್ದೇಶ ಸಹಕಾರ ಸಂಘ ನಿಯಮಿತ

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II training engagement with the selected Training Partners under the I-RISE skilling project shall be undertaken by Skill Council for Green Jobs (SCGJ). SCGJ; set up under the aegis of Ministry of Skill Development and Entrepreneurship (MSDE) and promoted by MNRE and CII, has a mandate to undertake industry skills gap analysis, develop National Occupational Standards along with course curriculums and certification of trainers and candidates to support skill development activity across the green businesses sector (including solar) in India.

Now, therefore RVCE as a Training Partner (TP) affiliated with Skill Council for Green Jobs (SCGJ) shall also confirm and abide by all the provisions and compliances agreed and signed herein the Cooperation agreement between the parties.

Now, therefore, this Cooperation agreement is made under the following terms and conditions mutually agreed by GIZ and SCGJ and RVCE.

- (i) I-RISE Program will sanction two Suryamitra upskilling training programs (option of more after prior approval) of ten-days each to be conducted with 25 certified Suryamitras (Participants) using the provided training material and equipment. Successful Participants will receive an upskilling certification from the program. These training programs will be sanctioned after successful participation of their trainers in TOT. Three months' time will be provided for execution of upskilling trainings.
- (ii) I-RISE Program will arrange Training of Trainers (TOT) Programs for training on Upskilling and Entrepreneurship. Training Partner will nominate minimum two trainers to take part in these TOTs. Training Partner can nominate one additional trainer whose participation will be confirmed based on the availability of seats in TOT. Training Fees of these TOTs will be borne by the Program. However, training partner will have to cover the cost of Transportation and Accommodation for their nominated trainers. The course curriculum for the Suryamitra Trainers will include the didactics technique and the upskilling on quality installations.
- (iii) A PV Port & Store (Lead – Acid Battery model) will be provided for training Purpose by the Project at zero cost for the TP. However, Training Partner must pay the Transportation charges for shipping the system from manufacturer's facility in Delhi. Installation of PV Ports at a suitable location within TP's premises can be done by the affiliated trainers sent to the TOT.

...4)





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ಸಂಖ್ಯೆ ೬(೨) ರ ಪ್ರಕಾರ ದಾಖಲಿಸಲಾಗಿದೆ.

ಕರ್ನಾಟಕ ರಾಜ್ಯ ನೋಂದಣಿ ಮತ್ತು ಮುದ್ರಾಂಕ ಇಲಾಖಾ  
ನೌಕರರ ವಿವಿಧೋದ್ದೇಶ ಸಹಕಾರ ಸಂಘ ನಿಯಮಿತ

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- (iv) All Training Partner's will provide the current status of their lab infrastructure against the lab details mentioned in Annexure-2. Training Partner must have the required lab infrastructure, workshop facilities, etc. to deliver the concerned training programs. In case the lab facility is inadequate (as per list provided), the TP will have to procure the additional equipment. However, the project may consider some limited support (by way of providing equipment) to strengthen the lab facilities with TP. This support for each TP will be limited to Euro 1000 (in kind only). TPs shall cover the cost of transportation from Delhi. SCGJ will ensure proper lab facility before commencement of training.
- (v) Responsibility/Ownership of these PV Ports lies with Ministry of New and Renewable Energy (MNRE)/ Skill Council for Green Jobs (SCGJ) under Indo-German Solar Energy Partnership. Training Partner will be responsible for any damage caused to these PV Ports. At the end of the contract, Training Partner can write an Asset transfer request to MNRE/SCGJ for retaining the PV Port for further continuing the upskilling trainings. After which the ownership of PV Port can be transferred to TP.
- (vi) The Training Partner will ensure all candidate information's including Aadhaar Card number, email id, mobile number, address and any other details as required and communicated by GIZ is securely handled. The Training Partner will make sure that the candidate do not submit any incorrect information. Also, this information should be made available, as and when required by GIZ.
- (vii) It will be the responsibility of the Training Partner to handhold the candidates for any future communication as and when required by GIZ. Candidates will be contacted after successful completion of the training.
- (viii) In the event any malpractice is observed for which training partner or any entity acting on behalf of the training partner is found responsible, GIZ has rights to cancel the sanctioned training and further participation. No training charges can be claimed in case of such dispute. SCGJ shall also take action to blacklist the TP in case of such event.

...5)





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ಸಂಖ್ಯೆ 5(9) ರ ಪ್ರಕಾರ ಮುದ್ರಿಸಲಾಗಿದೆ.

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- (ix) In the eventuality of training partner not able to deliver the training programs within the stipulated time period, then the training programs will be transferred and allotted to other training institutions.
- (x) The Training Partner shall abide by this Cooperation agreement which shall be valid for a period from the date hereof till 30<sup>th</sup> May 2022. Training Partner shall commit to further continue the upskilling trainings beyond the scope of this agreement.
- (xi) The Training Partner should inform in writing to GIZ at least one month in advance in case of their intention to discontinue the services to be provided under this agreement and handover all the documents and material which the Training Partner will be possessing. The Training Partner is obliged to complete the trainings that have already been committed and planned, prior to such termination date of notice aforesaid. GIZ can discontinue the services of TP with one-week notice.
- (xii) Committed share of fee/revenue shall be payable only on successful delivery of the programme and on completion of such formalities, as may be required/prescribed in the general terms and conditions for the upskilling training program.
- (xiii) In any event, GIZ will not be liable for any indirect, special, incidental, consequential damages (including loss) directly or indirectly arising out of breach of this Agreement, whether in contract, or otherwise, and whether or not such damages resulting from any breach, damage, even if Training Partner has been advised of the possibility thereof. GIZ will not be liable for damages/injuries occurred during the Suryamitra upskilling training.

...6)





ಈ ದಸ್ತಾವೇಜು ಹಾಳೆಯನ್ನು ಸಂಘದ ಉಪನಿರ್ದೇಶಕರು  
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IN WITNESS WHEREOF THE PARTIES HERETO HAVE SET THEIR RESPECTIVE HANDS ON THE DAY  
MONTH & YEAR FIRST ABOVE WRITTEN

For I-RISE Project, GIZ  
(Authorized Signatory)

Name: Joerg Gaebler  
Designation : GIZ Director

For Skill Council for Green  
Jobs (SCGJ)  
(Authorized Signatory)

Name: Dr. Praveen Saxena  
Designation : CEO, SCGJ

For TRAINING PARTNER/  
Training Partner  
(Authorized Signatory)

Name: Dr. K.N. Sybramany 3/8/20  
Designation : Principal, RVCE  
PRINCIPAL  
RV COLLEGE OF ENGINEERING  
BENGALURU - 560 059

Witness 1

Name : Abhishek Dalal  
Place: Bahadurgarh

Witness 2

Name: Deepak Rai  
Place: Greater Noida

Witness 3

Name: Dr. Rudranna  
Place: Bengaluru.  
03/08/2020.



Rashtriya Sikshana Samithi Trust

**RV College of Engineering**

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And NBA, New Delhi

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**TAX INVOICE**

GSTIN : 29AAATR0758A1ZP  
PAN : AAATR0758A

Invoice No. : 10201802000355  
Date : 16.11.2021

**Billing Details (Bill To) :**

Name : SKILL COUNCIL FOR GREEN JOBS  
Address : ,,,3rd Floor ,Industrial Area,CBIP Building,Malcha Marg New Delhi-110021

GSTIN : 07AANAS5590D1Z6  
PAN : AANAS5590D  
State Code : 07-Delhi

**Shipping Details (Ship To) :**

Name : SKILL COUNCIL FOR GREEN JOBS  
Address : ,,,3rd Floor ,Industrial Area,CBIP Building,Malcha Marg New Delhi-110021

GSTIN : 07AANAS5590D1Z6  
PAN : AANAS5590D  
State Code : 07-Delhi

Sl.No	Description	HSN/SAC	Quantity	UOM	Rate / Item (Rs.)	Taxable Value (Rs.)	GST						Total Amount (Rs.)
							SGST		CGST		IGST		
							Rate of Tax	Amount	Rate of Tax	Amount	Rate of Tax	Amount	
1	Institution Consultancy Projects Final amount to deliver upskilling training of 10 suryamitra certified candidates in Batch 1 under IRise Project		0.000		0.00	1,10,000.00	0.000	0.00	0.000	0.00	0.000	0.00	1,10,000.00
Beneficiary details for NEFT/RTGS						TCS Rate of Tax						0.00	
Bank A/C Details	R V College of Engineering 136010112055 Kotak Mahindra Bank					Discount						0.00	
						Round of Amount						0.00	
						Grand Total						1,10,000.00	

Mysore Road, RV Vidyaniketan  
Post, Bengaluru - 560059,  
Karnataka, India

080 - 87178020/ 8161

principal@rvce.edu.in  
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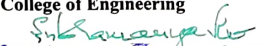
Hasthreeya Silahana Samithi Trust

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Branch Address & IFSC	R.V.College of Engineering Campus Mysore Road,,Bengaluru,10 KKBK0008053	Amount in Words : Rupees One Lakh Ten Thousand Only
<b>TERMS &amp; CONDITIONS :-</b> 1.Payment to be made at the earliest 2 Cheque in favour of Director/Principal/CEO/Head Mistress <b>R V College of Engineering</b>		<b>R V College of Engineering</b>  <b>PRINCIPAL</b> HOD/Authorized Signature <b>R V College of Engineering</b> Bangalore - 560 054 1,6 ) 11 ) 27

IRN :

Ack No :

Ack Date :

e-Invoicing detail(s) generated from the Government's e-Invoicing system.



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**TAX INVOICE**GSTIN : 29AAATR0758A1ZP  
PAN : AAATR0758AInvoice No. : 10201802000356  
Date : 16.11.2021**Billing Details (Bill To) :**Name : SKILL COUNCIL FOR GREEN JOBS  
Address : ,,,3rd Floor ,Industrial Area,CBIP Building,Malcha Marg New  
Delhi-110021GSTIN : 07AANAS5590D1Z6  
PAN : AANAS5590D  
State Code : 07-Delhi**Shipping Details (Ship To) :**Name : SKILL COUNCIL FOR GREEN JOBS  
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							SGST		CGST		IGST		
							Rate of Tax	Amount	Rate of Tax	Amount	Rate of Tax	Amount	
1	Institution Consultancy Projects Final amount to deliver upskilling training of 23 suryamitra certified candidates in Batch 2 under I Rise project		0.000		0.00	2,53,000.00	0.000	0.00	0.000	0.00	0.000	0.00	2,53,000.00
Beneficiary details for NEFT/RTGS						TCS Rate of Tax						0.00	
Bank A/C Details	R V College of Engineering 136010112055 Kotak Mahindra Bank					Discount						0.00	
						Round of Amount						0.00	
						Grand Total						2,53,000.00	

Mysore Road, RV Vidyaniketan  
Post, Bengaluru - 560059,  
Karnataka, India

080 - 67178020/ 8161

principal@rvce.edu.in  
rvce.edu.in*Go, change the world*





Rashitreeya Silahana Samithi Trust

**RV College of Engineering**

Autonomous  
Institution Affiliated  
to Visvesvaraya  
Technological  
University, Belagavi

Approved by AICTE,  
New Delhi, Accredited  
By NAAC, Bengaluru  
And NBA, New Delhi

Original

Branch Address & IFSC	R.V.College of Engineering Campus Mysore Road,,Bengaluru,10 KKBK0008053	Amount in Words : Rupees Two Lakh Fifty Three Thousand Only
<b>TERMS &amp; CONDITIONS :-</b> 1.Payment to be made at the earliest 2 Cheque in favour of Director/Principal/CEO/Head Mistress <b>R V College of Engineering</b>		<b>R V College of Engineering</b> <i>S. K. Ramaswamy</i> HOI/ADMINISTRATIVE <b>R V College of Engineering</b> Bangalore - 560 059 16/11/21

IRN :

Ack No :

Ack Date :

e-Invoicing detail(s) generated from the Government's e-Invoicing system.



Rashtriya Sikshana Samithi Trust

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New Delhi, Accredited  
By NAAC, Bengaluru  
And NBA, New Delhi

Original

### TAX INVOICE

GSTIN : 29AAATR0758A1ZP  
PAN : AAATR0758A

Invoice No. : 10201802000563  
Date : 18.02.2022

#### Billing Details (Bill To) :

#### Shipping Details (Ship To) :

Name : SKILL COUNCIL FOR GREEN JOBS

Name : SKILL COUNCIL FOR GREEN JOBS

Address : #4,,,,,3rd Floor ,Industrial Area,CBIP Building,Malcha Marg New Delhi-110021

Address : #4,,,,,3rd Floor ,Industrial Area,CBIP Building,Malcha Marg New Delhi-110021

GSTIN : 07AANAS5590D1Z6

GSTIN : 07AANAS5590D1Z6

PAN : AANAS5590D

PAN : AANAS5590D

State Code : 07-Delhi

State Code : 07-Delhi

Sl.No	Description	HSN/SAC	Quantity	UOM	Rate / Item (Rs.)	Taxable Value (Rs.)	GST						Total Amount (Rs.)
							SGST		CGST		IGST		
							Rate of Tax	Amount	Rate of Tax	Amount	Rate of Tax	Amount	
1	Institution Consultancy Projects Final amount to deliver upskilling training of 17 suryamitra certified candidates in Batch 3 under IRISE project	998393	0.000		0.00	1,87,000.00	0.000	0.00	0.000	0.00	0.000	0.00	1,87,000.00
Beneficiary details for NEFT/RTGS						TCS Rate of Tax						0.00	
Bank A/C Details	R V College of Engineering					Discount						0.00	
						Round of Amount						0.00	
						Grand Total						1,87,000.00	



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New Delhi, Accredited  
By NAAC, Bengaluru  
And NBA, New Delhi

Original

Branch  
Address &  
IFSC

..

Amount in Words : Rupees One Lakh Eighty Seven Thousand Only

**TERMS & CONDITIONS :-**

- 1.Payment to be made at the earliest
- 2 Cheque in favour of Director/Principal/CEO/Head Mistress

**R V College of Engineering**

R V College of Engineering

*18/2*  
**VICE PRINCIPAL**  
HOI/Authorized Signature

**RV College of Engineering**

**Mysore Road, Bengaluru-560 059**

IRN :

Ack No :

Ack Date :

e-Invoicing detail(s) generated from the Government's e-Invoicing system.

Mysore Road, RV Vidyaniketan  
Post, Bengaluru - 560059,  
Karnataka, India

080 - 07178020/ 8161

principal@rvce.edu.in  
rvce.edu.in

*Go, change the world*

Bank account details

Name of the Bank A/c	The Principal, R V College of Engineering
Name of the Bank	Kotak Mahindra Bank Ltd
Branch Address	R.V.College of Engg, Branch, RVCE Campus, 8 <sup>th</sup> Mile, Mysore Road, Bangalore – 560 059.
Bank Account Number	136010112055
IFSC Code	KKBK0008053
GSTN	29AAATR0758A1ZP
PAN	AAATR0758A
SWIFT code	KKBKINBB



# Connected Autonomous Vehicles WIRIN

The future of the automobile is electric, shared, autonomous and connected – a very exciting area. RV College of Engineering® (RVCE) has partnered with WIPRO and the Indian Institute of Science(IISc) to establish a Center of Excellence for Autonomous Vehicle Research at RVCE . The collaboration with WIPRO and IISc in a series of special programs devised by the WIPRO Innovation Center brings together the best automotive sector experts, researchers, innovators, companies and students to create a collaborative ecosystem at RVCE. The center seeks to focus on four key technologies for autonomous vehicles: sophisticated AI technologies for vehicle control, environment perception, route planning and vehicle navigation systems. It is a collaborative platform to observe an essential component of contemporary transportation networks.

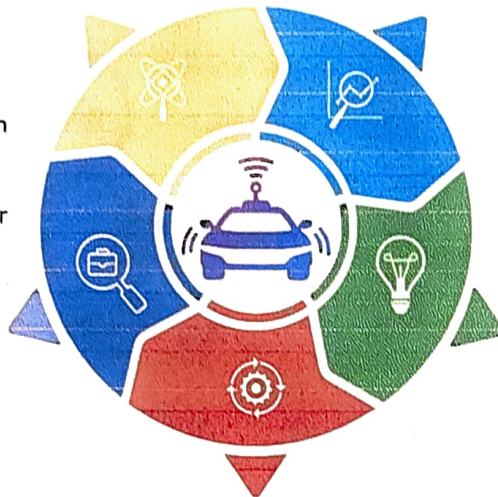
## Areas of Expertise

### National Dataset Collection

- Data Set Collection from LiDAR, Camera & IMU
- Annotation of the Datasets
- Deep Learning Models for Annotation Automation

### AI Stack Development

- Deep Learning Models for Perception, Localization & motion Planning.
- Embedded System Design for Vehicle Control Unit
- Sensor Integration : LiDAR, Camera, IMU etc



### Mechanical Design

- 3D Model of Chassis
- FE Analysis
- Brake by Wire
- Steer by Wire

### Powertrain Components Design

- Battery Design & Configuration
- Battery Management System
- Battery Health Monitoring System
- PID Controller Design
- Motor & its Controller

### Vehicle Simulator

- HD Map Creation
- Vehicle Modelling
- Scenario Generation on Road Runner.

## Lab & Infrastructure

### Sensor



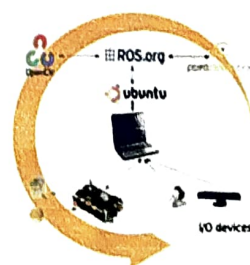
### Powertrain



### CARLA & National Dataset



### Integration



### Sensor Integration Through ROS

- LiDAR
- Camera
- IMU, Ultrasonic Sensors
- Temperature Sensors etc.

### Testing of Battery, Motor & Controllers

- EV Simulator
- Battery Testing
- Motor & its Controller Test Jig
- Battery Management System

### Vehicle Simulator S/W Dataset Collection and Annotation

### Embedded Controllers:

- STM
- CAN
- Display
- OBD
- Nvidia Jetson Processor

## Achievements

### Data Collection : Bangalore City:

9 TB Data, 10,00,000 Images, 25% Images Annotated and Integrated

### Mechanical & Electrical Architecture:

CAED Modelling, FE Analysis, Brake by Wire, EV Simulator Design, Battery Design & Configuration, BMS, Motor & its Controller Integration, Integration of Power Electronics Components.

### Design of ECU using Embedded Systems and ROS Integration:

Electronic Control of Speed, Steering and Brake Systems, Design of CAN Bus, Dashboard and OBD Design, Fusion Algorithm for Perception, Localization and Motion Planning!!

### Vehicle Simulator & Vehicle Testing :

Desktop Simulation, V2X, Design of Real time Scenarios, Development of vehicle Simulator S/W, Design of Dynamic Vehicle Model. Testing of Vehicle in Autonomous & Remote Control Mode, Obstacle Detection and maneuvering.

## Activity & Research Collaboration

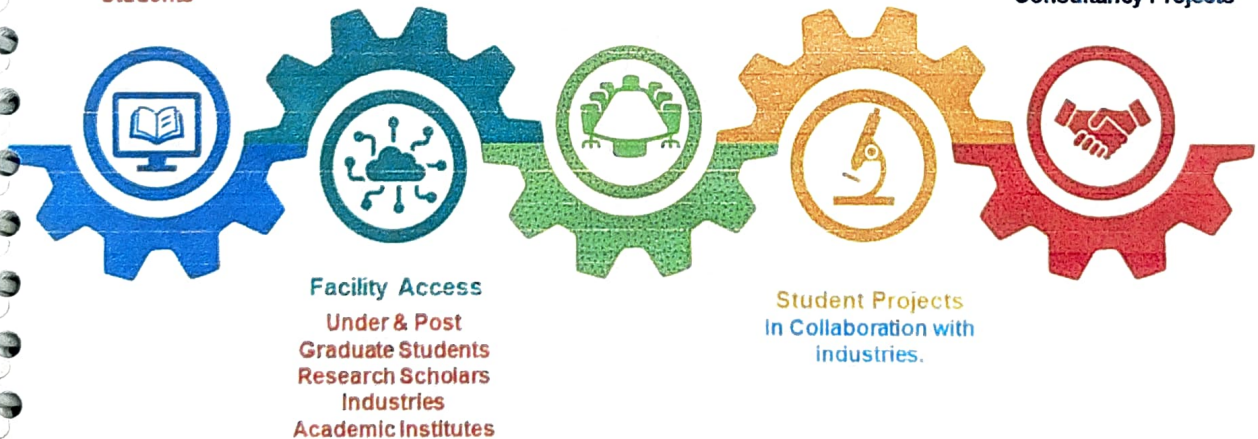
### Internships

Diploma, B.E, MTech  
Students

### Workshops, FDPs & Skill Based Training

### Industry Institute Collaboration

Funded Projects, Research,  
Consultancy Projects



## Contact details

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## EXECUTIVE SUMMARY

Wipro and Indian Institute of Science jointly initiated a collaborative consortium to do research on new technical areas such as AI, Robotics and Autonomous systems. It also intends to build cutting edge innovative solutions by combining technology and design.

WIRIN – Wipro IISc Research and Innovation Network (<http://wirin.iisc.ac.in>) is hybrid model consortium involving industry, academia, start-ups and funding agencies to advance emerging technologies. Wipro and IISc are its founding members and in 2019 more members were identified such as RVCE, NID, ARAI, Intel etc. to be added subsequently. At its inception in 2018, WIRIN embarked on couple of focus areas of research such as Autonomous systems and Robotics. The end objective of WIRIN for is to ultimately establish IISc, Wipro and its future partners as leaders in these areas of research and development, besides help India to position as a major player in Autonomous systems and Robotics for the next decade and help boosting economy and jobs through thought leadership, new market creation and most importantly capacity building. To make this a reality, a series of activities are planned. They are the various research artefacts in form of algorithms, platforms and systems, international events and competitions, papers and patents, talks and demonstrations/roadshows and building of WIRIN centers of innovation and labs across partners institutions.

This document focuses on describing various projects that are defined for next 2 years of WIRIN operations across different collaborators. It also enumerates the high-level responsibilities of various collaborators. Here is generic list of responsibilities of various stakeholders

- IISc with its vast experience in research, exploration and analysis of algorithms, shall have its primary focus on development of new algorithms. It will work closely with Wipro and other partners to achieve this primary objective. As IISc works in many multi-disciplinary and diverse topics its ability to bring diverse set of teams to solve problem is its significant strength, thereby it can also extend its system thinking experience and expertise on various diverse systems to help Wipro build and system integrate various platforms that are planned as part of WIRIN.
- Wipro with its global presence and network of diverse customers bring a rich global perspective to the problems of WIRIN. Its primary focus is to help define the context of identified problems/focus areas, co-create algorithms with IISc by helping in implementation and testing. Wipro with its experience in integration, shall also integrate various algorithms and other opensource/commercial modules into platforms and do its system testing finally.
- National Institute of Design will bring a rich and diverse experience in various areas of design into WIRIN. It will help conduct user studies, design strategies and help in product and experience design of various platforms of WIRIN.
- RVCE being a reputed engineering school of Karnataka is primarily responsible in helping with implementation of algorithms and integration of platforms under the guidance of Wipro and IISc. It will work closely with Wipro on system integration testing and data collection, curation of dataset and use case scenario creation activities for various algorithms being developed by IISc.

## RESEARCH THEMES AND HIGH-LEVEL SYSTEMS

Research and Innovation projects defined under WIRIN program roughly fall under one or more of the following high-level and broad themes. These themes are identified as thrust areas for 2018-19.

**Visual computing** – traditional image processing, visual intelligence and understanding using deep learning, computer generated imageries, visual analysis and synthesis, 3D processing, etc.

**Human computer interaction** – VR/AR/MR, design aspects of interaction with machines, force feedback systems, tactical/perceptual user interfaces, user studies, observation systems, etc.

**Cognitive computing and AI** – Agent systems, AI systems, man-machine interaction, Reinforcement learning, models for intelligent communication systems, conversational AI, NLG, Cognitive control and decision systems for intelligent transportation etc.

Each of the above themes may drive a group of projects/subsystems by providing necessary direction and vision, that in turn help to draw specifications for each of them and their inter-relationships for building parts of an intelligent cognitive system that paves the way for a robotic driving system in an autonomous car (ASR – Autonomous system and Robotics).

Building a Robotic decision system along with its perception systems for ambient sensing is a complex problem. Therefore, we are taking system of systems model approach for reducing the complexity of the entire system. Each of the systems will focus on a specific problem and try to solve it to a large extent.

Behavior and response of system of systems are perceived by means of scenario-based testing and systems are trained to perform certain set of activities for specific scenarios such as highway piloting, self-parking, join and merge traffic, etc.

#### End vertical integration system of systems

1. 4D Autonomous system simulator system – SDV in a box
2. AI Stack for Autonomy – focused problem-solving AI bots system
3. Auto Annotate Studio – Automated labelling and AI auditing system as part of National Dataset and Data platform

#### Major Scenarios based systems that are used to test the system – initial list

1. City ride and Highway piloting – on simulator
2. Co-ordinated campus vehicles with features such as auto-parking, valet parking, etc. – on a real vehicle.

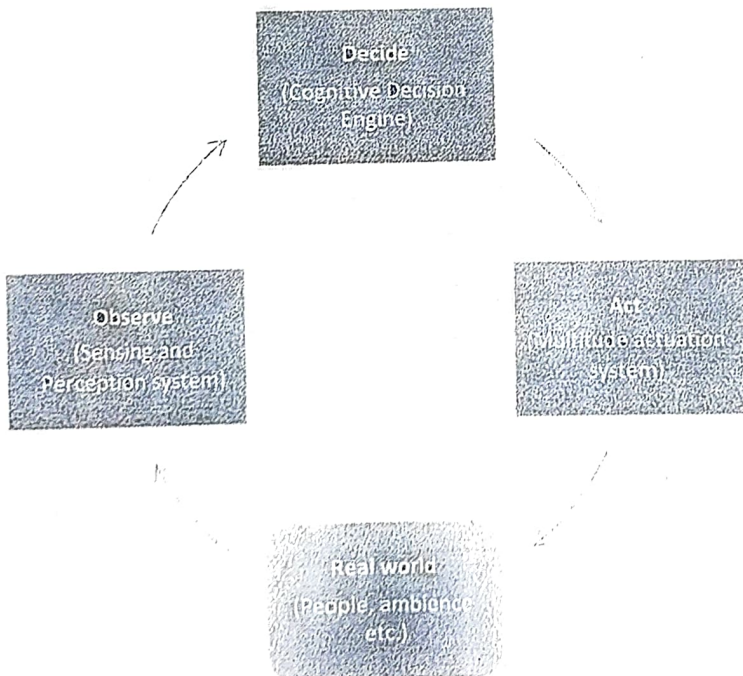


## FOCUSED RESEARCH PROJECTS FOR PROBLEM SOLVING

Algorithms that power the ASR to achieve human level performance are quite complex and the data sets that are used to train them need to be carefully curated and annotated. Therefore, the most important task of algorithm development is also to benchmark the performance using a standard training data and improvising the same with augmented data that is carefully curated to solve an important problem. Supervised learning has limitations for the real-world problems that pose a lot of uncertainty and throw up surprises without any cues. Humans use their experience as a tool and reason out the solution/response using their common-sense knowledge system. Therefore, building a system that depends purely on curated data may not be right choice for the autonomous systems/robots.

Inspired by cognitive neuroscience in the application of learning and decision making, we propose a strategy for system of systems. The proposed system uses combination of high-level knowledge that has actionable sequences and a set of intelligent networks that uses reinforcement learning to continuously learn at the elementary level. These elementary learning systems update the meta-level bots that maintain the knowledge for actionable sequences at higher levels in the hierarchy as inspired by cognitive neuroscience. Is it possible to build a system like this under this proposed strategic framework?

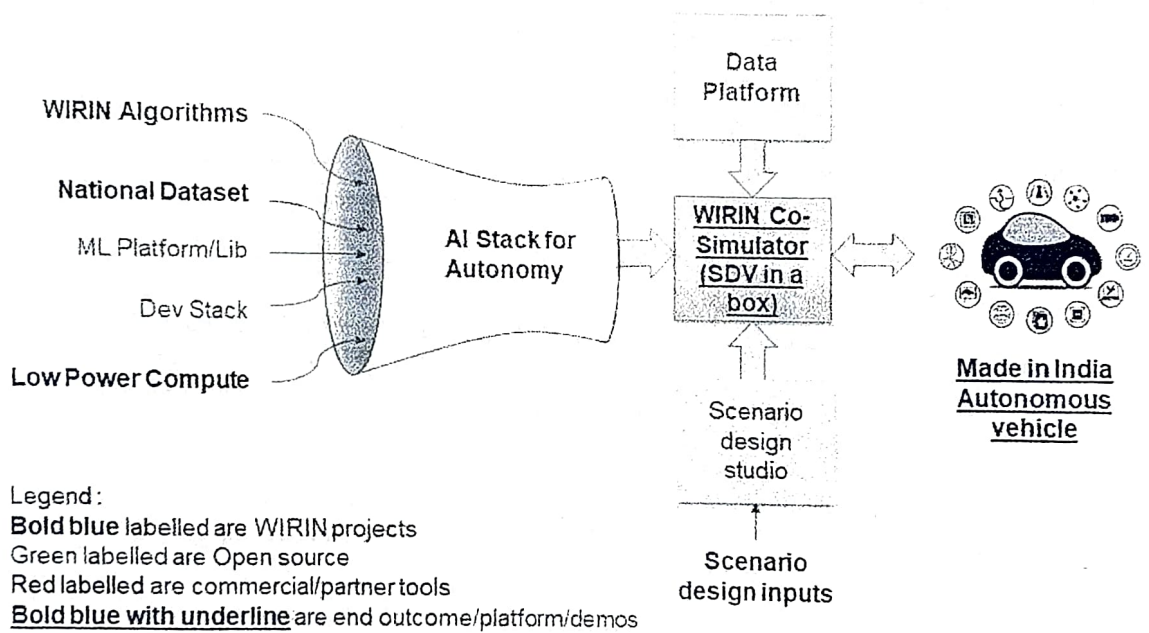
Answering this question through a series of focused problems helps to build and realize the end deliverables.



*Cognitive Framework loop for Autonomous systems and Robotics algorithms*

## BIG PICTURE OF OVERALL ORGANIZATION OF THE PROJECTS

There are various projects initiated under WIRIN in 2018 which are multi-year, multi-objective projects. While there were many exploratory projects in first year, that give an impetus to lay a firm foundation for the future projects, platform projects were designed to be vertical system integration of various projects that would end as a tangible, impactful demonstrations of WIRIN. These demonstrations use a mix of WIRIN data, algorithms, open sources data, tools and some select commercial software platforms. Figure gives the big picture of the overall organization of various elements and its end outcomes.



WIRIN AI Stack for Autonomy, National Dataset and Data platform, WIRIN Co-simulator (SDV in a box) are the multi-year, multi-objective projects and which are mostly vertical integration projects. WIRIN algorithms are the set of algorithms that are part of AI Stack for Autonomy which are based on the exploratory research done at IISc, market survey and customer feedbacks. Problems as part of algorithm development projects under AI Stack for Autonomy are also multi-year with specific quarterly outcomes that solves the various dimensions of problem step-by-step.

## SCOPE OF THE PROJECT

Scope of each of the projects will be decided during the scoping phase, once the projects are identified and approved. Overall scope of all the projects includes – study the state of the art, identify core problem and its definition, analysis and design, simulation/model results, coding and testing on a platform. System testing and integration is the scope of the Wipro team, subsequent to publication of the algorithm and its test results.

## DELIVERABLES

Project deliverables are typically the following and will be defined clearly at the start of each of the projects

1. Study report/requirements
2. Test data curation
3. Algorithm analysis and design documents
4. Algorithm simulation results including code in MATLAB/C/C++/Python
5. Research output – performance, functional and other results
6. Integrated output with algorithms working on scenarios on Simulator, emulator and on real vehicle in the campus for various identified end use scenarios

## SPECIFIC EXCLUSIONS FROM THE SCOPE

IISc project outputs are not hardened for deployment and need to be thoroughly tested and engineered before they get deployed and this is not in the scope of IISc personnel.

## PAYMENT SCHEDULE

This is a joint SoW of three institutions therefore three separate POs and payments have to be made to three institutions as per the table given below

Date	IISc	NID	RVCE	Remarks
Feb 2020	Rs 175 Lakhs	Rs. 50 Lakhs	37.5 Lakhs	Projects need money upstart to deliver

Note: IISc will also need lab resources and equipments which will be addressed separately by Wipro.



## IMPLEMENTATION PLAN

IISc and Wipro have jointly proposed the following for capacity building and execution of the project at IISc and other partner institutions (if at all any are added in the future)

1. Creation of test beds such as Simulator platforms, Skeleton vehicle for real world testing
2. Institution of Wipro-IISc fellowships to attract MTech and PhD students and make them work in this area
3. Institution of Wipro-IISc Internships for students of select academic institutions of the country to get them trained and work in the project, who could possibly be hired by Wipro and its partners later
4. Assisting Wipro in the creation of course material for training their employees for scaling in customer projects
5. Dedicated Infrastructure such as GPU clusters and High-performance computing for all the team members
6. Possible creation of a collaborative working space for Wipro staff and other partner institutions in the future
7. Possible setting up of a dedicated lab for Autonomous systems and Robotics

## HIGH-LEVEL TIMELINE/SCHEDULE

### Research Projects and fellowships

Phase	Q4 FY'20	Q1 FY'21	Q2 FY'21	Q3 FY'21
Research Projects - AI Stack for Autonomy	<p>Literature survey and survey document for the following functions of the stack</p> <ol style="list-style-type: none"> <li>1. Local trajectory planner with interchange traversal for local conflict resolution (IISc)</li> <li>2. Multitasking Deep neural network (IISc)</li> <li>3. Explanation for classification of objects (IISc)</li> <li>4. Action, intention and behaviour recognition of Driver and pedestrians (AZIBAR) (IISc+NID)</li> <li>5. Scenarios and UI for SDV in a box (NID)</li> </ol>	<p>Design and analysis of new set of algorithms and sample implementation for functional verification through simulation/analysis - analysis and design document</p> <ul style="list-style-type: none"> <li>- Local trajectory planner with interchange traversal for local conflict resolution</li> <li>- Multitasking Deep neural network</li> <li>- Explanation for classification of objects</li> </ul>	<p>Implementation and verification through simulation - preliminary algorithms and results</p> <ul style="list-style-type: none"> <li>- Feedback from Wipro and its customers and market in general.</li> <li>- Finalization of AI Algostack for Autonomy 2.0</li> </ul> <p>Driver and pedestrian intent and behaviour observation Design research document from NID</p>	<p>Integration testing on realworld usecase and performance optimization for final release of AI Algostack 2.0</p> <p>Release of AI Algostack 2.0 with atleast 2 best of class algorithms</p>
Fellowships	<p>Creation of criteria for Fellowships in consultation with Wipro and setting of expectations for Wipro Fellows</p> <p>Announcements and Call for Fellowship</p>	<ul style="list-style-type: none"> <li>- Process of rigorous selection</li> </ul>	<p>Institution of 2 Fellowships for 2020-21</p>	

### Platform Projects as part of WIRIN Lab 2020

Phase	Q4 FY'20	Q1 FY'21	Q2 FY'21	Q3 FY'21
SDV in a Box	<p>This is Wipro's AD platform 1.0 (SDV in a box) with following use case scenarios</p> <ul style="list-style-type: none"> <li>- Design of software architecture SDV in box</li> <li>- Integration with vehicle in an intersection</li> <li>- Auto parking assist 1.0</li> <li>- Lane merging in highway traffic</li> <li>- Data Platform integration for scenarios</li> </ul>	<p>AV simulator 1.0 with single seater driving and 120-degree screen setup with high fidelity graphics and following use case scenarios</p> <ul style="list-style-type: none"> <li>- Auto park assist 2.0</li> <li>- Auto emergency braking</li> <li>- Reverse assist</li> <li>- Develop physical model of vehicles and its interfaces</li> <li>- Traffic model and vehicle behavior model</li> <li>- Flexible software-in-loop simulator</li> </ul>	<p>6 DoF simulator design and implementation with a fully immersive surround view</p> <ul style="list-style-type: none"> <li>- Passenger experience use case</li> <li>- Integrated 360 deg visual and sound sensor data fusion and localization</li> <li>- Auto valet parking 1.0 scenario</li> <li>- Sensor model and build their corresponding interface</li> <li>- ML based Driver behavior model to create realistic simulation</li> <li>- Build an interface for AV stack inside the simulator for ego motion vehicle</li> </ul>	<p>Integration of AI Algostack 2.0 into simulator and testing on various edge case scenarios</p> <ul style="list-style-type: none"> <li>- Integration of AV Algorithms into simulator for validation testing</li> <li>- Feedback to algorithm developers</li> <li>- Testing forwarded to next stage - real world integration</li> <li>- First, Last mile autonomous navigation on to simulator and emulator</li> </ul>
LP Compute Platform (RVCE + IISc)	<ul style="list-style-type: none"> <li>- Study report on the state of the art and deliverables</li> <li>- Alliance with Semiconductor companies</li> </ul>	<p>Development of deep spiking neural network for visual perception</p> <p>Testing on Simulators</p>	<ul style="list-style-type: none"> <li>- Implementation of target platforms FPGA</li> <li>- CNN Accelerators</li> <li>- Functional characterization</li> <li>- Performance characterization</li> </ul>	<p>Integration with Self Driving computing hardware and testing of functionality and performance characterization at System level</p>



## Platform Projects as part of WIRIN Lab 2020

Phase	Q4 FY'20	Q1 FY' 21	Q2 FY' 21	Q3 FY' 21
<b>Data Set and Data Platform + Auto annotation Studio (IISc + RVCE)</b>	<ul style="list-style-type: none"> <li>Web based interface for image annotation, point cloud annotation using angular or react js</li> <li>Design of data platform with open source components with POC</li> </ul>	<ul style="list-style-type: none"> <li>Data sensor fusion, with additional sensors – Audio, Telescope camera</li> <li>Support for extended image annotations like lanes, 3d boxes and assisted image annotation</li> <li>3D point cloud support for Auto annotation</li> </ul>	<ul style="list-style-type: none"> <li>Data Visualization platform with search and retrieval using multiple attributes</li> <li>Support for RADAR, Audio, sensor fused visualization platform</li> <li>Multiuser, optimized task pipelines for simultaneous annotation and audits</li> </ul>	<ul style="list-style-type: none"> <li>Crowd sourced annotation platform</li> <li>AI annotation audit system</li> <li>Release of Auto Annotate system 2.0</li> <li>Data platform to cater to AV requirements and IISc data centre deployment</li> </ul>
<b>Synthetic Dataset generator</b>	<ul style="list-style-type: none"> <li>Study report on the state of the art and deliverables (IISc)</li> </ul>	<ul style="list-style-type: none"> <li>Analysis and design of algorithms and delivery of models, samples</li> </ul>	<ul style="list-style-type: none"> <li>Source code and trained model for visually degraded scene generation. A visually degraded scene dataset generated using the developed model.</li> </ul>	<ul style="list-style-type: none"> <li>Integration with Data set platform</li> </ul>

## ACCEPTANCE CRITERIA FOR ALGORITHMS DEVELOPED BY IISC – WIPRO'S ACTIVITY OF TESTING

- **Q4 FY20**
  - Create a high-fidelity real-world scenario for Auto parking and highway lane merging in the simulator with help of 3<sup>rd</sup> party components – collect the stakeholder data to create the scenarios
  - Test the Auto park assist set of algorithms on the high-fidelity scenario
  - Test Lane merging traffic with real-time metrics to measure the effectiveness of algorithms
  - **Pass criteria** – Algorithms should pass for at least 70% of the cases identified in the detailed scenarios designed for Q4 FY 20, should work for all 100% cases by Q3 FY21
- **Q1 FY21**
  - Auto park assist 2.0 to work for more than 90% of use cases in the scenarios created with stakeholder inputs
  - Scenarios for testing Emergency braking and Reverse assist
  - **Pass criteria** - Testing of AEB and Reverse assist for more than 90% of the cases
- **Q2 FY21**
  - 6 DOF platform deployment of Simulator and its testing with high speed algorithms
  - Creation of high-fidelity real-world scenarios for Auto valet parking (AVP) with stakeholder inputs
  - **Pass criteria** – Testing of AVP algorithms against all the test cases and it should pass at least for 70% of use cases
- **Q3 FY21**
  - Integration of all algorithms and AV functions into AI stack for Autonomy and deployment as a pluggable stack on to the simulator
  - **Pass criteria** – Testing of AI stack for Autonomy algorithms on high fidelity scenarios with 100% pass on all cases. Cases includes both functional aspects and performance aspects such as response time/latency of algorithms as prescribed in the standards such as SAE, ISO etc.

In case any of the algorithms fails to clear the pass criteria, a root cause analysis will be done to provide qualitative and performance inputs for research teams to improvise on the same and rework on the algorithms and deliver with high performance and high-fidelity functionalities

End of the document

VERSION 1.0

Feb 18, 2021



राष्ट्रीय डिज़ाइन संस्थान  
NATIONAL INSTITUTE OF DESIGN



# WIPRO IISC RESEARCH AND INNOVATION PROGRAM

SOW FOR RESEARCH THEMES AND PROJECT IDEAS FOR  
FY22

Prof. Suresh Sundaram  
INDIAN INSTITUTE OF SCIENCE

Prof. Mamata Rao  
NATIONAL INSTITUTE OF DESIGN

Prof. Uttara Kumari  
RV COLLEGE OF ENGINEERING

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	Deliverables	
	Specific Exclusions from Scope	
	Implementation Plan	
	High-Level Timeline/Schedule	
	Payment schedule	



## EXECUTIVE SUMMARY

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- Wipro with its global presence and network of diverse customers bring a rich global perspective to the problems of WIRIN. Its primary focus is to help define the context of identified problems/focus areas, co-create algorithms with IISc by helping in implementation and testing. Wipro with its experience in integration, shall also integrate various algorithms and other opensource/commercial modules into platforms and do its system testing finally.
- National Institute of Design will bring a rich and diverse experience in various areas of design into WIRIN. It will help conduct user studies, design strategies and help in product and experience design of various platforms of WIRIN.
- RVCE being a reputed engineering school of Karnataka is primarily responsible in helping with implementation of algorithms and integration of platforms under the guidance of Wipro and IISc. It will work closely with Wipro on system integration testing and data collection, curation of dataset and use case scenario creation activities for various algorithms being developed by IISc.



## RESEARCH AND INNOVATION PROGRAM

Research and Innovation projects defined under WIRIN program roughly fall under one or more of the following high-level and broad themes. These themes are identified as thrust areas for 2018-19.

**Visual computing** – traditional image processing, visual intelligence and understanding using deep learning, computer generated imageries, visual analysis and synthesis, 3D processing, etc.

**Human computer interaction** – VR/AR/MR, design aspects of interaction with machines, force feedback systems, tactical/perceptual user interfaces, user studies, observation systems, etc.

**Cognitive computing and AI** – Agent systems, AI systems, man-machine interaction, Reinforcement learning, models for intelligent communication systems, conversational AI, NLG, Cognitive control and decision systems for intelligent transportation etc.

Each of the above themes may drive a group of projects/subsystems by providing necessary direction and vision, that in turn help to draw specifications for each of them and their inter-relationships for building parts of an intelligent cognitive system that paves the way for a robotic driving system in an autonomous car (ASR – Autonomous system and Robotics).

Building a Robotic decision system along with its perception systems for ambient sensing is a complex problem. Therefore, we are taking system of systems model approach for reducing the complexity of the entire system. Each of the systems will focus on a specific problem and try to solve it to a large extent.

Behavior and response of system of systems are perceived by means of scenario-based testing and systems are trained to perform certain set of activities for specific scenarios such as highway piloting, self-parking, join and merge traffic, etc.

### End vertical integration system of systems

1. 4D Autonomous system simulator system – SDV in a box
2. AI Stack for Autonomy – focused problem-solving AI bots system
3. Auto Annotate Studio – Automated labelling and AI auditing system as part of National Dataset and Data platform

### Major Scenarios based systems that are used to test the system – initial list

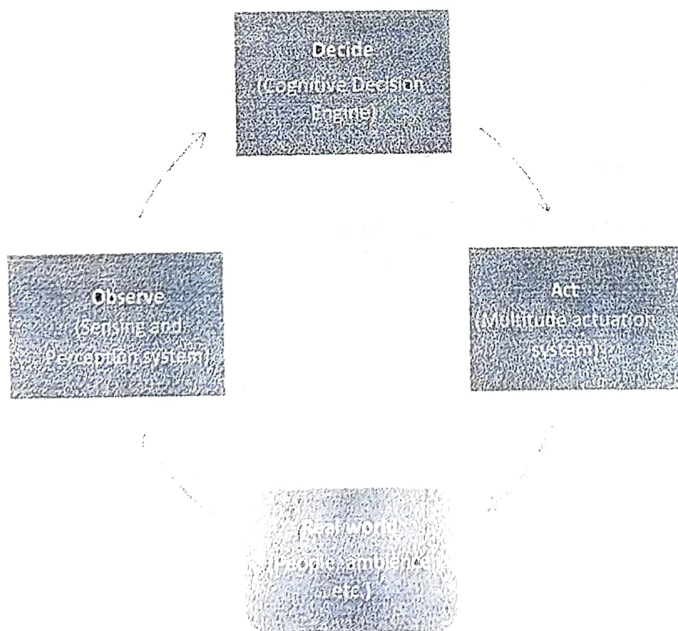
1. City ride and Highway piloting – on simulator
2. Co-ordinated campus vehicles with features such as auto-parking, valet parking, etc. – on a real vehicle.

## WIPRO IISc RESEARCH PROJECT FOR PROBLEM SOLVING

Algorithms that power the ASR to achieve human level performance are quite complex and the data sets that are used to train them need to be carefully curated and annotated. Therefore, the most important task of algorithm development is also to benchmark the performance using a standard training data and improvising the same with augmented data that is carefully curated to solve an important problem. Supervised learning has limitations for the real-world problems that pose a lot of uncertainty and throw up surprises without any cues. Humans use their experience as a tool and reason out the solution/response using their common-sense knowledge system. Therefore, building a system that depends purely on curated data may not be right choice for the autonomous systems/robots.

Inspired by cognitive neuroscience in the application of learning and decision making, we propose a strategy for system of systems. The proposed system uses combination of high-level knowledge that has actionable sequences and a set of intelligent networks that uses reinforcement learning to continuously learn at the elementary level. These elementary learning systems update the meta-level bots that maintain the knowledge for actionable sequences at higher levels in the hierarchy as inspired by cognitive neuroscience. Is it possible to build a system like this under this proposed strategic framework?

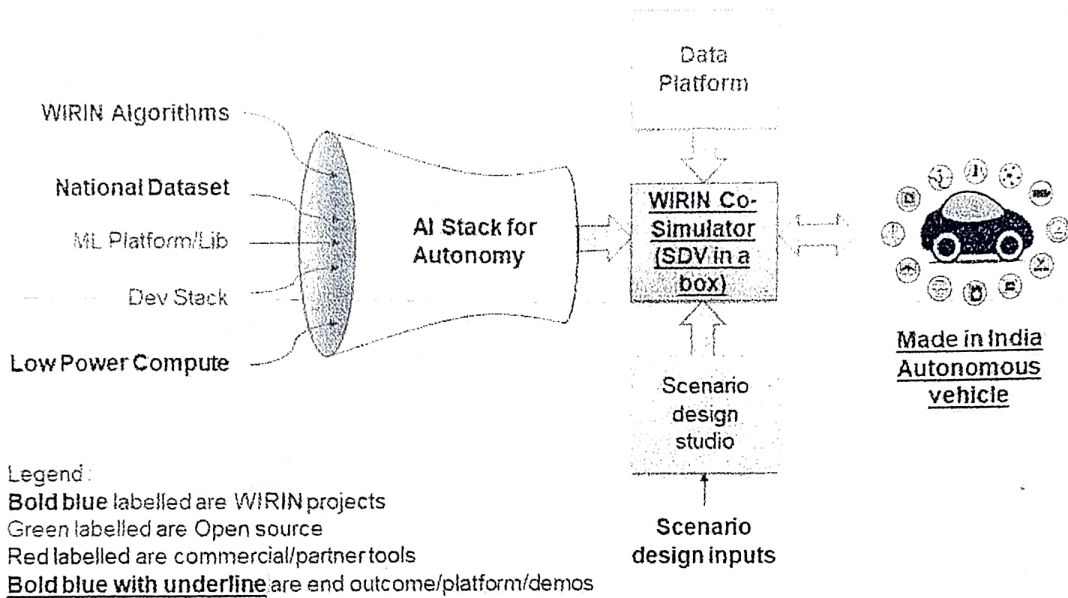
Answering this question through a series of focused problems helps to build and realize the end deliverables.



*Cognitive Framework loop for Autonomous systems and Robotics algorithms*

### BIG PICTURE OF OVERALL ORGANIZATION OF THE PROJECTS

There are various projects initiated under WIRIN in 2018 which are multi-year, multi-objective projects. While there were many exploratory projects in first year, that give an impetus to lay a firm foundation for the future projects, platform projects were designed to be vertical system integration of various projects that would end as a tangible, impactful demonstrations of WIRIN. These demonstrations use a mix of WIRIN data, algorithms, open sources data, tools and some select commercial software platforms. Figure gives the big picture of the overall organization of various elements and its end outcomes.



WIRIN AI Stack for Autonomy, National Dataset and Data platform, WIRIN Co-simulator (SDV in a box) are the multi-year, multi-objective projects and which are mostly vertical integration projects. WIRIN algorithms are the set of algorithms that are part of AI Stack for Autonomy which are based on the exploratory research done at IISc, market survey and customer feedbacks. Problems as part of algorithm development projects under AI Stack for Autonomy are also multi-year with specific quarterly outcomes that solves the various dimensions of problem step-by-step.



## WIPRO IISC RESEARCH AND INNOVATION PROGRAM

### SCOPE OF THE PROJECT

Scope of each of the projects will be decided during the scoping phase, once the projects are identified and approved. Overall scope of all the projects includes – study the state of the art, identify core problem and its definition, analysis and design, simulation/model results, coding and testing on a platform. System testing and integration is the scope of the Wipro team, subsequent to publication of the algorithm and its test results.

### DELIVERABLES

Project deliverables are typically the following and will be defined clearly at the start of each of the projects

1. Study report/requirements
2. Test data curation
3. Algorithm analysis and design documents
4. Algorithm simulation results including code in MATLAB/C/C++/Python
5. Research output – performance, functional and other results
6. Integrated output with algorithms working on scenarios on Simulator, emulator and on real vehicle in the campus for various identified end use scenarios

### SPECIFIC EXCLUSIONS FROM THE SCOPE

IISc project outputs are not hardened for deployment and need to be thoroughly tested and engineered before they get deployed and this is not in the scope of IISc personnel.

### PAYMENT SCHEDULE

This is a joint SoW of three institutions therefore three separate POs and payments must be made to three institutions as per the table given below.

Date	IISc	NID	RVCE	Remarks
Feb 2021	Rs 200 Lakhs	Rs. 39 Lakhs	Rs. 380 Lakhs	Projects need money upstart to deliver including the Lab setup and assets
			Rs. 32 Lakhs	- Towards COE for EV

Note: Note the above also includes the lab setup expenses for projects at RVCE and IISc. All amounts mentioned above does not include taxes. GST at prevailing rates will be extra.



## WIPRO-IISC RESEARCH AND INNOVATION PROGRAM

### IMPLEMENTATION PLAN

IISc and Wipro have jointly proposed the following for capacity building and execution of the project at IISc and other partner institutions (if at all any are added in the future)

1. Creation of test beds such as Simulator platforms, Skeleton vehicle for real world testing
2. Institution of Wipro-IISc fellowships to attract MTech and PhD students and make them work in this area
3. Institution of Wipro-IISc Internships for students of select academic institutions of the country to get them trained and work in the project, who could possibly be hired by Wipro and its partners later
4. Assisting Wipro in the creation of course material for training their employees for scaling in customer projects
5. Dedicated Infrastructure such as GPU clusters and High-performance computing for all the team members
6. Possible creation of a collaborative working space for Wipro staff and other partner institutions in the future
7. Possible setting up of a dedicated lab for Autonomous systems and Robotics

### ACCEPTANCE CRITERIA FOR ALGORITHMS DEVELOPED BY IISC – WIPRO'S ACTIVITY OF TESTING

- Q1 FY22
  - Auto park assist 2.0 to work for more than 90% of use cases in the scenarios created with stakeholder inputs
  - Scenarios for testing Emergency braking and Reverse assist
  - **Pass criteria** - Testing of AEB and Reverse assist for more than 90% of the cases
- Q2 FY22
  - 6 DOF platform deployment of Simulator and its testing with high speed algorithms
  - Creation of high-fidelity real-world scenarios for Auto valet parking (AVP) with stakeholder inputs
  - **Pass criteria** – Testing of AVP algorithms against all the test cases and it should pass at least for 70% of use cases
- Q3 FY22
  - Integration of all algorithms and AV functions into AI stack for Autonomy and deployment as a pluggable stack on to the simulator
  - **Pass criteria** – Testing of AI stack for Autonomy algorithms on high fidelity scenarios with 100% pass on all cases. Cases includes both functional aspects and performance aspects such as response time/latency of algorithms as prescribed in the standards such as SAE, ISO etc.
- Q4 FY22
  - Create a high-fidelity real-world scenario for Auto parking and highway lane merging in the simulator with help of 3<sup>rd</sup> party components – collect the stakeholder data to create the scenarios
  - Test the Auto park assist set of algorithms on the high-fidelity scenario
  - Test Lane merging traffic with real-time metrics to measure the effectiveness of algorithms
  - **Pass criteria** – Algorithms should pass for at least 70% of the cases identified in the detailed scenarios designed for Q4 FY 20, should work for all 100% cases by Q3 FY21

The acceptance criteria is subjected to revision based on finalization of project deliverables for individual members after the study phase. In case any of the algorithms fails to clear the pass criteria, a root cause analysis will be done to provide qualitative and performance inputs for research teams to improvise on the same and rework on the algorithms and deliver with high performance and high-fidelity functionalities

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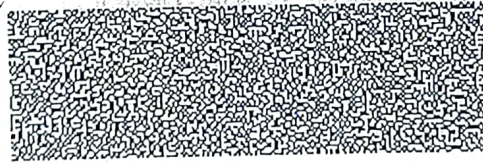
INDIA NON JUDICIAL

## Government of Karnataka

e-Stamp

Certificate No.	: IN-KA88341715880799S
Certificate Issued Date	: 22-Jan-2020 09:47 AM
Account Reference	: NONACC (FI)/ kacrsfl08/ MATHIKERE/ KA-BA
Unique Doc. Reference	: SUBIN-KAKACRSFL0889992868799070S
Purchased by	: INDIAN INSTITUTE OF SCIENCE
Description of Document	: Article 12 Bond
Description	: CONSORTIUM AGREEMENT
Consideration Price (Rs.)	: 0 (Zero)
First Party	: WIPRO LIMITED
Second Party	: INDIAN INSTITUTE OF SCIENCE
Stamp Duty Paid By	: INDIAN INSTITUTE OF SCIENCE
Stamp Duty Amount(Rs.)	: 200 (Two Hundred only)

*Syothi*  
Authorised Signatory  
THE MATHIKERE CO-OP.  
SOCIETY LTD.



Please write or type below this line

### WIRIN Consortium Associate Member Agreement

This Development Partnership Agreement ("Agreement") is executed at Bengaluru on this the 6<sup>th</sup> day of February Two Thousand and Twenty (06/02/2020) to be referred as "Effective Date"





BY AND BETWEEN

**Wipro Limited**, a company incorporated in India as per the provisions of the Companies Act, 1956 and an existing company under the provisions of the Companies Act, 2013 having its registered office at Doddakannelli, Sarjapur Road, Bengaluru - 560 035, represented by, duly authorized representative, (hereinafter referred to as "**Wipro**") which expression shall unless repugnant to the context or meaning thereof, mean and include its directors, affiliates, subsidiaries, successors-in-business and permitted assigns) of the FIRST PART;

AND

**Indian Institute of Science**, a Trust registered under the Charitable Endowments Act, 1890, a Deemed University and an Autonomous Technical Institution under the Ministry of Human Resource Development, Government of India having its registered office at Sir CV Raman Road, Malleshwaram, Bengaluru - 560 012, represented by its Registrar or a duly authorized representative (hereinafter referred to as "**IISc**", which expression shall mean and include its trustees, officers, and permitted assigns) and of the SECOND PART;

Hereinafter referred to as '**Founding Members**;

AND

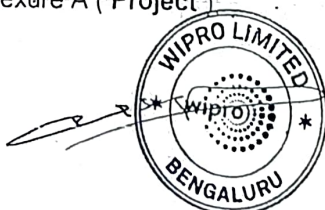
**RV College of Engineering**, an institution under Rashtreeya Sikshana Samithi Trust (RSST) having its registered office at 3<sup>rd</sup> Block, Jayanagar, Bengaluru represented herein by its authorized signatory Dr. K.N Subramanya, (hereinafter referred to as "**RVCE**" which expression shall mean and include its successors in interest, trustees, officers and permitted assigns) and of THIRD PART.

Hereinafter referred to as '**Associate Member**.

Founding Member and the Associate Members may individually be referred to as Party and collectively as Parties.

WHEREAS:

- A. WHEREAS Wipro and IISc have knowledge and expertise and have agreed to do research and innovation in the area of Computing, Communications, Electronics and different aspects of design through various collaborative projects hereinafter called "**Consortium**", are set to work on various projects, which may be further defined in Annexure A ("**Project**").



- B. The Associate Member is engaged in the business of Education, Research, Consultancy, Development and it has intimated that it aligns with the goals of the Wipro-IISC Innovative Network (WIRIN) Project and is interested in undertaking R&D in artificial intelligence, machine learning, computer vision and human machine interaction, related to autonomous systems and robotics.
- C. The Associate Member has expressed interest in making contribution and add value to the Project and has represented that it has the requisite skills, facilities and resources to assist the Founding Members achieve the objectives of the Project;
- D. Based on the representations of the Associate Member, the Founding Members have identified the Associate Member to contribute and to provide certain Deliverables to the Project under the terms and conditions as detailed below.

NOW THEREFORE, FOR GOOD AND VALUABLE CONSIDERATION, IT IS HEREBY AGREED AS FOLLOWS:

1. SCOPE OF ENGAGEMENT

- a. - The nature and scope of engagement, the areas of cooperation between the Parties herein and the Deliverables to be provided by the Associate Member are detailed in Annexure A. Annexure A, maybe updated from time to time upon mutual agreement between the Parties and such updated Annexure A shall duly be signed by the Parties.
- b. The Associate Member undertakes to deploy sufficient resources and to provide value addition to the Project by performing the Services and delivering the Deliverables as provided in Annexure A below.

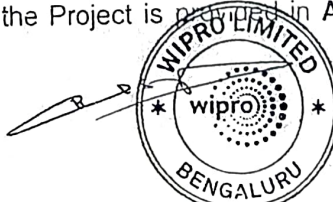
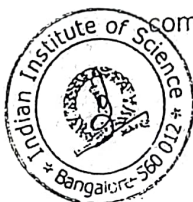
2. TERM

- a. This Agreement shall be valid till 2 years from the Effective date, unless terminated in accordance with the terms of this Agreement. The Parties may, by mutual consent, extend the Term of this Agreement for such period as mutually agreeable.

3. OBLIGATIONS OF THE ASSOCIATE MEMBER

- a. The Associate Member shall:

- i. Follow the required processes to bring in any component or Intellectual Property into the Project. The Process of adding a component to the Project is provided in Annexure B. Annexure B,





may be updated from time to time, upon mutual Agreement between the Parties, and shall be duly signed by the Parties.

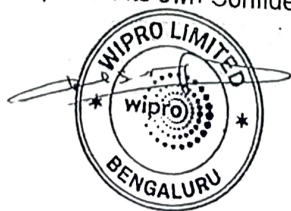
- ii. Ensure that the hardware/software component provided by the Associate Member under this Agreement shall be in working conditions and that requisite tests for these components have been successfully completed. The Associate Member undertakes to replace/rectify the hardware/software component, in case of any defects, without any delay.
- b. The component(s) and materials that a Associate Member provides to the Project will be available to the Founding Member and all other participants of the Project in an equal manner.

#### 4. RIGHTS AND ENTITLEMENTS OF MEMBERS

Subject to the terms of this Agreement, the rights and obligations of a party to this Agreement, shall be mentioned in Annexure A. Annexure A, shall also mention the investment to be made by each party, any payment terms, and other such detail as may be required from time to time.

#### 5. CONFIDENTIALITY

- a. "Confidential Information" means information (whether electronic or otherwise) disclosed by a Party ("Disclosing Party") to the other Party ("Receiving Party"), including but not limited to, business information, specifications, ideas, know-how, designs, drawings, data, computer programs, marketing, technical, financial and any other information relating to its personnel, customers, affiliates or agents, provided that such information is identified and marked as "Confidential" at the time of disclosure.
- b. The Receiving Party may use the Confidential Information only for the purpose of the Project and not for any other purpose ("Purpose").
- c. **Protection of Confidential Information:** The Receiving Party shall not disclose the Confidential Information to any person other than the Receiving Party's (and/or its affiliates) personnel, directors, consultants and independent contractors as is necessary to fulfil the Purpose of the Project. The Receiving Party shall protect the Confidential Information by using the same degree of care, but no less than a reasonable degree of care, the Receiving Party uses to protect its own Confidential Information.



- d. **Exclusions:** This Agreement imposes no obligation upon the Receiving Party with respect to Confidential Information which: (i) is a part of or enters into the public domain; (ii) was already in the Receiving Party's possession prior to the date of disclosure; (iii) is rightfully received by the Receiving Party from a third party without any duty of confidentiality; (iv); is independently developed by the Receiving Party without use of the Confidential Information; or (v) is required to be disclosed by operation of law or governmental authority.
- e. **Proprietary Rights:** Each Party shall retain all right, title and interest to such party's Confidential Information. Neither Party acquires any intellectual property rights or any other rights or licenses under this Agreement except for the limited right to use as is required for the Project, or as agreed in this Agreement.
- f. **Injunctive Relief:** The Receiving Party agrees and acknowledges that any breach of this Confidentiality clause would cause the Disclosing Party irreparable harm for which monetary damages would be inadequate. Accordingly, the Disclosing Party will be entitled to seek injunctive or other equitable relief to remedy any threatened or actual breach of this clause.
- g. This Section 5, shall survive termination of the Agreement and the obligations shall survive, for a period of three (3) years post termination.

## 6. OWNERSHIP OF THE INTELLECTUAL PROPERTY RIGHTS

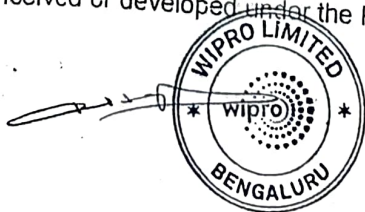
- a. **Background IP:** Each Party shall own and continue to own its pre-existing rights (including intellectual property) in any invention, know-how, technology, software, hardware, tools, products or any other material i.e. which was owned by the Party prior to the entering into this Agreement or created independently or licensed by third parties ("Background IP") and the other Party shall have no rights over it. License to Background IP, required for commercialization of the Foreground IP, shall be negotiated between the Parties, through a separate license agreement. However, the Parties grant to each other, a non-exclusive, termed, royalty free, sully paid up and revocable license to use a Party's Background IP, introduced to the Project solely for the purposes of performance of obligations under the Project.
- b. **Foreground IP**

- i. The Background IP brought to the Project by the Party will be retained with the Party bringing



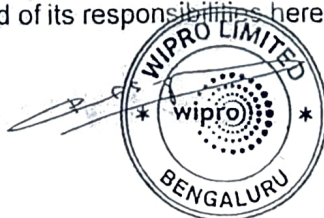


- ii. Notwithstanding any agreement between the persons who are seconded to work on the Project and the respective Associate Member or Founder Member, when any party to the Project provides manpower resources, or has participated in the Project under this Agreement, for development of any material, code, software, framework or accelerator, algorithm, flowcharts, database, ("Foreground IP") such Foreground IP shall be jointly owned between the Parties to the Project. The Founding Members shall always be the joint owners of the Foreground IP.
- iii. The Parties agree that if during joint development of an IP and as a result of information exchange between the Parties herein in respect of the Purpose as specified in this agreement, should there arise ideas, including implementations and/or other manifestations thereof, that prima facie seem patentable or warrant such other IP protection, each party agrees and undertakes to jointly own and protect such IP with the other, naming only those individuals as inventors therein, who contributed to the inventing or creative process of the joint development.
- iv. Each Party shall be entitled to use, exploit and commercialize the Foreground IP without any recourse or consent from the other Parties.
- v. The Parties are not obligated to share any revenue, fees, royalty or any other type of payment with the other Parties for any use, exploitation or commercialization of the Foreground IP.
- vi. However, notwithstanding the above, or the Agreement, IISc or Associate Member, shall not assign, or license the Foreground IP to any other party who is a competitor of Wipro providing similar services or products, without the prior written consent of the Wipro, for a period of two (2) years from the date of filing for registration of such intellectual property, or from Project completion date, whichever is earlier. Post the two (2) year exclusivity, if IISc or Associate Member decides to license, or assign right in the Foreground IP, then such Party, shall first approach Wipro and both Parties shall negotiate commercial terms on a good faith basis.
- vii. Each Party, shall document all developments in writing, and convey to the rest of the members to the Agreement all intellectual properties, conceived or developed under the Project.



## 7. PATENT DRAFTING, FILING & PROSECUTION

- a. Whenever any invention in or underlying a Foreground IP is assessed to be patent eligible by WIPRO, or upon recommendation from IISc or Associate Member, Wipro holds the right to file a patent application with respect to such invention on behalf of all the Parties to the Project. Each Party grants Wipro the right to file and prosecute the patent applications on their behalf. Wipro using its own expertise and resources by itself or through its agents and/or vendors shall draft and prosecute the complete patent application(s).
  - b. Each Party, shall cooperate with Wipro, and provide all the necessary information, documents and technical support to Wipro to successfully draft, file and prosecute the patent application(s). Wipro shall intimate all the Parties about each stage of the patent drafting, filing and prosecution process. Wipro shall before filing for a patent take into consideration all the recommendations provided to it by the other Parties, provided that such recommendations are shared with Wipro in writing, within 15 days of Wipro's intimation). However, Wipro shall have the sole discretion to decide on the best strategy for drafting, filing prosecuting such patent application(s). Each Party shall have one person of contact, whose contact details shall be shared with the other Parties, for the purpose of sending and receiving information with respect to the patent application(s). The assignees of the patent application(s) shall be the parties to the Project.
  - c. The jurisdictions for filing such patent application(s) shall be decided mutually between the Parties. Such jurisdictions, on which the Parties are not able to come to a mutual agreement, the Parties who are interested to pursue patent application(s) in such jurisdictions shall take the application(s) forward at their sole cost and effort, and shall be the sole assignees. Wipro's responsibilities with respect to Section 7.1, 7.2 and 7.4 shall be applicable only to such jurisdictions, where Wipro has shown interest.
  - d. The cost for the patent application(s), including but not limited to drafting of the application, filing of the application, prosecution of the application(s) shall be borne by Wipro. On grant of the patent application, Wipro shall be responsible and bear the cost to maintain the patent.
8. Wipro shall determine whether to continue with the patent application(s) or maintain the patent(s). If Wipro chooses not to pursue with the filed patent application(s) in certain jurisdictions, or maintain patent(s) in certain jurisdictions, then Wipro shall be absolved of its responsibilities hereunder. Other Parties who





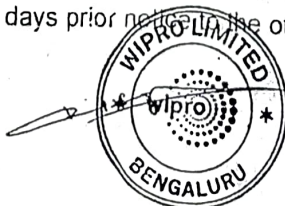
are interested to pursue with the patent application(s), or maintain the patent(s) may do so at their sole efforts, resources and investment. Such Parties, who are pursuing the application(s), or maintaining the patent(s), shall remain as the assignees.

## 9. INDEMNIFICATION & LIMITATION OF LIABILITY

- a. The Associate Member shall indemnify and hold the Consortium and the Founder Member, harmless from all claims and damages awarded against, or incurred or paid by the Consortium or the Founding Member as a result of or in connection with:
  - i. Any alleged or actual infringement, whether or not under Indian law, of any third party's Intellectual Property Rights or other rights arising out of use of any pre-existing material provided of the Associate Member, performance of obligations or delivery of deliverables under this Agreement;
  - ii. Any claim made against the Consortium or the Founding Member in respect of any liability, loss, damage, injury, cost or expense sustained by the Consortium, to the extent that such liability, loss, damage, injury, cost or expense was caused by, relates to or arises from the performance of obligations under this Agreement or the Deliverables as a consequence of a breach or negligent performance or failure or delay in performance of this Agreement by the Associate Member.
- b. NEITHER PARTY SHALL BE LIABLE FOR ANY INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES (including loss of profits, loss of business, depletion of goodwill and similar losses), costs, proceedings, damages and expenses (including legal and other professional fees and expenses) ARISING OUT OF THE USE, PERFORMANCE OR APPLICATION OF CONFIDENTIAL INFORMATION, AND/OR BACKGROUND IP, BY THE OTHER PARTY OR THIRD PARTIES.
- c. EXCEPT INDEMNITY OBLIGATIONS, BREACH OF COFIDENTIALITY, OR DATA BBREACH EITHER PARTY'S LIABILITY FOR DIRECT DAMAGES SHALL BE LIMITED TO AN AGGEGATE AMOUNT EQUAL TO THE PRJECT COST.

## 10. TERMINATION

- a. Either Party shall have the right to terminate this Agreement with or without cause, upon 30 days prior notice to the other Party.



- b. Notwithstanding the termination of this agreement, the components provided by the Associate Member to the Project during the validity of this agreement will continue to be available in the test bed without any restrictions.

## 11. MISCELLANEOUS

- a. Any notice must be in writing to the nominated address of the Party and sent whenever practical by facsimile, failing which by courier or personal delivery. A Party may change its nominated address at any time and may designate that copy to all other Parties. The nominated addresses of the Parties as at the date hereof are:

For Founding Member:

If to Indian Institute of Science: The Registrar  
Indian Institute of Science (IISc)  
Bengaluru – 560 012

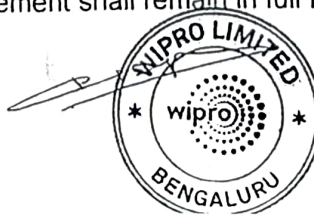
If to WIPRO:

K R Sanjiv  
Chief Technology Officer  
Wipro Ltd.  
EC123, Electronics City,  
Bengaluru – 560 100

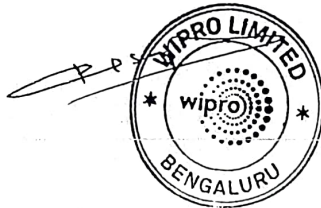
For Associate Member:

RV College of Engineering  
8<sup>th</sup> Mile, Vidyanikethan Post  
Bengaluru – 560 059

- b. This Agreement supersedes all previous arrangements, representations, understandings, negotiations, communications and the like, whether oral or written, with respect to the subject matter between the Parties.
- c. Each Party shall abide by all the applicable laws, rules, policies, standards, guidelines and procedures now in effect or hereinafter enacted.
- d. **Waiver:** Upon a party's breach or default hereunder, the other party's failure, whether single or repeated, to exercise a right hereunder shall not be deemed to be a waiver of that right as to any future breach or default.
- e. **Severability:** If any of the provisions of this Agreement are held by a court of competent jurisdiction to be unenforceable or invalid, then such provisions will be ineffective to the extent of the court's ruling. All remaining portions of the Agreement shall remain in full force and effect.



- f. **Arbitration:** The parties shall use their best endeavours to settle any dispute or claim arising out of or relating to the Agreement, in supplemental agreements and their attachments thereto through amicable discussions. The Parties shall create a committee consisting of equal representations from each Party ("Dispute resolving Committee"). The Dispute resolving Committee will be the dispute resolution forum to amicably settle any disputes/complaints. If not amicably settled within a period of sixty (60) days of the dispute or claim arising, such dispute or claim shall be decided by a panel of three (3) Arbitrators in accordance with the provisions of the Arbitration and Conciliation Act, 1996 read with its amendments. The venue and seat of Arbitration will be at Bengaluru. The parties agree that the decision of the majority of the Arbitrators so appointed shall be final and binding upon the parties. The Dispute resolving Committee may if required participate in the Arbitration and the Parties hereby provide their no objection for the same.
- g. Neither Party shall solicit or attempt to solicit for employment either directly or indirectly an employee or contractor from the other Party nor encourage any employee of other party to terminate her/his relationship with the party during the term of this Agreement and for a period of one year after the termination of the Agreement without the prior written consent of the other Party.
- h. **Governing Law:** The validity, interpretation and construction of this Agreement, and all other matters related to the Agreement, will be governed and interpreted by the laws of India and shall be subject to the exclusive jurisdiction of the courts at Bengaluru City alone.





IN WITNESS WHEREOF, the Parties hereto have signed this Agreement as of the date set forth above

Indian Institute of Science

Signature:

Name: V Rajarajan

Designation: Registrar

Date: 07/02/2020

Seal: रजिस्ट्रार / REGISTRAR

भारतीय विज्ञान संस्थान / Indian Institute of Science

बैंगलूर / Bangalore - 560 012

RV College of Engineering

Signature:

Designation: Principal

Date:

Seal:

R V College of Engineering

Mysuru Road

Bengaluru - 560 059

WIPRO Ltd.

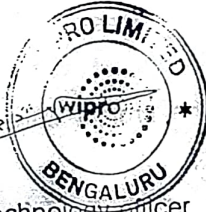
Signature:

Name: K R Sanjiv

Designation: Chief Technology Officer

Date: 7/2/2020

Seal:





## ANNEXURE A

### 1. Nature and Scope of Engagement:

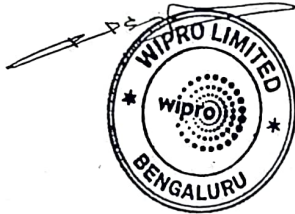
- Will be participating in the project themes of WIRIN which has relevance to the mutual areas of interest such as AI, Machine learning, VLSI/FPGA hardware designs, computer vision, electric vehicle simulation, testing
- Scoping of the work will be added in due course after the identification of problems by project collaborators and made part of this Annexure.

### 2. Areas of Cooperation:

In the field of AI, Machine learning, VLSI/FPGA hardware designs, computer vision, electric vehicle simulation, testing.

### 3. Deliverables:

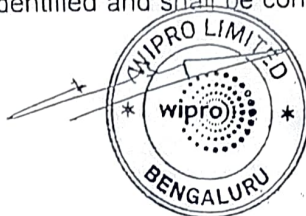
- Will be listed after the initial scoping of the project with other project collaborators



## ANNEXURE B

### List of any component or Intellectual Property brought into the Project

The Components and relevant IP, if any, will be added to this Annexure before the start of the project or as and when identified and shall be considered part and parcel of this Agreement.



## STATEMENT OF WORK

This Statement of Work is dated as of 1 April 2020, and is attached to and made a part of the WIRIN Agreement (hereinafter referred to as the "Agreement") dated 1 April 2020.

### BY AND BETWEEN

Wipro Limited, a public limited existing under the Indian Companies Act, 2013, having its registered office at Doddakannelli, Sarjapur Road, Bangalore 560-035, India (hereinafter referred to as "Wipro" which term unless repugnant to the context shall include its successors-in-interest, subsidiaries, affiliates and permitted assigns), on the ONE PART

### AND

RV College of Engineering, 8<sup>th</sup> Mile, RV Vidyaniketan Post, Mysuru Road, Bengaluru - 560059, an Educational Institution under Rashtriya Shikshana Samithi Trust, registered under Trust Act, and having its principal or registered office at Jayanagar, 3<sup>rd</sup> Block, Bengaluru - 560011 (hereinafter referred to as "Supplier" which term unless repugnant to the context shall include its successors and permitted assigns) on the OTHER PART

Any term used herein that is defined in the "Agreement" shall have the same meaning in this Statement of Work as in the "Agreement". To the extent that this Statement of Work is inconsistent with or conflicts with the "Agreement", this Statement of Work shall amend and supersede those inconsistent or conflicting terms of the "Agreement". In all other respects, the "Agreement" shall remain in full force and effect according to its terms.

NOW THEREFORE, in consideration of the terms and conditions set forth herein, the parties agree as follows:

### Scope:

Research and Innovation projects defined under WIRIN program roughly fall under one or more of the following high-level and broad themes. These themes are identified as thrust areas for 2020-21. Visual computing – traditional image processing, visual intelligence and understanding using deep learning, computer generated imageries, visual analysis and synthesis, 3D processing, etc.

Human computer interaction – VR/AR/MR, design aspects of interaction with machines, force feedback systems, tactical/perceptual user interfaces, user studies, observation systems, etc. Cognitive computing and AI – Agent systems, AI systems, man-machine interaction, Reinforcement learning, models for intelligent communication systems, conversational AI, NLG, Cognitive control and decision systems for intelligent transportation etc. Each of the above themes may drive a group of projects/subsystems by providing necessary direction and vision, that in turn help to draw specifications for each of them and their interrelationships for building parts of an intelligent cognitive system that paves the way for a robotic driving system in an autonomous car (ASR – Autonomous system and Robotics). Building a Robotic decision system along with its perception systems for ambient sensing is a complex problem. Therefore, we are taking system of systems model approach for reducing the complexity of the entire system. Each of the systems will focus on a specific problem and try to solve it to a large extent. Behavior and response of system of systems are perceived by means of scenario-based testing and systems are trained to perform certain set of activities for specific scenarios such as highway piloting, self-parking, join and merge traffic, etc. End vertical integration system of systems

1. 4D Autonomous system simulator system – SDV in a box
2. AI Stack for Autonomy – focused problem-solving AI bots system
3. Auto Annotate Studio – Automated labelling and AI auditing system as part of National Dataset and Data platform Major Scenarios based systems that are used to test the system – initial list

1. City ride and Highway piloting -- on simulator
2. Co-ordinated campus vehicles with features such as auto-parking, valet parking, etc. – on a real vehicle.

Scope of each of the projects will be decided during the scoping phase. once the projects are identified and approved. Overall scope of all the projects includes – study the state of the art, identify core problem and its definition. analysis and design, simulation/model results, coding and testing on a platform. System testing and integration is the scope of the Wipro team, subsequent to publication of the algorithm and its test results.

#### Detail of Services:

Research and innovation projects by WIRIN – Wipro, IISC, RVCE, NID

#### Place of Performance

Bangalore, India

#### Period of Performance/Term

This Statement of Work is dated as of 1 April 2020 and shall be effective for a period of 1 year from date of signature.

Version June 2012

#### Fees for Supply/Services and Optional Services/Payment Schedule:


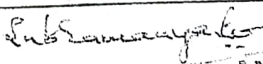
RVCE – INR 380 lacs for AV and INR 32 lacs for COE of EV ✓

#### VII. Miscellaneous:

Describe any items unique to the project such as:

- Standards to be used including hardware, software and technical architecture
- Travel and accommodations
- Support personnel
- Shipping, handling and packaging
- Conflict resolution agreement
- Service level agreements
- Performance standards
- Any other clauses that is not covered in reference to the provisions of the Underlying agreements or in addition there to.

IN WITNESS WHEREOF, the parties acknowledge that each has fully read and understood this SOW, and, intending to be legally bound thereby, executed this SOW on the date set forth above.

FOR AND ON BEHALF OF WIPRO LIMITED	FOR AND ON BEHALF OF SUPPLIER
Signature:  DocuSigned by: 0C358A56BC0A458...	Signature:  22/2/21 Dr. K N Subramanya PRINCIPAL
Name: Pankaj Gupta	Name: RV COLLEGE OF ENGINEERING
Title: Head - Global vertical Pass	Title: BENGALURU - 560 059

24-Feb-2021



Phase-2  
Payment

76P 80P, Doddakanneli Sarjapur Road  
Bangalore, 560035 IN..



Supplier Code : 2041015  
Supplier Name: RV College of Engineering  
Supplier Add : RV Vidyaniketan Post Mysuru Road Bengaluru  
Karnataka 560059 IN

Payment Voucher No : 1211320590  
Date : 30.03.2020  
Currency : INR

Dear Sir/Madam,

Please find the Electronic Transfer of Amount INR 4,050,000.00 to the credit of your account 136010112055 towards the following detail

Invoice Ref	Invoice Date	Wipro REF No.	Gross Amt	TDS Amt	Net Amt
802000840	23.03.2020	1211315945	4,050,000.00	0.00	4,050,000.00
				<b>TOTAL PAY</b>	<b>4,050,000.00</b>

This is a computer-generated advice and does not require a signature.

Note: Would request to mail/send your invoice to IRS ( Invoice Receiving Station ) for on time payment.

76P 80P, Doddakanneli Sarjapur Road  
Bangalore, 560035 IN..



Order Code : 2041015  
Supplier Name: RV College of Engineering  
Supplier Add : RV Vidyaniketan Post Mysuru Road Bengaluru  
Karnataka 560059 IN

Payment Voucher No : 1211320590  
Date : 30.03.2020  
Currency : INR

Sir/Madam,

se ( ) the Electronic Transfer of Amount INR 4,050,000.00 to the credit of your account 136010112055 towards following detail

Invoice Ref	Invoice Date	Wipro REF No.	Gross Amt	TDS Amt	Net Amt
000840	23.03.2020	1211315945	4,050,000.00	0.00	4,050,000.00
				<b>TOTAL PAY</b>	4,050,000.00

This is a computer-generated advice and does not require a signature.

Note: Would request to mail/send your invoice to IRS ( Invoice Recieving Station ) for on time payment.

76P 80P, Doddakanneli Sarjapur Road  
Bangalore, 560035 IN..



Code : 2041015  
Name: RV College of Engineering  
Add : RV Vidyaniketan Post Mysuru Road Bengaluru  
Karnataka 560059 IN

Payment Voucher No : 1211320590  
Date : 30.03.2020  
Currency : INR

Sir/Madam,

We have made the Electronic Transfer of Amount INR 4,050,000.00 to the credit of your account 136010112055 towards the following detail

Invoice Ref	Invoice Date	Wipro REF No.	Gross Amt	TDS Amt	Net Amt
1211315945	23.03.2020	1211315945	4,050,000.00	0.00	4,050,000.00
				<b>TOTAL PAY</b>	<b>4,050,000.00</b>

This is a computer-generated advice and does not require a signature.

Note: Would request to mail/send your invoice to IRS ( Invoice Recieving Station ) for on time payment.

Original

TAX INVOICE												
GSTIN : 29AAATR0758A1ZP PAN : AAATR0758A		Invoice No. : 10201802000371 Date : 27.02.2021										
Billing Details (Bill To) :		Shipping Details (Ship To) :										
Name : Wipro Ltd		Name : Wipro Ltd										
Address : Keonics Electronic City, Hosur Main Road,, Wipro Limited, WIVIDUS, Tower4, 5th Floor, B Wing Bengaluru-560100		Address : Keonics Electronic City, Hosur Main Road,, Wipro Limited, WIVIDUS, Tower4, 5th Floor, B Wing Bengaluru-560100										
GSTIN : 29AAACW0387R2ZI PAN : AAACW0387R State Code : 29-Karnataka		GSTIN : 29AAACW0387R2ZI PAN : AAACW0387R State Code : 29-Karnataka										
Sl.No	Description	HSN/SAC	Quantity	UOM	Rate / Item (Rs.)	Taxable Value (Rs.)	GST			Total Amount (Rs.)		
							SGST	CGST	IGST			
							Rate of Tax	Amount	Rate of Tax	Amount		
1	Institution Consultancy Projects WIRIN-RVCE (AV) 2020-21	998393	0.000		0.00	3,80,00,000.00	9.000	34,20,000	9.000	34,20,000	0.00	4,48,40,000.00
Beneficiary details for NEFT/RTGS						TCS Rate of Tax					0.00	
Bank A/C Details R V College of Engineering 136010112055 Kotak Mahindra Bank						Discount					0.00	
Branch Address & Ifsc R.V.College of Engineering Campus Mysore Road,,Bengaluru, 10 KKBK0008053						Round of Amount					0.00	
						Grand Total					4,48,40,000.00	
						Amount in Words : Rupees Four Crore Forty Eight Lakh Forty Thousand Only						
TERMS & CONDITIONS :- 1. Payment to be made at the earliest 2. Cheque in favour of Director/Principal/CEO/Head Mistress R V College of Engineering						R V College of Engineering HOI/Authorized Signature						

Go, change the world

principal@rvce.edu.in  
rvce.edu.in

080 - 67178020/8161

Mysore Road, RV Vidyaniketan  
Post. Bengaluru - 560059,  
Karnataka, India



Original

IRN :

Ack No :

Ack Date :

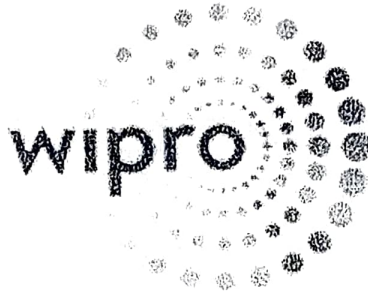
e-Invoicing detail(s) generated from the Government's e-Invoicing system.

Mysore Road, RV Vidyaniketan  
Post, Bengaluru - 560059,  
Karnataka, India

080 - 67178020/ 8161

principal@rvco.edu.in  
rvco.edu.in

*Go, change the world*

**ORDER NO. 5500272954**

Issued on 3-Mar-2021 IST

Created on 3-Mar-2021 IST by Subham SU383709

**SUPPLIER:**

RV College of Engineering  
RV Vidyaniketan Post Mysuru Road  
Bengaluru Karnataka 29  
059  
India  
Phone: +91 9663699299  
Fax: +91 1

**TOTAL AMOUNT**  
44,840,000.00 INR

**STORAGE LOCATION (SHIP TO):**

Wipro Limited, STPI/EC123/T1-T8  
WIPRO LIMITED,#72 Kenoics Electronic city,  
Hosur Main Road, Bengaluru  
Bengaluru 29  
560100  
India

**BILL TO (PLANT):**

Wipro Limited, STPI/EC123/T1-T8  
WIPRO LIMITED,#72 Kenoics Electronic city,  
Hosur Main Road, Bengaluru  
Bengaluru 29  
560100  
India

**DELIVERY CONTACT:**

Dr. Ramachandra Budihal

Asset Class:

Deliver To: Dr. Ramachandra Budihal

Payment Terms: Net 60 days from receipt of invoice

Validity Start Date: 1-Apr-2020 GMT

Validity End Date: 31-Mar-2021 GMT

Payment Milestone:

Payment Cycle:

IncoTerms:

VendorCode: 0002041015

Vendor GSTN: 29AAATR0758A1ZP

Requester: Subham SU383709

PR No.: PR353410-V2

Service Start Date: 1-Apr-2020 GMT

Service End Date: 31-Mar-2021 GMT

**HSN / SAC Code:**

ID: 998313

Name: Information technology (IT) consulting and support

Material Code:

Reference Address for ShipTo:

Sales Order / Contract Item No.: 0

LINE ITEM DETAILS ( 1 LINE ITEM )

NO.	DESCRIPTION	PART NUMBER	QTY	NEED BY	UNIT PRICE	DISCOUNT	NET AMOUNT	CHARGES	TAXES	EXTENDED AMOUNT
1	WIRIN - RVCE (AV) 2020-21		1	31- each Mar- 2021 IST	38,000,000.00 INR		38,000,000.00 INR		6,840,000.00 INR	44,840,000.00 INR

Full Description: WIRIN - RVCE (AV) 2020-21

TAX CODE	TAXES	RATE	TAX AMOUNT	AMOUNT
BU	SGST	9.0%	3,420,000.00 INR	6,840,000.00 INR
	CGST	9.0%	3,420,000.00 INR	


Buyer GSTN: 29AAACW0387R2ZI  
Req. Line No.: 1

TOTAL AMOUNT  
44,840,000.00 INR

TERMS AND CONDITIONS OF PURCHASE:

IMPORTANT COMMUNICATION

LEGAL TERMS AND CONDITIONS OF PURCHASE

1. Delivery of products and services should always be as per a valid Purchase Order (PO).
2. Please ensure delivery of products and services is as per the description and quantity in the PO.
3. Please also ensure that any changes (billing/delivery location/ mode of delivery/ part delivery etc.) to the PO terms is agreed with Wipro and communicated through a revision in the PO.
4. Invoice should be submitted on time to ensure the payment as per due date.
5. Details in invoice should match with that in the PO to avoid invoices being put on hold for queries/clarification/amendment. For instance, quantity, description, unit price, Legal entity (Bill to Wipro entity & address) etc.
6. Visit <https://support.ariba.com/item/view/189376> for general instructions and legal terms & conditions. It is the supplier's responsibility to read and understand the (i)  billing guidelines, (ii) invoice submission process, (iii) geography specified requirements and (iv) legal terms and conditions of the Purchase Order.
7. Detailed invoice submission procedures and guidelines are mentioned in the document hosted in the link above. Refer Section A.7.
8. For any queries or invoice status please reach out to Help Desk: (a) Europe – [europesupport.cpo@wipro.com](mailto:europesupport.cpo@wipro.com); (b) LATAM – [latamsupport.cpo@wipro.com](mailto:latamsupport.cpo@wipro.com); (c) North America – [nasupport.cpo@wipro.com](mailto:nasupport.cpo@wipro.com); (d) Other regions – [vendorhelpdesk.wipro@wipro.com](mailto:vendorhelpdesk.wipro@wipro.com)  
OR  
Login to My Supplier Buddy <https://mysupplierbuddy.wipro.com/> with 3 simple steps for registration. Step 1 – Register with your official email ID. Step 2 – An OTP will be sent to your email ID, using which you can login. Step 3 – Start chatting with the BOT to get your invoice status. For escalations write to [escalation.cpo@wipro.com](mailto:escalation.cpo@wipro.com)



RV Educational Institutions  
RV College of Engineering

Autonomous  
Institution Affiliated  
to Visvesvaraya  
Technological  
University, Belagavi

Approved by AICTE,  
New Delhi, Accredited  
By NAAC, Bengaluru  
And NBA, New Delhi

Go, change the world

Phase - 1

## RVCE\_Wipro-IISC Innovative Network (WIRIN) Project

Projects executed during June - November 2019

Sl No	Project No	Title of The Project	Faculty Name	Students
1	1	Driver Status	1. Dr.Vecna Devi 2. Dr.Saraswathi 3. Dr.Suresh	1. Shashank Holla 2. Aniruth M 3. Aniruth Kashyap 4. Karthik Sunil
2	2&3	Surround Sense Using Neuromorphic Sensors	1. Dr.Rajani Katiyar 2. Prof.Subrahmanya K N 3. Prof. Mohana	1. Pottem Samhith Kumar 2. B I. Vidhath 3. Rakshak Udupa T S 4. Divyananthan C 5. Rohit Hr 6. Sahana
3	4	SDV- In Box -Global Av Simulator	1. Dr Soumya A 2. Dr Poonam Ghuli 3. Prof. Swetha S	1. Shreyas S Kasetty 2. Gowtham H N 3. Sharath H Nagaraj 4. Rohit Sachin Sadavarte 5. Suchit T E 6. Suhas S Prasad 7. Surya S
4	5	National Dataset and Data Platform- Team 1	1. Prof. Rajeswari Shettar 2. Prof. Deepika Dash	1. Abdul Khaliq Almel 2. Harini V 3. Monica B
5	5	National Dataset and Data Platform- Team 2	Prof. Merin Melect	1. Sampan S Nayak 2. Sushma G 3. Santosh Patil 4. Muteeb Akram
6	6	Cognitive Load Detection on Drivers	1. Prof. Mahendra BM 2. Prof. Sujata P M	1. Karthik A Maiya 2. Hemanth Kumar V 3. Harish K 4. Peddi Saurabh
7	7	Semantic Segmentation Algorithms	1. Prof. Mohana 2. Prof. Hemavathi 3. Prof. Revati Sa 4. Prof. Nagraj Bhat	1. Mahadev Maitri 2. H K Kiran Kumar 3. Bhargav N 4. Chirag Bapat 5. Nischal Jagadeesh
8	8	Stereopsis Depth Using Cameras	1. Prof. Lalitha V.P 2. Prof. Manonmani	1. R Shreya 2. Priya Bansal
9	9	Autonomous UAV	1. Dr Abhay Deshpande 2. Dr Adinath Jain	1. Shreyas Dhavali 2. Vinayak Singh

Dean Academics  
RV College of Engineering  
Mysore Road, RV Vidyaniketan Post. 560 059.

080-67178020

P.A. Kanchan Anty  
Principal  
11/11/2020



## RVCE\_Wipro-IISC Innovative Network (WIRIN) Project

Projects executed during June - November 2019

Sl No	Project No	Title of The Project	Faculty Name	Students
10	10	Trajectory Planning For Autonomous Lane-Change Manuevers	1. Prof.Jyothi R 2. Dr.MN Dinesh 3. Dr.Madhu BR	1. Tejas Holla 2. Deekshith Nayak 3. Sambram C Swamy 4. K Rampratap
11	11	Battery Charging, Motor Selection, Control And Fault Diagnosis	Prof. Raja Vidya	1. Darshan N Kannur 2. Prajwal Shetty S L 3. Mujavar Mohammed Ashtaq 4. Shravan Sridhar
12	12	Product Design	1. Dr. Chandra Kumar R 2. Dr. Nagesh S	1. Manjunath S G 2. P Naresh 3. Sona N B
13	13	Object Annotations	Prof. Uttara Kumari M	1. Khushi Talesra 2. Tejaswini S 3. Mahadev Mahesh Maitri

*[Signature]*  
DEAN ACADEMICS  
R.V. College of Engineering  
Bengaluru - 560 059

*[Signature]*  
PRINCIPAL  
RV COLLEGE OF ENGINEERING  
BANGALORE - 560 059



RV Educational Institutions®  
RV College of Engineering®

Autonomous  
Institution Affiliated  
to Visvesvaraya  
Technological  
University, Belagavi

Approved by AICTE,  
New Delhi

RWE/PSR/22-23

Date: 13/09/2022

To,

The HOD  
Dept. of Electrical and Electronics Engineering  
RVCE

**Sub: Allocation of Industry Research Grant**

WIPRO has sanctioned an amount of Rs. 37.5 lakhs in the year 2019-20 and Rs. 413.0 lakhs in the year 2020-21 towards execution of project.

Students and Faculty of eight departments are involved in the design and development of autonomous car. The department of Electrical and Electronics Engineering is involved in the executing various projects in 2019-20, 2020-21 and 2021-22.

An amount of Rs. 5.0 Lakhs and Rs. 60.0 Lakhs were allocated to the dept. of EEE in the year 2020-21 and 2021-22 respectively, towards Development of Vehicle Architecture and Battery Management System.

*Subramanyam*  
Principal

PRINCIPAL  
RV COLLEGE OF ENGINEERING  
BENGALURU - 560 059

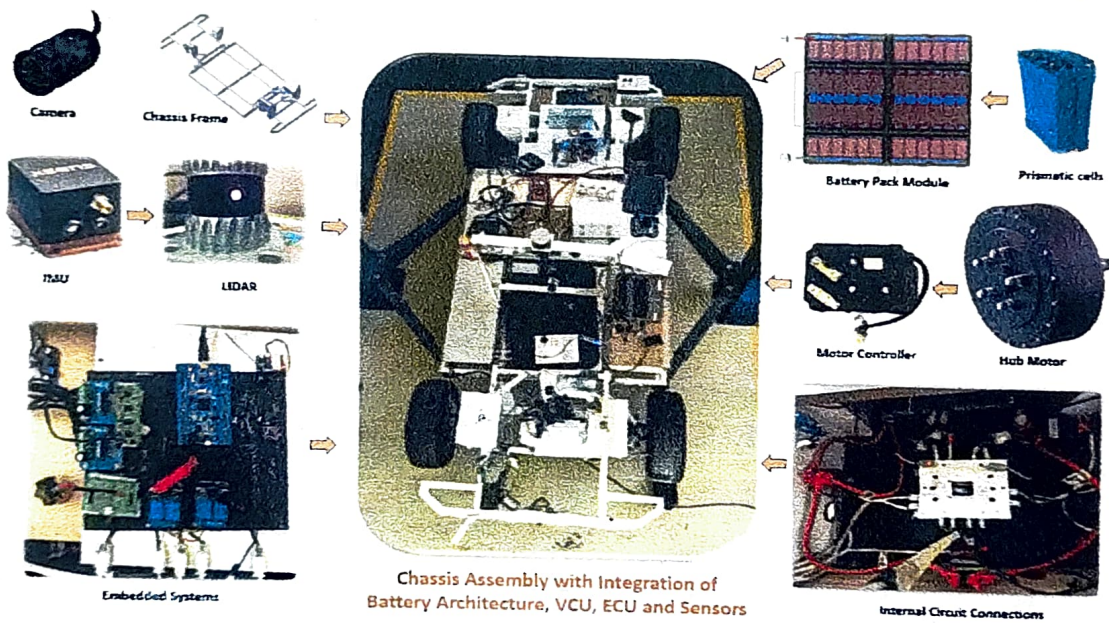


# Gallery



## WIRIN Project and Samsung (R&D) Project Team -2022 RV College of Engineering® Bengaluru 560059

*Go, change the world*







(old)

wipro



# Connected Autonomous Vehicles WIRIN

The future of the automobile is electric, shared, autonomous and connected - a very exciting area. RV College of Engineering® (RVCE) has partnered with WIPRO and the Indian Institute of Science(IISc) to establish a Center of Excellence for Autonomous Vehicle Research at RVCE. The collaboration with WIPRO and IISc in a series of special programs devised by the WIPRO Innovation Center brings together the best automotive sector experts, researchers, innovators, companies and students to create a collaborative ecosystem at RVCE. The center seeks to focus on four key technologies for autonomous vehicles: sophisticated AI technologies for vehicle control, environment perception, route planning and vehicle navigation systems. It is a collaborative platform to observe an essential component of contemporary transportation networks.

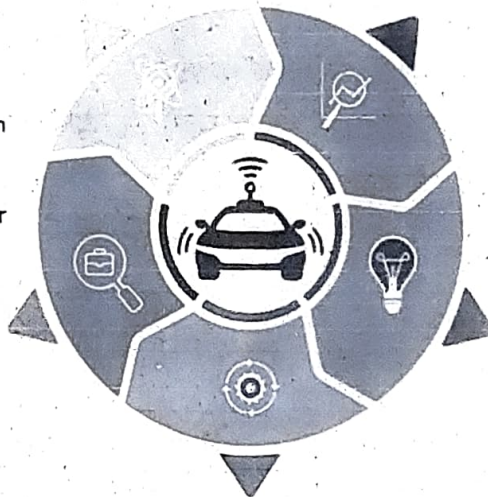
## Areas of Expertise

### National Dataset Collection

- Data Set Collection from LiDAR, Camera & IMU
- Annotation of the Datasets
- Deep Learning Models for Annotation Automation

### AI Stack Development

- Deep Learning Models for Perception, Localization & motion Planning.
- Embedded System Design for Vehicle Control Unit
- Sensor Integration : LiDAR, Camera, IMU etc



### Mechanical Design

- 3D Model of Chassis
- FE Analysis
- Brake by Wire
- Steer by Wire

### Powertrain Components Design

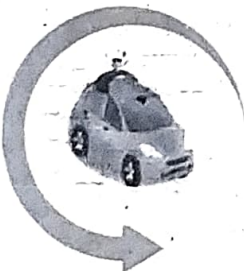
- Battery Design & Configuration
- Battery Management System
- Battery Health Monitoring System
- PID Controller Design
- Motor & its Controller

### Vehicle Simulator

- HD Map Creation
- Vehicle Modelling
- Scenario Generation on Road Runner.

## Lab & Infrastructure

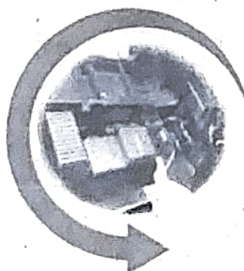
### Sensor



#### Sensor Integration Through ROS

- LiDAR
- Camera
- IMU, Ultrasonic Sensors
- Temperature Sensors etc.

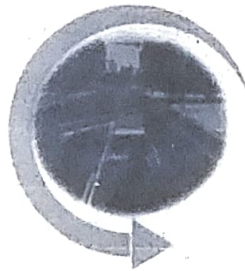
### Powertrain



#### Testing of Battery, Motor & Controllers

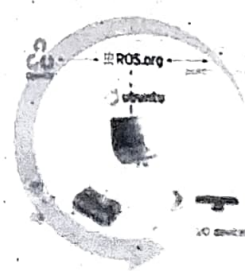
- EV Simulator
- Battery Testing
- Motor & its Controller Test Jig
- Battery Management System

### CARLA & National Dataset



#### Vehicle Simulator S/W Dataset Collection and Annotation

### Integration



#### Embedded Controllers:

- STM
- CAN
- Display
- OBD
- Nvidia Jetson Processor





RV College of  
Engineering®

Placement RVCE <placement@rvce.edu.in>

---

## Selected Teams for Cisco thingQbator Cohort 4 Project Track

---

**Sahanraj** <sahanraj@nasscomfoundation.org>

Thu, Jun 10, 2021 at 10:04 PM

To: Ranganath D <ranganathd@rvce.edu.in>

Cc: "Narahari N.S." <naraharins@rvce.edu.in>, Placement RVCE <placement@rvce.edu.in>, Joshua <joshua@nasscomfoundation.org>

Hi Ranganath Sir,

Greetings from NASSCOM Foundation, thingQbator program!

Hope you are safe and doing good. Apart from the regular activities in the past month in the Universities, It's been an exciting journey for the students. We have come to an end of the Learning Track and have been moving towards the Project Track.

After two months of intense engagement with 150 teams on Learning Track, the teams have shared their video to pitch for the selection of Project Track. The Jury members have evaluated the Pitch videos and have selected 80 Teams that would progress for the Project Track. Therefore, we'd like to update you on the progress on the 'Learning Track'.

Congratulations to the selected teams which will progress towards the 'Project track' from RVCE University. This was possible with your support and involvement in the thingQbator program. All the teams have worked hard and would like to highlight the top 80 teams.

Please find the attached list of teams from your University progressing to the Project track. This list also includes details of the teams who were part of the Learning track and requests you to go through the same.

We will be starting the Project Track activities soon. Also, we are planning for a 6-week internship program for Project Track and Learning Track participants. We will update you more about it soon.

We hope students will make the best use of these opportunities.

Regards,  
Sahanraj K S  
Maker Manager,  
Cisco thingQbator  
Nasscom Foundation



**RVCE\_Teams.xlsx**

7K



RV College of  
Engineering®

Placement RVCE <placement@rvce.edu.in>

## Notification: thingQbator Meeting with RVCE @ Wed May 11, 2022 10am - 10:30am (IST) (Placement RVCE)

Google Calendar <calendar-notification@google.com>  
Reply-To: Sahan Raj <sahanraj@nasscomfoundation.org>  
To: Placement RVCE <placement@rvce.edu.in>

Wed, May 11, 2022 at 9:50 AM

### thingQbator Meeting with RVCE

When Wed May 11, 2022 10am – 10:30am India Standard Time - Kolkata

Where <https://thethingqbator.webex.com/thethingqbator/j.php?MTID=m94958e25321c22ac35c0a43ddc501881> (map)

Calendar Placement RVCE

Who

- Sahan Raj - organizer
- [placement@rvce.edu.in](mailto:placement@rvce.edu.in) - creator

[more details »](#)

#### JOIN WEBEX MEETING

<https://thethingqbator.webex.com/thethingqbator/j.php?MTID=m94958e25321c22ac35c0a43ddc501881>

Meeting number (access code): 2519 561 0148

Meeting password: EAsJ33tyCa6

#### TAP TO JOIN FROM A MOBILE DEVICE (ATTENDEES ONLY)

+91-80-6480-0114,,25195610148## tel:%2B91-80-6480-0114,,\*01\*25195610148%23%23\*01\* India Toll (Bangalore)

+91-11-6480-0114,,25195610148## tel:%2B91-11-6480-0114,,\*01\*25195610148%23%23\*01\* India Toll (Delhi)

#### JOIN BY PHONE

+91-80-6480-0114 India Toll (Bangalore)

+91-11-6480-0114 India Toll (Delhi)

#### Global call-in numbers

<https://thethingqbator.webex.com/thethingqbator/globalcallin.php?MTID=m168c4d40073e150fb2df083f63b13f78>

#### JOIN FROM A VIDEO SYSTEM OR APPLICATION

Dial sip:25195610148@thethingqbator.webex.com

You can also dial 210.4.202.4 and enter your meeting number.

#### Can't join the meeting?

<https://collaborationhelp.cisco.com/article/WBX000029055>

**IMPORTANT NOTICE:** Please note that this Webex service allows audio and other information sent during the session to be recorded, which may be discoverable in a legal matter. By joining this session, you automatically consent to such recordings. If you do not consent to being recorded, discuss your concerns with the host or do not join the session.

Going ([placement@rvce.edu.in](mailto:placement@rvce.edu.in))? **Yes** - **Maybe** - **No** [more options »](#)

Invitation from [Google Calendar](#)

You are receiving this email at the account [placement@rvce.edu.in](mailto:placement@rvce.edu.in) because you are subscribed for notifications on calendar Placement RVCE.

To stop receiving these emails, please log in to <https://calendar.google.com/calendar/> and change your notification settings for this calendar.

Forwarding this invitation could allow any recipient to send a response to the organizer and be added to the guest list, or invite others regardless of their own invitation status, or to modify your RSVP. [Learn More.](#)



Shyamala S. <shyamalas@rvce.edu.in>

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## Fwd: Approval Note For RVCE Bangalore

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Principal RVCE <principal@rvce.edu.in>

Sat, Jul 25, 2020 at 4:39 AM

To: "Shyamala S." <shyamalas@rvce.edu.in>, "Dinesh M.N." <dineshmn@rvce.edu.in>

FYI

Sent from my iPhone

Begin forwarded message:

**From:** Umesh Krishnappa <umesh.krishnappa@greavescotton.com>

**Date:** 24 July 2020 at 6:04:07 PM IST

**To:** Principal RVCE <principal@rvce.edu.in>

**Subject:** Approval Note For RVCE Bangalore

Dear Sir,

We have approved for rs 5 L sponsorship and the details are as attached. Apart from this, 26 instruments for lab are procured and would be transferred to RVCE soon.

Please send me the details for the transfer.

Regards,

Umesh

**P Please save the Tree**

Think! Do you really need to print this email? Be Eco-friendly, Go Green..

Important Note: This e-mail may contain trade secrets or privileged, undisclosed or otherwise confidential information. If you have received this e-mail in error, you are hereby notified that any review, copying or distribution of it is strictly prohibited. Please inform us immediately and destroy the original transmittal.

Thank you for your cooperation.

## Approval Note For RVCE Bangalore

1.) **Background** : On 11<sup>th</sup> Jan'2020, MD of Greaves Cotton Limited, Mr Nagesh Basavanhalli inaugurated the 'Centre of Excellence of Electric Mobility' at RVCE –Bangalore. The Objective of the COEEM is to nurture talent in EV Technology by :

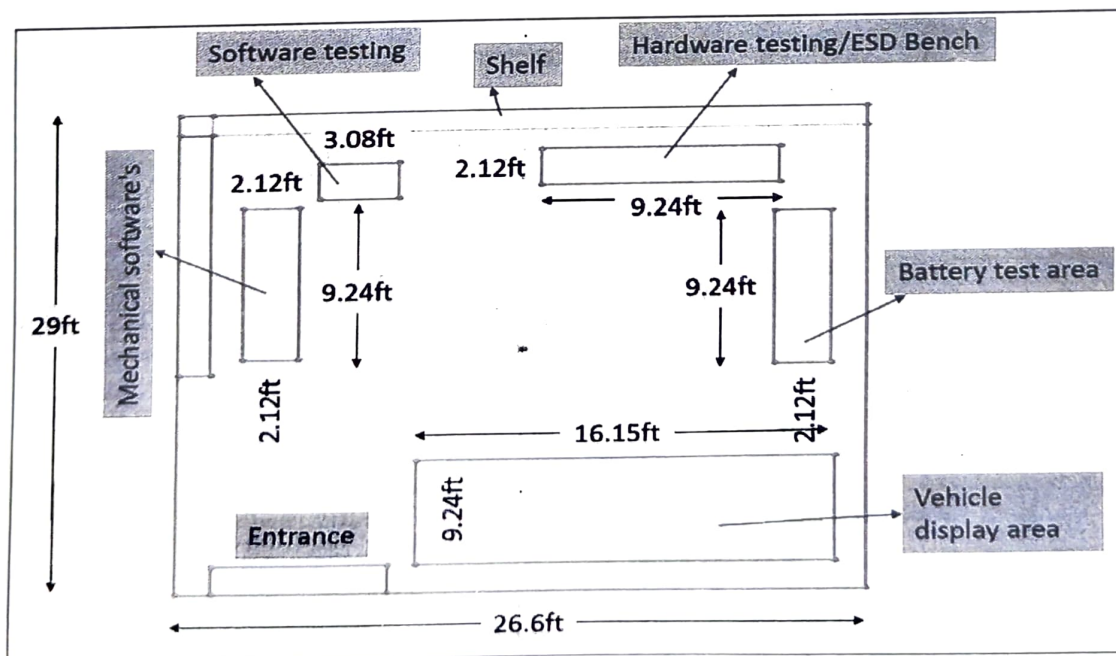
- a. Training Interns BE / ME to do projects in the EV field
- b. Using simulation softwares in the Mechanical & E&E Field for the Product development
- c. Development of Controller for 48 V vehicle and algorithm
- d. EMI / EMC testing at RVCE centre for Ampere Controller

2.) **Current Situation** : The Lab is set up in the Physics Lab and started operating from 1<sup>st</sup> Feb. The Lab has the following set up :

- a. An area of around 1200 sq Ft
- b. Access to the EMI/EMC set up
- c. Desktops for 6 engrs to work
- d. Equipment for measuring Power, Torque , Waveforms of vehicle.

3.) **Sponsorship for the Controller Project** :

3a.) **Working Layout by RVCE** : Provided by RVCE working area of around 800 sq ft and maintained by RVCE





Date : 24<sup>th</sup> July'2020

3b.) **Facilities, SW available from RVCE** : For Controller development, Garuda Team works with Ampere Team and following equipment are available.

Sl No	Material	Qty
1	ESD Benches	3
2	Benches - 12" x 3"	1
3	Benches	1
4	Workstation	3
5	Ansys Software	1
6	Solidworks Software	2
7	Computer	3
8	OrCAD Simulation software	1
9	IOT java development software	1
10	Oscilloscope	1
11	MAT lab	1
12	Psim	1
13	Android Studio	1
14	MP IDE	2
15	Ki Cad software	1
16	Ms Fatigue Software	1
17	EMI / EMC Lab	1
18	CFD simulation Software -Fluent	1

3c.) **Equipment from GCL @ RVCE Lab - COEEM** : For Controller development

Sl	Material	Qty
1	Soldering Unit	2
2	Multimeter	2
3	Clampmeter	1
4	De-soldering Unit	1
5	Resistor, Capacitor & Others	1
6	Power supply 100V 50A	1
7	Function generator	1
8	HV Tester	1
9	Insulation Tester	1
10	OBD 2	1
11	OBD 2 Adapters	1
12	Bluetooth hc-05 Module	1
13	Microcontroller boards	3
14	Arduino Uno boards	2
15	CAN Transceiver	2
16	Bluetooth Kit	1
17	Vernier Caliper	1
18	Screw guage	1
19	Protractor	1
20	Measuring Tape	1
21	Measuring Scale	1
22	12V 20Ah SLA battery	5
23	48V 24Ah Lithium ion battery	1
24	60V 30Ah Lithium ion battery	2
25	Discharger	1
26	Charger	1

3d.) **Sponsorship / Capex for Controller Project** : RVCE has requested for sponsorship of the project and the Amount requested is Rs 5 lakhs. This would be utilized for :

- i) Component Purchase by Garuda Team
- ii) PCB Tool fabrication
- iii) PCB Assys

Approved By

(P Sanjeev)



(Umesh Krishnappa)

Electric vehicle incubator  
project & promote  
activities

FB 70

1902000057

31/07/2020



Shyamala S. <shyamalas@rvce.edu.in>

## Fwd: Approval Note For RVCE Bangalore

Tue, Aug 4, 2020 at 3:34 PM

Soundararajan.S <soundararajan.s@amperevehicles.com>

To: "Shyamala S." <shyamalas@rvce.edu.in>

Cc: Umesh Krishnappa <umesh.krishnappa@greaves cotton.com>, Principal RVCE <principal@rvce.edu.in>, dineshmn <dineshmn@rvce.edu.in>

You may pls refer the pic below

GST 33AAHCA0665K1ZQ

## Tax Invoice - Original for Recipient

<b>Invoice No.</b>	: 2045005455	<b>Date</b>	: 08-JUN-2020
<b>Kind Attn.</b>	: Mr. Jitendar Singh	<b>Client Name</b>	: Ampere Vehicles Private Limited
<b>Mailing Address</b>	: 150/1B Nanthavana Thottam, Kannampalayam Sular, Coimbatore - 641402, Tamil Nadu, India.	<b>Address</b>	: 150 1B, Nanthavana Thottam Kannampalayam Road, Ranganathapuram, Coimbatore - 641402, Tamil Nadu, India.
		<b>Place of Supply</b>	: 33 TAMIL NADU
		<b>GSTIN/ Unique ID</b>	: 33AAHCA0665K1ZQ

Regards,

Soundararajan S

[Quoted text hidden]

[Quoted text hidden]



Rashtriya Sikshana Samithi Trust

R V College of Engineering

R V Vidyaniketan Post, Mysore Road

Bengaluru-560059, Ph.No:080-67178020

Email:principal@rvce.edu.in, Website:www.rvce.edu.in

Original

**TAX INVOICE**

GSTIN : 29AAATR0758A1ZP  
PAN : AAATR0758A

Invoice No. : 1802000057  
Date : 31.07.2020

**Billing Details (Bill To) :**

Name : Ampere Vehicles Private Limited  
Address : ...Nanthavana Thottam Kannampalayam Road, Ranganathapuram  
Coimbatore-641402  
GSTIN : 33AAHCA0665K1ZQ  
PAN : AAHCA0665K  
State Code : 33-Tamil Nadu

**Shipping Details (Ship To) :**

Name : Ampere Vehicles Private Limited  
Address : ...Nanthavana Thottam Kannampalayam Road, Ranganathapuram  
Coimbatore-641402  
GSTIN : 33AAHCA0665K1ZQ  
PAN : AAHCA0665K  
State Code : 33-Tamil Nadu

Sl.No	Description	HSN/SAC	Quantity	UOM	Rate / Item (Rs.)	Taxable Value (Rs.)	GST						Total Amount (Rs.)
							SGST		CGST		IGST		
							Rate of Tax	Amount	Rate of Tax	Amount	Rate of Tax	Amount	
1	Prj & Workshop Sponsorship for Electric Vehicle incubation project & 8th Mile activities	998397	0.000		0.00	5,00,000.00	0.000	0.00	0.000	0.00	0.000	0.00	5,00,000.00

**Beneficiary details for NEFT/RTGS**

Bank A/C Details  
The Principal,  
R V College of Engineering  
136010112055  
Kotak Mahindra Bank

TCS Rate of Tax 0.00

Discount 0.00

Round of Amount 0.00

Grand Total 5,00,000.00

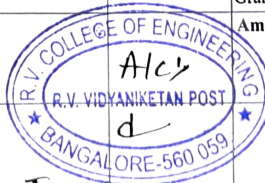
Branch Address & IFSC  
R.V.College of Engineering Campus  
Mysore Road,,Bengaluru,10  
KKBK0008053

Amount in Words : Rupees Five Lakh Only

**TERMS & CONDITIONS :-**

- 1.Payment to be made at the earliest
- 2 Cheque in favour of Director/Principal/CEO/Head Mistress

R V College of Engineering



*R. S. Lakshmi*  
13/08/2020

R V College of Engineering

*Subramanya*  
**PRINCIPAL**  
Authorized Signature  
R V College of Engineering  
Bengaluru - 560 059


*05/08*





# RV COLLEGE OF ENGINEERING

Bangalore

**RV College of  
Engineering**<sup>®</sup>Go, change the world

You are cordially invited to

## **DST INSPIRE Boot camp 2019**


5 days Boot Camp for pre-university students

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DEC  
**26 TO 30**

Department of  
Biotechnology, RVCE  
BENGALURU

10 AM  
TO  
4:30 PM



FUNDED BY  
**DST Inspire**



## VISION

Leadership in Quality Technical Education, Interdisciplinary Research & Innovation, with a Focus on Sustainable and Inclusive Technology

## MISSION

- To deliver outcome-based Quality education, emphasizing on experimental learning with the state-of-the-art infrastructure.
- To create a conducive environment for interdisciplinary research and innovation.
- To develop professionals through holistic education focusing on individual growth, discipline, integrity, ethics and social sensitivity.
- To nurture industry-institution collaboration leading to competency enhancement and entrepreneurship.
- To focus on technologies that are sustainable and inclusive, benefiting all sections of the society

Established in 1963 with three engineering branches namely Civil, Mechanical and Electrical, today RVCE offers 12 Undergraduate Engineering programs, 21 Master Degree programs and Doctoral Studies. Located 13 km from the heart of Bangalore City – the Silicon Valley of India, on Mysore Road. Sprawling campus spread over an area of 52 acres set in sylvan surroundings. Provides an ideal ambience to stimulate the teaching-learning process, helping in bringing out skilled and disciplined Engineers. Rated one amongst the top ten self-financing Engineering Institutions in the country.



**DR. VIDYA NIRANJANA**

Professor and HOD

Dept. of Biotechnology

RV College of engineering,  
Bangalore

## MESSAGE

The youth of the country are the 'Beacon of Light' for the development of the nation and they need proper guidance and motivation. Today's inquisitive minds are tomorrow's discoverers and inventors. The curiosity to enquire and eagerness to learn is what we need to tap amongst the youth. The DST Inspire internship science camp organized by the RV College of Engineering Bangalore is to educate and lighten the future generation to understand the use of science. Inspire Camp is an opportunity to meet eminent scientists from well-known research Institutions and Universities with in-depth knowledge base.

In the classroom based teaching method, students are occupied with only the exam oriented Ta syllabus learnings. DST Inspire will encourage them to think 'out of the box' and place before them many alternative ways of education other than the professional ones. With immense satisfaction and pleasure, I hereby bring out the proceedings of the first Inspire science internship camp conducted in 2019 by the Department of Biotechnology RV College of Engineering Bangalore.

We have received an overwhelming response from our 1st and 2nd PUC students of three different colleges. All the students who participated in this camp were very innovative and showed active involvement in all the camp conducted activities. All the students who had participated in the science camp were given kits. At the end of the science camp, poster making competition was held for all those enthusiastic students who were present in every session conducted by the camp. Posters with innovative ideas were awarded.

As an Inspire coordinator, organizing this Inspire science camp has been an unique opportunity to interact with the young minds. It gives me immense satisfaction to serve the scientific fraternity by being a teacher. We could exploit all our available resources to the best of our capacity for the benefit of the students at the camp.



**DR. K.N. SUBRAMANYA**

Principal

RV College of engineering,  
Bangalore

## MESSAGE

**"Innovation in Science Pursuit for Inspired Research" (INSPIRE) is an innovative program initiated by the Department of Science and Technology (DST), Govt. of India, to attract talents and instill a sense of excitement & interest for the study of science at an early age. Under the purview of DST INSPIRE program, RV College of Engineering, Bengaluru, organized a science camp between 26<sup>th</sup> - 30<sup>th</sup> December, 2019 with an aim of attracting the young minds of India and motivating them to mold their career in research focusing on the front-line areas of science and technology. Gone are the days where competitive exams was the only method for Talent Hunting. Today the talent identification method believes in and relies on the efficacy of the existing educational structure.**

The science camp had talks from eminent scientists, one-one student-mentor interactions, hands on experience program, innovative ideas on topics of national importance etc.,

I am extremely delighted to know that there was an overwhelming response from the students of 1<sup>st</sup> and 2<sup>nd</sup> PUC of three different colleges. The young minds were ignited with innovative ideas and other thought-provoking activities. The winners of the competitions have been suitably awarded.

With great pleasure, I would like to compliment the organizers of the INSPIRE Boot Camp for bringing a detailed proceeding of the internship camp conducted during 26-30 December 2019 at RV College of Engineering.





**RV College of Engineering®**

**DECEMBER  
26th - 30th**

*Go, change the world*



**Rashtreeya Sikshana Samithi Trust**  
**R V College of Engineering®**  
RV Vidyaniketan Post, Bengaluru - 560059

## **DST INSPIRE Boot camp 2019**

**5 Day Event for Pre-University Students**

**26th to 30th December 2019**



**RV College of Engineering®**

**DECEMBER  
26th - 30th**

*Go, change the world*



## **DST INSPIRE Boot camp 2019**

### **Speakers**

#### **Principal Investigator**



**Dr. Vidya Niranjana**  
Professor & HOD, Biotechnology,  
RVCE

#### **Day 1**



**Dr. Subramanya K N**  
Principal, RVCE



**Dr. Gulab Khedkar**  
Professor,  
Paul Nealen Centre of DNA Barcoding  
& Biodiversity Studies



**Dr. P. Kondaliah**  
Professor of Biochemistry, RVCE

#### **Day 2**



**Dr. Alex Hankey**  
Professor of Tissue & Plant Science, SVSUUSA



**Mr. Raghavendra Prasad**  
Assistant professor, IIS  
RVCE

#### **Day 3**



**Dr. Raja Mugasainangalam**  
Founder BCCO, Genotypic Technology



**Dr. Bharathi Prakash**  
Assistant Professor of Microbiology  
University college, Mangalore

#### **Day 4**



**Dr. A R V Kumar**  
Retired Professor, Entomology  
UVS-B



**Dr. K Chandrashekara**  
Professor (Retd.),  
Former Head of The Dept. Entomology,  
UVS-B

#### **Day 5**



**Lt Ishwar Doddamani**  
Deputy registrar, RVCE

## **DST INSPIRE INTERNSHIP CAMP**

**26th to 30th December 2019**

### **INSPIRE SCIENCE CAMP COMMITTEE**

Registration	<ul style="list-style-type: none"><li>• Pradeep M R</li></ul>
Stage Arrangement	<ul style="list-style-type: none"><li>• Mrs. M Rajeswari, Assistant Professor</li><li>• Dr. Nagashree N Rao, Associate Professor</li><li>• Mrs. M Rajeswari, Assistant Professor</li><li>• Meghana.N</li><li>• Muktha Bharadwaj S</li></ul>
Food Committee	<ul style="list-style-type: none"><li>• Dr. A H Manjunatha Reddy, Associate Professor</li><li>• Chaitra Lingaiah</li></ul>
Student Activity In-charge	<ul style="list-style-type: none"><li>• Shreedhanya</li></ul>
Virtual Lab	<ul style="list-style-type: none"><li>• Dr Shantaranga Swamy</li></ul>
Photo/Media	<ul style="list-style-type: none"><li>• Vasant Kumar</li><li>• Meeran Hussain</li></ul>
Advisory Committee	<ul style="list-style-type: none"><li>• Dr. K.N. Subramanya , Principal</li><li>• Lt Ishwar Doddamani</li></ul>
Inspire camp coordinator	<ul style="list-style-type: none"><li>• Dr. Vidya Niranjana, HOD</li></ul>
Accounts	<ul style="list-style-type: none"><li>• Dr. Vidya Niranjana, HOD</li><li>• Akshay Uttarkar C</li><li>• Shyamala</li><li>• Shreedhanya</li></ul>
Validictory Incharge	<ul style="list-style-type: none"><li>• Akshay Uttarkar C</li></ul>

## DAY WISE PROGRAM COORDINATOR

26.12.2019 - C Lavanya

27.12.2019 - Shivani K

28.12.2019 - Aditi G Muddebihalkar

29.12.2019 - K Piyusha

30.12.2019 - Pooja Ramesh

Student Volunteers : Aayushi Zaveri

Hifza

Divya

Kusum M Warad

Meghana N

Muktha Bharadwaj S

Shreya P Naidu

Shreya Choudhary

Naveen

Vidhyadhara

Shounak

Jayashree

Shambavi



**RV COLLEGE OF  
ENGINEERING®**

*Go, change the world*



## Schedule for DST INSPIRE BOOT CAMP 2019

### 26<sup>TH</sup> DECEMBER 2019

9:30 - 9:40	Invocation Lighting of the lamp and Inauguration of the Boot Camp
9:40 - 10:00	Welcome Speech and Briefing about the Boot Camp- Dr Vidya Niranjan- PI DST Funded INSPIRE program
10:00 -11:00	Presidential Address by Dr K N Subramanya
11:00 - 11:30	Tea Break
11:30 - 12:30	KeyNote address- Dr Gulab Khedkar- Thinking outside the box
12:30 - 13:30	Lunch
13:30 - 15:00	Dr Paturu Kondaiah
15:00 - 15:30	Tea Break
15:30 - 16:30	Virtual lab experiment (Biotechnology)

### 27<sup>TH</sup> DECEMBER 2019

10:00 - 11:00	Dr Alex Hanke,
11:00 - 11:30	Tea Break
11:30 - 12:30	Mr Raghavedra Prasad
12:30 - 13:30	Lunch
13:30 - 16:30	Virtual Lab (Physics, Electronics)

### 28<sup>TH</sup> DECEMBER 2019

10:00 - 11:00	Dr Raja Mugasaimangalam
11:00 - 11:30	Tea Break
11:30 - 12:30	Dr Bharathi Prakash
12:30 - 13:30	Lunch
13:30 - 16:30	Virtual Lab (Chemistry, Computer science)



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**29<sup>TH</sup> DECEMBER 2019**

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10:00 - 11:00	Dr A. R. V. Kumar
11:00 - 11:30	Tea Break
11:30 - 12:30	Dr K Chandrashekara
12:30 - 13:30	Lunch
13:30 - 14:30	Poster presentation
14:30 - 15:00	Tea Break
15:00 - 16:30	Culturals

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**30<sup>TH</sup> DECEMBER 2019**

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10:00 - 11:00	Science and innovation in Village
11:00 - 11:30	Tea Break
11:30 - 13:00	Science and innovation in Village
13:00 - 14:00	Lunch
14:00 - 16:30	Lt Ishwar Doddamani

**LIST OF COLLEGES PARTICIPATED IN THE INSPIRE CAMP 2019**

1. **NMKRV P.U.COLLEGE**
2. **SSMRV P.U.COLLEGE**
3. **RV P.U.COLLEGE**

## DAY 1 DOCUMENTATION



### **Lighting of lamp and Inauguration of BOOTCAMP**

Invocation song by MUDITH

Welcome speech and briefing about boot camp – Dr Vidya Niranjana

#### **Timings 10.15am to 10.30am**

Boot camp was scheduled for 5 days from 26<sup>th</sup> December 2019 to 30<sup>th</sup> December 2019 and the theme of the workshop was science and innovation to inspire PU students. 5 days of boot camp actively engaged students in the journey of curiosity, innovation, training and virtual lab. Wide range of activities had been planned for the students for 5 days. Students were provided with stationary kits, science kits and a platform for postal presentation at the end of the 3<sup>rd</sup> day. Cultural events were organized to boost up the energy and a village tour was organized to understand the science and innovation needs in the village. Quote of "Thiruvalluvar". Best poster presentation award were given to encourage students.

### **Presidential address - Dr K N Subramanya**

#### **Timings 10.31am to 11.15am**

Youngster's need to focus and avoid distractions. To help them concentrate, boot camps were conducted all over the country by the Government. Boot camps were held in all parts of country for PU students especially to help them to be focused on the things they should do and to inspire them to contribute back to the society. Also help them to channelize their efforts properly in order to achieve their goal. Briefing on innovation and research was done to motivate students by quoting few examples like Thomas Alva Edison, Newton, Einstein and mathematicians etc....

Briefing was also done on how to think 'out of the box' by quoting an example of watermelon. And the Quote says - "Your eyes and ears should be like an elephant" if you wish to do research and innovation.

Many people have been working hard to work in STEM research (science technology engineering mathematics) and STEAM.

## **Speaker 1:** Dr Gulab Khedkar – Thinking out of the box

Timings: 12pm to 1pm

To bring the missing part of science, Government of India has conducted this camp across country. 53 camps have been held throughout the country. The driving motivational factor was to know as to how the scientists think and how the discoveries happen. DST will help bright students to pursue the bachelor degree & the master's degree. All the financial support will be provided by the Government.

Indians were the first to discover metallurgies, symbol of zero and introduce astrophysics to the whole world.

Inspiring students by quoting that "Learning is a continuous process and it should never stop" and nothing can make you learn until you are prepared to achieve something. "Try to appreciate whatever happens around you".

Referring to inspiring examples of:

Newton – why does the apple fall? When this question came up , he started to think, started to research and gave laws. All these inspiration did not happen in the class, there is no limit to get inspired and start thinking. A new thought need to evolve in class room or an institution. It can happen anywhere and anytime.

Mendel – described biological law using mathematics.

Invention of featherless chicken, scattering of light.

Archimedes found solution to the problem in bathroom which led to a great discovery of Archimedes principle.

Galileo used to polish glass and he went on to invent telescope. He never gave up on what he had invented and never lost faith in his discovery even though many people were opposing it.

Aryabhatta and other people behind the discovery of atom bomb led to a huge disaster. "Science is one such thing which depends on how you utilize resources, it can be either helpful or can lead to destructions too".

Roseline discovered DS DNA and X-ray but she failed to publish and make a document as she was diagnosed with cancer. Her supervisor shared her research to Watson and Crick who later won the noble prize. Its therefore said that "sharing thoughts and knowledge is important"

Quoting few inspiring statements like:

"You are your own evaluators and no evaluating system exist"

"Train your brain for maximum thinking"

"Science is thinking and scientist belongs to whole world"

## **Speaker 2: Dr. Paturu Kondaiah -**

Timings: 2:20pm to 3:45pm

Briefing about Gravitational force of earth.

Information about what is a cell and its components. Cells are made of molecules (carbohydrates, proteins, lipids). Types of nucleic acid- DNA and RNA. Information about RNA( Ribonucleic acid) and its composition. RNA is composed of sugar, nucleoside.

Number of DNA molecules present in a human cell. Number of chromosomes present in human (23 pairs). Brief introduction to genetics -Gregory Mendel theory - genes - character - phenotype - functions of genes.

"Research is the exploration of nature through scientific method". Curiosity drives one to explore.

Example : Why blood is red in color?

Gene expression :Genes are transcribed to form mRNA. mRNA is translated to form proteins which perform specific functions.

Proteins have different structures. Structure of a protein is very important to know the function and mechanisms of the respective protein. This field which includes study of protein structure is known as structural biology.

A physicist understands the structure of protein. A chemist gives chemical reasoning for the structure of the protein. A biologist studies what exactly the proteins are doing.

Neuroscience - how nerve transmission takes place, neuro degenerative disease. Better understood by electrical students.

Example: alzheimer's, parkinson's disease

Mechano biology - fibrosis

Need based research - find cause of the disease and find cure for that

Example: malaria, cancer, swine flu.

Darwins theory of evolution: Organisms have evolved from lower organisms. The study was based on observation.

Creation vs Evolution

Engineers are focusing more on energy. Estimate is that by 2050 there will be no petrol or diesel resource. There's a need to preserve fossil fuels and find an alternative resource.

Watson and Crick put together all the information and studied the structure of double stranded DNA. Chargaff stated that  $A+G=T+C$ . Rosalind Franklin gave the x-ray of the double stranded DNA molecule.

Pythagoras spoke about genetic tree and heredity.

Double stranded nature of DNA- gives stability, replication.



Medical biotechnology - Rat and mouse are used for clinical trials.

Regulations of gene expression - some genes are expressed in some organs and some are silent.

Mutations: sudden heritable phenotypic change is known as mutation. Change in base of nucleotide chain leads to mutation.

Crop improvement is one of the main application of biotechnology. Hybrid is the offspring resulting from combining the qualities of two organisms with desired characteristics.

Recombinant DNA technology - desired gene is inserted into host organism to get the desired product. Several tools are developed for performing recombinant DNA technology.

Example : Transgenic plant, Insulin production, Therapeutic protein.

Bioinformatics : field that develops methods and software tools for understanding biological data.

Example : Strand life science in bangalore.

Human genome project : sequencing the whole human genome.

### **Speaker 3: Biology Virtual lab**

Coordinator- Dr Sumatra M

Assistant professor, Biotechnology, RVCE

Timing: 3:30pm to 4:30 pm

Information about biomolecule and their composition (carbohydrate, nucleic acid, protein, lipids). Fundamental difference between sucrose, glucose, lactose and starch.

Different types of enzymes- invertase, lyase

Different types of signals are monitored to test the presence and quantify the biomolecules.

Different adulterants present in milk- urea, water, microorganisms, soap etc.

Movie: testing for presence of adulterants in milk.

Different types of enzymes- invertase, lyase

Different types of signals are monitored to test the presence and quantify the biomolecules.

Different adulterants present in milk- urea, water, microorganisms, soap etc.

Movie: testing for presence of adulterants in milk.

## DAY 2 DOCUMENTATION



### **Speaker 1: Dr Alex Hankey**

Timings 10.30am to 11.30am

Why scientific research is important??

You may believe in something but if you want to be absolutely certain its true you need to prove its true. Scientific research tells you that the methods that may be needed in different subject areas to prove something is true. Quoting the most famous philosopher in the west Aristotle, Socrates and Descartes who invented Cartesian geometry X and Y axis. India produced one of the world's greatest number theorists "the man who knew infinity – Ramanuja".

"Vedic mathematics means to optimize contemporary mathematics education". There is no scientific definition of health. Optimal regulation is equal to optimal health.

"Subtle level of reality controls the gross level of reality".

Various aspects of Vedic mathematics are:

1. Cultural origin – Veda and science
2. Contemporary significance
3. New possibility in teaching mathematics.
4. Mathematics education in the future

Tamil Nadu is the origin of cultural collaboration of between India and China. "Best way to envying your prana is to sit in padmasana position for 30 mins". Kerala based mathematicians produced the infinite series of  $\sin x$  and  $\cos x$ . "Yoga is skill and action". In Lord Krishna's picture ,sometimes we find either 5 or 7 horses. These horses symbolizes the organs of action. "Krishna is working through Arjuna" is quoted by one of Dr Alex's gurus. Subtle is the highest level of spiritual growth. "Mediation improves creativity". Ramanujan got ideas from Goddess Saraswathi.

Shankaracharya spent many years in reticules meditation and he designed 16 sutras to study mathematics. "Mathematics is fun!!!" Each sutra is like a key to unlock the problem knot. Dr Alex has been writing a book on mathematics and the name of the book is "statistics without tears". Brain partially uses digital information.

### **Speaker 2: Dr. Raghavendra Prasad**

Timing : 1145 am to 1pm

Revision of integration and differentiation formulae. Simple methods to solve integration

and differentiation problems. Logic of vedic mathematics was explained. Shortcuts to solve multiplication of large numbers.

### **Speaker 3: Electronics Virtual lab**

Coordinator- Dr. Shilpa and team

Associate professor, Department of electronics and communication, RVCE

Timing: 2:30 pm to 4:30 pm

### **Group Activity 1**

Students correlated the two topics given below and came up with some creative ideas:

- Bird and shaker
- Number of students in the auditorium and lights
- Rain and umbrella

### **Group activity 2**

Students came up with ideas or models implementing the following topics:

- Automated door bell
- Smart traffic management
- Electronic waste management
- Drowsy driving

Students of Electronics and communications showcased their projects and explained it to the students. The projects are as follows :

- Smart agriculture : Shashank
- Seed sower : Revanth and team
- Krushi yantra: Mitesh and team
- Digital clock: Ashwant and team

## DAY 3 DOCUMENTATION



### **Speaker 1: Dr Raja Mugasaimangalam**

Timings 10am to 11.10am

"Astronomy is mathematics, it's not science! Astrology is extrapolation of that into predictions". Panchanga is a mathematics people used for prediction but over a period of time they started to believe that there is nothing religious in it and all these are scientifically calculated. "Belief is based on theory ,not on experimentation". It is based on repeated observation. 'Panchanga' is scientifically correct but jataka is extrapolation. Quoting examples of saints like Shankaracharya, Baba etc.....

Only a significant number of beliefs are correct. For example, the Ganga Jal-the holy water, cures wounds. This is because of the bacteriophages that come from the dead bodies which had been thrown into water .These bacteriophages don't affect us. Before antibiotics were invented, whole of Eastern Europe used bacteriophages since antibiotics were actually bacteriophages. In Bangalore there is a company called "Ganga Jal" which isolates bacteriophage from Ganges water.

"Innovation is applying an invention or discovery for an application". Curds are made of two bacteria's lactobacillus and thermophiles. Thermophiles get destroyed by bacteriophage. Probiotics gives live bacteria or fungi whereas prebiotics – give something which changes the biotic For example fibre changes bacteria in the gut.

Thulsi leaf cures cough as it has antibacterial action. "Tamil medicine is different from Ayurveda". Methylation leads to organ failure over a period of time. Bark juice for dengue was invented by Africans.

What is Science?

It should be reproducible, should have positive (100mg/ml is diluted) and negative control (0mg/ml or plain water), correct mathematics, pattern and marker.

### **Speaker 2: Dr Bharathi Prakash**

Timings 11.45am to 12.45pm

"Students are the darlings of the society"

Video on microbes was played. An activity was performed by four volunteer PU students. They were asked to close their eyes for a minute and had to raise their hands



once they feel one minute is over. This was a time game used to match biological time alongwith the activity they do. To choose our carrier ,we have to look towards few parameters like: to know the field in which we are interested, passion/interest and self-satisfaction. "Never insult yourself by comparing with others". "Fitness is important" as unless you are fit you cannot do the work actively. Another activity was performed by all students present in the auditorium. They were asked to sit straight and inhale oxygen slowly which charged up an individual and by doing so throughout the whole day an individual will not feel hungry. "Specialisation level is so precise" ,this was explained by quoting an example of a student who worked as a physiotherapist and has been specialized only for treating little finger. These days there is specialization for each and every finger, tissue or organs.

"B.Sc is a basic degree in science" and this was explained by quoting an example on innovation by a B.Sc( Computer Science) student who ethically hacked the websites of leading companies. These leading companies had built an anti-virus software and had openly challenged to hack that software. This 20 year old boy had hacked it by building a software and called it as "black box" software. He was awarded with 3.2 crores for this innovation. So it's not that ,only the professional degree holders should do inventions, anybody who has interest and can think of innovative ideas can invent. "Science and innovation must go hand in hand".

"Success will follow if you persistently innovate or work on something, no matter which field it is". Foldable microscope or a paper microscope is known as fold scope. Camphor reduces lot of microbes and bacteria's. Tulips which are infected with plant virus gains wrinkles and have more importance in market.

Meditation is the time of enlightenment. This is useful to bring and build up new ideas. BOTOX is extracted from clostridium botulinum which reduces skin wrinkles as one ages. This was explained by quotin Hema Malini as an example. This being one of the application of pharmaceutical industry.

### **Speaker 3: Physics Virtual lab**

Coordinator- Dr. B M. Rajesh

Assistant professor, Department of Physics, RVCE

Timing: 2:00 pm to 3:00 pm

Virtual experiments are conducted for better understanding of the concept of a particular subject

There are two types of sources:

- Open source: Available to public
- Proprietary sources: Should be bought in order to use it

Different experiments performed:

- Direct and alternating current

AC mains pickup. AC is more dangerous. AC travels in both the direction. Hence AC is more dangerous than DC

- Conducting human body

- Resistance of human body : Voltage kills and not current
- Diode

Diode is made of a semiconductor. It allows current to pass on only one direction.

- Persistence of vision

AC is supplied to a LED

At frequency 1500Hz - LED is glowing

At frequency 10Hz- LED is seen blinking

At 1500Hz LED was blinking too fast for eye to differentiate.

- Light dependent resistor
- How a sound looks like?
- Generating sound

Piezo buzzer was used to generate sound

- Velocity of sound

Fourier equation can be used.

DC motor connected to pendulum and pendulum is taken to extreme end and made to oscillate. The oscillations generates emf and emf is recorded by the computer.

#### **Speaker 4: Chemistry virtual lab**

Coordinator- Dr Vishnu Murthy

Assistant professor, Department of Physics, RVCE

Timing : 3:30 pm to 4:30 pm

Students should orient towards research. Different tools can be used to help the research. Open source office can be used to perform experiments.

Virtual lab:

Same kind of lab setup is present in the virtual lab as that of physical labs.

Outputs from virtual lab are reliable.

Virtual labs are divided into three categories:

- Modeling and simulation
- Measurement based
- Remote triggered

Advantages of virtual lab:

- Virtual lab is Cost effective
- Virtual labs can be used as there are limited options in the physical labs
- Virtual lab saves a lot of time. Experiments can be repeated how many ever times needed.
- Virtual labs can be conducted anywhere and anytime

Different software's:

- Chem lab connective

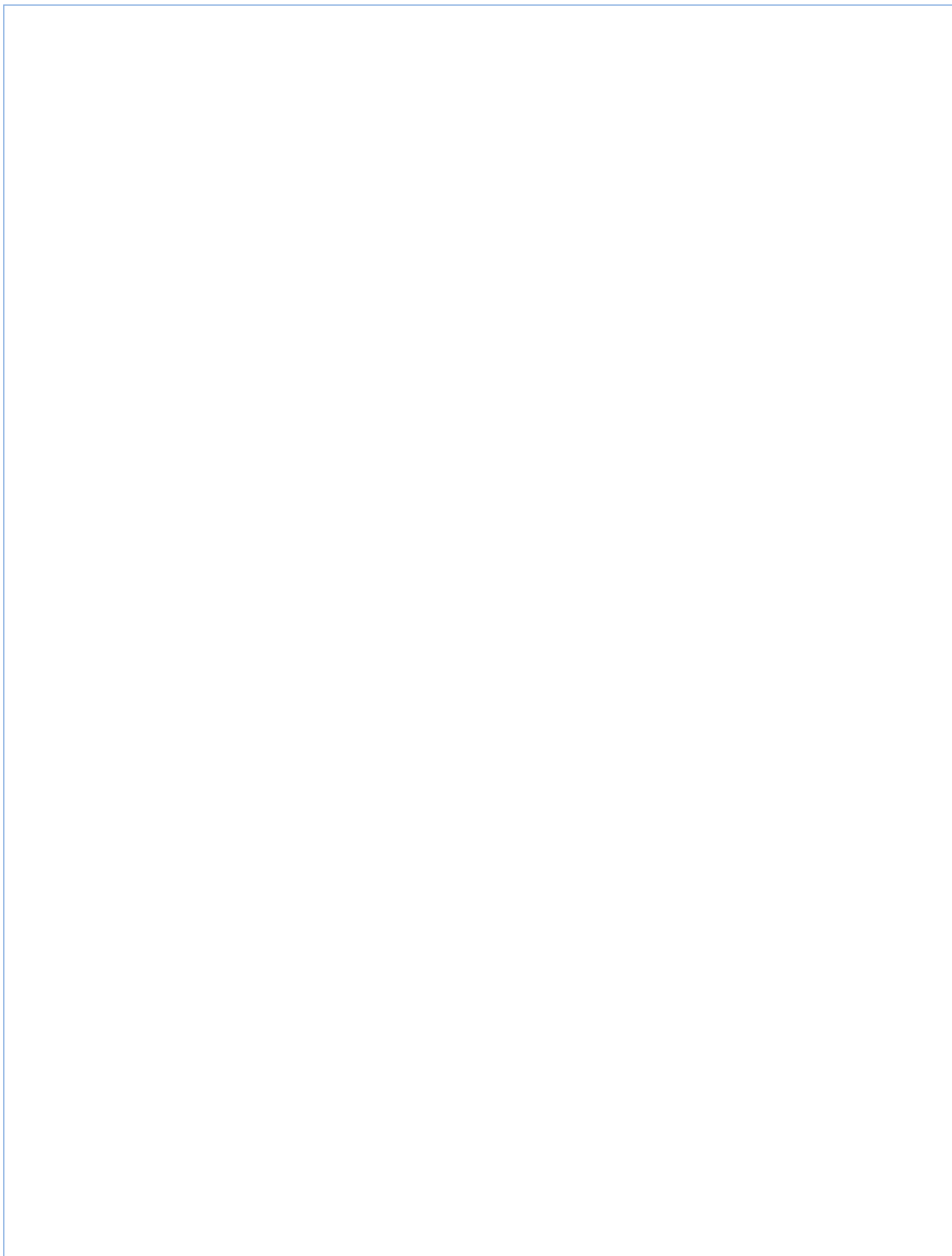
Titration can be performed using this software

- Model science lab

More sophisticated software

- Chem sketch

Chemical structure can be designed and viewed. Molecular interactions can be studied using different tools present in the software



## DAY 4 DOCUMENTATION



### Speaker 1: Dr A.R.V Kumar

Timings: 11.30 AM to 12.20PM

Biological evolution meaning species change through time

Activity: Natural selection

20 grains of Kabuli channa and 20 grains of desi channa were mixed in a cup and students were blindfolded and asked transfer 20 seeds of any one type with a stop clock to note down the timings. Later for 2<sup>nd</sup> time they had to count number of grains left in the cup and had to double the count such that total grains are equal to 40 grains and had to repeat the process until any one variety of seed was left over in the cup. A graph was plot in order to find out number of generations.

The fastest time recorded till now is 9.2 sec.

$$\begin{array}{l}
 1. \quad D + K \\
 20 \quad 20 = 40 \\
 40 - 20 = 20 \\
 \quad \swarrow \quad \searrow \\
 \quad D \quad K \\
 \quad X \quad y \\
 2. \quad 2x + 2y = 40 \\
 \quad 40 - 20 = 20 \\
 \quad \quad \swarrow \quad \searrow \\
 \quad \quad D \quad K \\
 \quad \quad X1 \quad y1
 \end{array}$$

And so on continue the process till you get only one variety

Theory of natural selection - Charles Darwin

Darwinian idea of evolution:

1. Variability--each organism is different from each other



2. Heritability - similarity between parents and offspring  
3. Random selection  
Nonrandom survival  
4. Resistant to changes in the environment  
Theodosius Dobzhansky- nothing in biology makes sense except in the light of evolution

**Speaker 2:** Dr. K Chandrashekara

Timings: 12.20 pm to 1.30pm

How you can extend an idea of natural selection was taught to students by giving an example of caterpillar. Application of Theodosius Dobzhansky was explained by quoting an example of why different kinds of caterpillars exist and that it is due to the basic reason that different types of butterfly exists. Now there arose a question as to why different kind of butterflies exist and it was due to the Darwinian Theory. Drugs from bugs - Butterflies produce toxic substance to prevent the attack from predators

Bactericidal activity of an ant extract against drug resistant *Pseudomonas* – Ant stores their food under mud (ant hill) for up to one year and these grains are not destroyed or degraded based on climatic changes. When research or study was performed they found that food ant produce something that can store these grains. This was done by performing simple experiment by putting normal seeds and the seeds collected from an ant hill onto an agar plate. They found that normal seeds started dividing and started sprouting the fungi whereas the seeds collected from an ant hill showed no change. This was due to the fact that ants clean the seeds by putting their saliva and this acts as an antibacterial protective layer and safeguards the seeds. Wasp venom has antimicrobial property

**Poster presentation:**

Timings: 2.15pm to 3.30pm

Students made creative posters on different topics, Five group posters were awarded best presentation based on different criteria such as Best Idea, Best Presentation, Overall excellence.

**Cultural events:**

Timings: 3.45pm to 5 pm

- Classical song by Niranjana
- Recitation of poetry by Amaan
- Act by English CARV
- Performances like dancing, singing and beat boxing was given by the pu students.
- Saquib from SSMRV – Beat boxing
- Geetha from NMKRV – Dance

- Shiva and pavan from SSMRV – Dance
- Tejashree from NMKRV – Singing
- Shreya from SSMRV – Recitation of poem
- Ananya bhat and team from RV PU– Dance
- Chayan and vachana from SSMRV – Dance

## DAY 5 DOCUMENTATION



### **VILLAGE VISIT- Science and innovation in village**

**Timings: 10am to 2pm**

All PU students alongwith teacher and students coordinator visited 6 villages near BIDADI with the help of BOSCH volunteers. There was brief introduction about all the villages by the gram panchayat head about the population count, number of male and female individuals and about other activities of the village like farming and which crop they cultivate. All the students were taken to visit the farm, sericulture area to see the growth and development of silkworms, milk dairy, schools and anganwadi, chicken farm etc

Village named "Mutturayanagudipalya" has a population of 337 members consisting of 80 families out of which the male individual count is 175 and female individual count being 162. The main occupation of this village is farming and sericulture. They mainly grow mulberry plant in order to feed silkworms and they cultivate ragi crops too.

In school and anganwadi ,22 students studying in government schools (Low primary school) between the 1<sup>st</sup> and the 5<sup>th</sup> grade ,Kannada being the medium of education. 1<sup>st</sup> to 3<sup>rd</sup> grade students are combined in one classroom and are taught together. Similarly 4<sup>th</sup> and 5<sup>th</sup> grade students are combined together. Ms.Jayalakshmi is only one teacher who teaches all the students. All the students from the 1<sup>st</sup> grade to the 5<sup>th</sup> grade are taught Kannada, EVS, Mathematics and English. MGML(multi grade multi-level) system is used here. If the strength is low all the students of **classes 4th to 10th** are combined into one class.

Villagers explained the process of sericulture to the students and visited mulberry farm. Drip irrigation technology has been implemented a few years back. Students were allowed to interact with the people to know about the facilities provided to them and problems they face , if any.

Similarly in other five villages, students were associated with similar kind of activities to gain knowledge about the village environment and other activities carried out in that place.

In a village named "Gopalli", students were taken to milk dairy farm to know how the milk is stored and the processed carried before it reaches to the customer. Villagers extract milk from cow and the milk is stored in a huge tank at 4°C . Once the tankers

from Nandini and other companies are sent to the village, they transfer the stored milk which is then carried to milk dairy company for further processing and quality check. In a village named "Hosuru", students were taken to the chicken poultry and they learnt how the chickens are taken care, their average growth period, what type of food is provided, their weight and how transportation of chicken happens. Only those chickens are transported which are healthy and health are above a certain standard weight.

In the village Kempanyanapalya, students were also taken to aquarium where the different kinds of fishes are grown and taken care of. Purification of water was carried out as the water was not suitable for the fishes. These fishes were transported to Bangalore to be sold to the customers.

**Speaker:** Lt Col Ishwar Doddamani –

**Timings:** 3:30 pm to 4:30 pm

Regarding opportunities in army, navy and air forces, their exam structure and means to get into any one of these (army, navy and air force) to serve nation

India was most powerful during the Mauryan Empire and Gupta period

Armed forces was not too popular amongst the people for the following reasons

- Awareness
- Myths
- Hard vs Easy life
- Me First, Nation Last

Armed forces is not very popular in Karnataka for the following myths :

- People assume that anyone who joins armed forces runs away from home
- One will die if they join armed forces
- Armed forces work in different regions of the country with different weather Conditions. Siachen: - 55degree Celsius

Explanation of Chetwode motto :

The safety, honor and welfare of your country comes first, always and every time.

The honor, comfort and welfare of the men you command comes next.

Your own ease, comfort and safety comes last, always and every time.

Explanation of why armed forces should be chosen as a career.

**Nation first :**

- Major General Ian cardozo - We have not come here to sleep. We have come here to destroy you.
- First differently abled officer

**Service before self:**

- Floods at Leh
- Battle of Saragrahi
- Battle of Rezang La
- Capt. Vikram Batra



- In attack leave no one behind
- In defense fight till last man ,last bullet
- Respect from society
- Military technology is the most advanced technology
- Follow your passion
- Adventure /travel /experience /memories
- Way of life not a career

#### What do armed forces do?

Primary role: Preserve the national interests and safeguards the sovereignty, territorial integrity and unity of India against any external threats.

Secondary role: Assists Government agencies to manage the internal threats and provides aid to civil authorities when requisitioned for the purpose.

#### More about armed forces:

- Recruitment is merit based.
- Religion of troop is religion of officer
- Attend all religious functions
- Sarv dharma sthal
- No distinction based on caste
- Uniform is the religion

#### Various areas in which armed forces work:

- National development
- Internal security
- Earthquake
- Flood
- Accidents
- Women empowerment (1922)
- NCC
- UN peacekeeping
- Contribution in sports

#### Criteria to become an officer?

##### 1.NDA exam

- Only boys can apply
- Age: 16.5 years to 19.5 years
- Qualification: 12th class

##### 2.IMA exam

- Age: 19 to 24
- Qualification: graduation

##### 3.SSC Exam

- Age: 23 to 25 years

•Qualification :Graduation

- TGC(ENGINEERS)
- GSES- navy

#### TEAM PICTURE



## ನಾಳೆಯಿಂದ ವಿಜ್ಞಾನ ಶಿಬಿರ

ಕೆಂಗೆರಿ: ಮೈಸೂರು ರಸ್ತೆಯ ಆರ್.ವಿ.ತಾಂತ್ರಿಕ ವಿದ್ಯಾಲಯದ ವತಿಯಿಂದ 5 ದಿನಗಳ ವಿಜ್ಞಾನ ಶಿಬಿರ (ಡಿ. 26-30) ಆಯೋಜಿಸಲಾಗಿದೆ ಎಂದು ಕಾರ್ಯಕ್ರಮದ ಸಂಯೋಜಕ ಡಾ.ವಿದ್ಯಾನಿರಂಜನ್ ತಿಳಿಸಿದರು.

ವಿಜ್ಞಾನ ಮತ್ತು ತಂತ್ರಜ್ಞಾನ ಇಲಾಖೆಯ ಸಹಯೋಗದೊಂದಿಗೆ ಆಯೋಜಿಸಲಾದ ಈ ಕಾರ್ಯಕ್ರಮದಲ್ಲಿ ವಿವಿಧ ಪಿಯು ಕಾಲೇಜಿನ 275 ವಿದ್ಯಾರ್ಥಿಗಳು ಭಾಗವಹಿಸಲಿದ್ದಾರೆ. ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ವಿಜ್ಞಾನ ಮತ್ತು ತಾಂತ್ರಿಕ ಸಂಶೋಧನೆಗಳಲ್ಲಿ ಅರಿವು ಮೂಡಿಸುವುದು ಶಿಬಿರದ ಉದ್ದೇಶವಾಗಿದೆ. ದೇಶದ ಶ್ರೇಷ್ಠ ವಿಜ್ಞಾನಿಗಳು ಕಾರ್ಯಕ್ರಮದಲ್ಲಿ ಪಾಲ್ಗೊಂಡು ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಸಂವಹನ ನಡೆಸಲಿದ್ದಾರೆ ಎಂದರು.

ಈ ವೇಳೆ ಪ್ರಾಂಶುಪಾಲ ಡಾ.ಕೆ.ಎನ್.ಸುಬ್ರಹ್ಮಣ್ಯ, ಡಾ.ಗುಲಾಬ್ ಖೇದರ್, ಡಾ.ಪತೂರ್ ಕೊಂಡಯ್ಯ, ಡಾ.ಅಲೆಕ್ಸಾಂಡರ್, ರಾಘವೇಂದ್ರ ಪ್ರಸಾದ್ ಇತರರಿದ್ದರು.

### ಯುವಕರ ಸಂಶೋಧನೆಗಳ ಪರಿಣಾಮಗಳಿಗೆ ತಲುಪುವಂತಾಗಲಿ

ಕೆಂಗೆರಿ, ಡಿ.26 - ಯುವ ವಯಸ್ಸಿನ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಅಭಿವೃದ್ಧಿ ಹೊಂದಿದ ವಿಜ್ಞಾನ ಶಿಬಿರದ ಉದ್ಘಾಟನೆ ಮಾಡಿದ ಡಾ.ವಿದ್ಯಾನಿರಂಜನ್, ಯುವಕರ ಸಂಶೋಧನೆಗಳಿಗೆ ತಲುಪುವಂತಾಗಲಿ ಎಂದು ಕಾರ್ಯಕ್ರಮದ ಸಂಯೋಜಕ ಡಾ.ವಿದ್ಯಾನಿರಂಜನ್ ಹೇಳಿದರು. ಈ ವೇಳೆಗೆ ಡಾ.ವಿದ್ಯಾನಿರಂಜನ್, ಡಾ.ಕೆ.ಎನ್.ಸುಬ್ರಹ್ಮಣ್ಯ, ಡಾ.ಗುಲಾಬ್ ಖೇದರ್, ಡಾ.ಪತೂರ್ ಕೊಂಡಯ್ಯ, ಡಾ.ಅಲೆಕ್ಸಾಂಡರ್, ರಾಘವೇಂದ್ರ ಪ್ರಸಾದ್ ಇತರರಿದ್ದರು. ಈ ವೇಳೆಗೆ ಡಾ.ವಿದ್ಯಾನಿರಂಜನ್, ಡಾ.ಕೆ.ಎನ್.ಸುಬ್ರಹ್ಮಣ್ಯ, ಡಾ.ಗುಲಾಬ್ ಖೇದರ್, ಡಾ.ಪತೂರ್ ಕೊಂಡಯ್ಯ, ಡಾ.ಅಲೆಕ್ಸಾಂಡರ್, ರಾಘವೇಂದ್ರ ಪ್ರಸಾದ್ ಇತರರಿದ್ದರು. ಈ ವೇಳೆಗೆ ಡಾ.ವಿದ್ಯಾನಿರಂಜನ್, ಡಾ.ಕೆ.ಎನ್.ಸುಬ್ರಹ್ಮಣ್ಯ, ಡಾ.ಗುಲಾಬ್ ಖೇದರ್, ಡಾ.ಪತೂರ್ ಕೊಂಡಯ್ಯ, ಡಾ.ಅಲೆಕ್ಸಾಂಡರ್, ರಾಘವೇಂದ್ರ ಪ್ರಸಾದ್ ಇತರರಿದ್ದರು.

### ಆರ್.ವಿ.ಟಿಯಲ್ಲಿ ಇಂದಿನಿಂದ ವಿಜ್ಞಾನ ಶಿಬಿರ

ಯಶವಂತಪುರ: ಆರ್.ವಿ. ತಾಂತ್ರಿಕ ವಿದ್ಯಾಲಯ ಗುರುವಾರದಿಂದ (ಡಿ.26) ಡಿ.30ರವರೆಗೆ ವಿಜ್ಞಾನ ಶಿಬಿರ ಆಯೋಜಿಸಿದೆ. ವಿಜ್ಞಾನ ಮತ್ತು ತಂತ್ರಜ್ಞಾನ ಇಲಾಖೆಯ ಸಹಯೋಗದಲ್ಲಿ ಶಿಬಿರ ಆಯೋಜಿಸಲಾಗುತ್ತಿದ್ದು, ವಿವಿಧ ಪದವಿ ಪೂರ್ವಕಾಲೇಖುಗಳ 275 ವಿದ್ಯಾರ್ಥಿಗಳು ಪಾಲ್ಗೊಳ್ಳಲಿದ್ದಾರೆ ಎಂದು ಕಾರ್ಯಕ್ರಮದ ಸಂಯೋಜಕ ಡಾ. ವಿದ್ಯಾನಿರಂಜನ್ ತಿಳಿಸಿದ್ದಾರೆ. ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ವಿಜ್ಞಾನ ಮತ್ತು ತಾಂತ್ರಿಕ ಸಂಶೋಧನೆಗಳ ಬಗ್ಗೆ ಅರಿವು ಮೂಡಿಸುವುದು ಶಿಬಿರದ ಉದ್ದೇಶವಾಗಿದೆ. ರಾಷ್ಟ್ರದ ಪ್ರಸಿದ್ಧ ಸಾಧಕರು ಹಾಗೂ ವಿಜ್ಞಾನಿಗಳು ಪಾಲ್ಗೊಂಡು ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಸಂವಾದ ನಡೆಸುವರು.



To

The Principal  
R V College of Engineering  
Bangalore 560059

05-09-2019

From

Head of the Department  
Department of Biotechnology  
R V College of Engineering -59

**Subject:** Requesting permission for "One day workshop" and "Inauguration of Center for flow cytometry" at Biotechnology department.

With reference to above here requesting permission to conduct "one day flow cytometry workshop" and "Inauguration of Center for flow cytometry" held at Biotechnology Seminar Hall on Friday date 06-09-2019 from 09-00 AM to 05-00 PM. Conducting this workshop with registration amount of 100=00 rupees per candidate remaining excess expenditure if any requesting from college side. Kindly accept this invitation and permit us to conduct this workshop. Here attached the Invitation, Registration form and Programme schedule.

Thanking you

Your's faithfully

*Vidya Narayan*  
Head of the Department  
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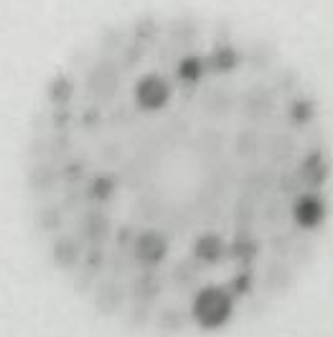
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A Joint Venture of R.V.C.E &  
Cytometry Solutions Pvt. Ltd., Kolkata



Cytometry Solutions

# An Introductory Flow Cytometry one day Workshop

*and*

## Inauguration Programme of "Center for Flow Cytometry"

Resource person: Dr. Sanjaya K Mallick, Ph.D  
Director & Chief Scientist, Cytometry Solutions Pvt. Ltd

Key note speaker: Dr. Jitendra Kumar Managing Director,  
Bangalore Bioinnovation Centre, Bangalore.

Presidential Address: Dr. K N Subramanya Principal RVCE

Date and Time: Friday, 6th Sept 2019, at 9.00 AM to 5.00 PM

Venue: Biotech Seminar Hall, Dept. of Biotechnology, RVCE

Dr. Vidya Nirajan

Convener, Prof. & Head,

Department of Biotechnology,

R V College of Engineering-560059

Dr. Raju H

Workshop Co-ordinator,

Asst. Prof



# An Introductory Flow Cytometry one day Workshop

## LIST OF REGISTRATION & ATTENDANCE SHEET

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8m Page No - 03

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Rashtreeya Sikshana Samithi Trust  
Department of Biotechnology  
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(An Autonomous Institution Affiliated to VTU, Belagavi)  
R V Vidyaniketan Post, Mysore Road, Bengaluru 560 059



## Certificate

This is to certify that Mr. / Ms / Dr. ....**Shravanjani K.S**..... of  
.....**Biotechnology**..... has successfully participated the in the  
“Flow Cytometry One Day Workshop” jointly organized by Cytometry  
Solutions Pvt. Ltd., Kolkata and Department of Biotechnology, R V College of  
Engineering Bengaluru -59 on 06<sup>th</sup> September 2019.

**Dr. Sanjaya K Mallick**

Director and Chief Scientist,

Cytometry Solutions Pvt. Ltd., Kolkata

**Dr. Vidya Niranjana**

Convener, Prof. & HOD, Biotechnology

R V College of Engineering

**Dr. K N Subramanya**

Principal

R V College of Engineering



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**Dr. K. N. Subramanya**, *Principal, RVCE*  
**Prof. Padmanaban Govindarajan**, *Former Director/Hon Prof. IISc.Bangalore*  
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**Dr. Jitendra Kumar**, *Managing Director, Bangalore Bioinnovation Centre, Department of IT, BT and S&T, Govt. of Karnataka.*  
**Dr. Vijay Chandru Reddy**, *Co-Founder & Chairman, Strand Life Sciences*  
**Dr. Geetha K. S.**, *Vice Principal, RVCE*  
**Dr. B. V. Uma**, *Dean of Student Affairs, RVCE*  
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**Chair**  
**Dr. Vidya Niranjan**, *HoD, BT, RVCE*

**Co-Chair**  
**Dr. Ramakanth Kumar P**, *HoD, CSE, RVCE*  
**Dr. B Sathish Babu**, *HoD AI & ML, RVCE*  
**Dr. B.M. Sagar**, *HoD, ISE, RVCE*

**Organizing Committee:**  
**Faculty and Staff :** *Departments of Biotechnology, Computer Science, Information Science, AI & ML and Chemistry, RVCE*  
**Mr. Vinay Kumar Chowdry**, *Senior Operations Officer, BBC*  
**Ms. Megha Telkar**, *Innovation and Ecosystem Development Officer, BBC*  
**Dr. Mary Mangalyarkarsi**, *Intellectual Property Consultant, BBC*

**Student Co-ordinators:**  
**Genesis**, *a student-led Biotechnology club, under the Centre of Excellence in Computational Genomics, RVCE*

**Aakaanksha Kaul, J. Sanjana, Joanna N D'Souza, Maryanne Varghese, Sarah Philip, Vibha R**

For any further queries kindly contact:

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Conference Email: [aimlbio2022@rvce.edu.in](mailto:aimlbio2022@rvce.edu.in)

Email ID: [vidya.n@rvce.edu.in](mailto:vidya.n@rvce.edu.in), [www.aimlbio.com](http://www.aimlbio.com)

## ABOUT THE CONFERENCE

The International Conference on “Artificial Intelligence and Machine Learning in Applied Biotechnology” primarily focuses on identifying possible ways to integrate the AI & ML in Biotechnology areas viz., Drug Design, Disease diagnostics, Agriculture sectors, Food and Nutrition etc. The conference aims to bring experts in the field to deliberate on emerging trends and generate quality research contribution by providing suitable platform for prospective and practicing researchers.

## ABOUT RVCE

RV College of Engineering® (RVCE) established in 1963 is one of the earliest self-financing engineering colleges in the Country. The institution is run by Rashtreeya Sikshana Samithi Trust (RSST), a not-for-profit Trust. RVCE is an Autonomous college. Currently, the institution offers 15 bachelor's, 14 Master's Programs, and all the departments have Research Centres affiliated with Visvesvaraya Technological University (VTU) Belagavi. The institution has set itself a Vision of "Leadership in Quality Technical Education, Interdisciplinary Research & Innovation, With a Focus on Sustainable and Inclusive Technology."

The institute has ranked 89<sup>th</sup> in the Country by the National Institutional Ranking Framework (NIRF:2020-21), QS-IGUAGE-Diamond University Rating (2021-2024), and "Excellent" rating in ARIIA Ranking-2021. The institution has to its credit over 1500 National and International Journal & Conference publications, filed over 50 patents, 49 published patents, 14 granted patents and completed sponsored research and consultancy projects worth Rs. 20.0 crores in the last three years. Institute has established an Incubation Centre, Centre of Excellence in Microelectronics, Internet of Things, RVCE-Mercedes Benz Centre for Automotive Mechatronics, Toyota Kirloskar Motors sponsored Automotive workshop, Centre for Smart Antenna Systems, Centre for Computational Genomics, RV-Bosch Rexroth Centre for Automation, Autonomous Vehicles, e-Mobility, Quantum Information and Technology, Hydrogen & Green Technology Research and HPCC Systems, Cognitive Intelligent Systems for Sustainable Solutions and Visual Computing.

## OBJECTIVES OF THE CONFERENCE

- ❖ Envision the application of AI/ML in the new frontiers of biotechnology
- ❖ Collaborate and network among the students, faculty, working professionals and researchers
- ❖ Provide a compendium of new ideas for research & commercial applications

## CONFERENCE TRACKS

The Conference emphasizes contemporary research works and applications of Artificial Intelligence & Machine learning technologies to build sustainable solutions in the domain of Biotechnology. The contributions may include algorithms and technologies comprising data science & analytics, Machine learning, Deep learning, Artificial Intelligence and its forms to address the challenges in the Biotechnology field but not limited to the mentioned topics.

### Track 1: Diseases and Diagnostics

Disease Detection and Prevention, Therapeutic agents

### Track 2: Computational Methods for Genomics to Drug discovery

GWAS, Exome, Gene Essentiality, Whole Genome Sequence

### Track 3: Information Systems & Technology for Agriculture, Food and Nutrition

Green biotechnology, Microbial, Fermentation, Nutrition, Crop biotechnology

### Track 4: Algorithms for Life Sciences

Correction of genetic diseases, Forensic medicine, Fertility control and healthcare applications.

## CALL FOR PAPERS

Prospective authors are encouraged to submit quality and original research papers for presentation at the conference. The submission of the abstract should follow the standard template provided by the organizers of the conference. The acceptance of the abstract submission will be based on the relevance, quality of content, and plagiarism check.

All oral and poster-related submissions, including the technical paper submissions will be handled electronically, double-blind peer reviewed. All accepted and presented papers will be published in the conference proceedings and selected papers will be considered for publication in Elsevier.

## REGISTRATION FEES

**Paper submission link:** <https://easychair.org/conferences/?conf=aimlbio2022>

**Industry professionals: Rs. 3540** (GST included)

**Faculty and Research Scholars: Rs. 2360** (GST included)

**Students - Presenting authors for oral presentations: Rs. 1180** (GST included)

**Non-presenting authors for oral presentations: Rs.885** (GST included)

**Authors for poster presentations: Rs. 708** (GST included)

**Foreign Delegates: \$100**

## IMPORTANT DATES

**Abstract submission: 30<sup>th</sup> Sept. 2022,**

**Acceptance Notification: 07<sup>th</sup> Oct. 2022**

**Registration Deadline: 14<sup>th</sup> Oct. 2022**

**Oral and poster-related proceedings: 31<sup>st</sup> Oct. 2022**

**Technical paper submission: 15<sup>th</sup> Nov. 2022**

**Final Publication: 31<sup>st</sup> Dec. 2022**

**Register here:**

<https://rzp.io/l/6iLl7eERr>

Or use the QR Code



**RV COLLEGE OF ENGINEERING®**  
(Autonomous Institution Affiliated to VTU, Belagavi)  
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**Bengaluru - 560 059**

## International Conference on “Artificial Intelligence and Machine Learning in Applied Biotechnology” (AIMLBIO)

Organized by  
**RV College of Engineering®**  
**Bengaluru**

In collaboration with



**8 – 10, December, 2022**

**Hosted by**  
Department of Biotechnology  
**Co-Hosted by**

Department of Computer Science and Engineering  
Department of Artificial Intelligence and Machine Learning  
Department of Information Science and Engineering

2019

Entered

22/4/24

# MEMORANDUM OF UNDERSTANDING (MoU)

Between

**Bangalore Bioinnovation Centre (BBC)**

**Bangalore**



*AND*



**RV College of Engineering®**

Mysore Road, RV Vidyaniketan Post, Bengaluru - 560059, Karnataka, India

**R V College of Engineering**

**Bangalore**

**2024-25**

# MEMORANDUM OF UNDERSTANDING (MOU)

BETWEEN

**Bangalore Bioinnovation Centre (BBC), Bangalore**

AND

R V College of Engineering  
R V Vidyaniketan Post, Mysuru Road  
Kengeri, Bangalore 560059  
Karnataka, INDIA

**Bangalore Bioinnovation Centre (BBC)** a section 8 Company having its registered office at Helix Biotech Park, Electronic City Phase 1, Bangalore – 560100, Karnataka and a bio-incubation center for startups in the field of Life Sciences, Pharma, MedTech, Agriculture, Food & Nutrition funded by Department of Electronics, IT, BT and S&T, Government of Karnataka with a liberal funding support from Department of Biotechnology (DBT) Government of India. The Centre is a world class incubation Centre with Central Instrumentation facility in a 10-acre campus with total builds up area of 60,000 sq. ft. (hereinafter referred to as '**BBC**'), which expression shall, unless repugnant to the context or meaning thereof include and be deemed to include its, successors-in-interest and permitted assigns,

AND

R V College of Engineering located at R V Vidyaniketan Post, Mysuru Road, Kengeri, Bangalore 560059 Karnataka, INDIA, hereinafter referred to as "**RVCE**", which expression shall, unless repugnant to the context or meaning thereof include and be deemed to include its, successors-in-interest and permitted assigns,

WHEREAS, BBC is established with the aim of fostering innovation ecosystem through translational research by start-ups/entrepreneurs in the broad areas of Life Sciences viz., Health Care (MedTech/Pharma/Bio-Pharma), Agriculture, Food/Nutrition, Industrial Biotechnology and Environmental Biotechnology and take it forward to commercialization;

WHEREAS, RVCE is established with the aim to provide quality technical education and emphasizes interdisciplinary research and innovation. RVCE focuses on sustainable and inclusive technology and has a strong industry-institution collaboration. The college's core values include professionalism, commitment, integrity, teamwork, and innovation.

WHEREAS, both parties recognize the potential benefits of collaborating for development of



the startup ecosystem that leverages complementary strengths, resources, and expertise to drive innovation and entrepreneurship in life sciences and healthcare;

WHEREAS, each party referred to individually as “Party” and jointly as “Parties” have intended to enter into a MoU according to the terms and conditions stated below.

### **Purpose of this Memorandum of Understanding**

The purpose of this Memorandum of Understanding is to establish a collaboration between the Parties to promote academic bio-entrepreneurship, promotion of spinouts and facilitate commercialization of technologies developed by RVCE in broad areas of Life Sciences. Parties admire the benefit from the cooperation to take on the challenge of promoting bio-entrepreneurship through providing training and job opportunities. In compliance with legal regulations, and adhering to the principles of equality, mutual benefits, mutual trust, mutual assistance, and complementary advantages, both organizations agree to work towards a long-term mechanism to promote cooperation in innovation ecosystem, and thus creating a holistic ecosystem for advancements in innovation in the country.

### **Areas of Cooperation**

#### **1. Ecosystem Development initiatives:**

The Parties agree to cooperate, in the context of their respective mandates, policies and resources, for the purposes of promoting bio-entrepreneurship especially in the field of Life Sciences through technical cooperation, capacity-building, training and commercialization of technologies.

#### **2. Training/Internship Programs:**

The Parties agree to act as a link between the college and the start-up's incubated at BBC and facilitate the transfer of knowledge/technologies through training programs and/or webinars. Facilitating BBC to facilitate Internships / Student Projects, Industrial visit for the students,

#### **3. Research Partnerships:** The Parties will strive towards strengthening research and development through joint research programs and bring out more spinouts.

#### **4. Access to instrumentation and infrastructure facilities:**

BBC to provide access to instrumentation and infrastructure facilities for collaborative research projects, to the students/ scholars/ faculty of RVCE as per the policies of BBC.

#### **5. Common Research Projects:**

The Parties agree to carry out common research projects in the relevant field and to

discuss the obtained results in order to publish articles or IP protection and to participate at Scientific/National/International Conferences, Seminars, Workshops and Meetings.

**6. Commercialization of Technologies developed:**

BBC to facilitate the commercialization of technologies developed in the college in the field of Life Sciences.

**7. Networking and Events:**

The Parties agree to jointly conduct field specific events in the area of technology commercialization and entrepreneurship. The Parties agree to jointly conduct events such as workshops, training and skill development programmes, conferences, webinars etc., to capacitate the researchers and faculty.

**8. Reporting and Evaluation:**

The "Parties" referred to in this MOU below shall meet as necessary to review the fields of cooperation.

**Scope and Implementation of MoU**

1. The Party having the responsibility to organize an agreed activity under this Memorandum of Understanding, shall apply its own administrative and financial regulations and comply with its own practices, unless provided otherwise in this MoU. It shall apply its own practice in terms of organization, logistical arrangements and other activity-specific matters, unless otherwise agreed between the Parties.
2. For agreed activities organized by a Party and financed, in full or in part, by the other party, administrative and financial modalities shall be defined in advance between the Parties.
3. In all instances, each party shall cover the expenses related to the participation of its nominees in the agreed activities out of its own financial resources.
4. No provision of this agreement shall be construed so as to interfere in any way with the Parties respective decision-making processes with regard to their own respective affairs and operations.

**Responsibilities of the parties involved in this agreement:**

**Responsibilities of BBC:**

1. BBC will facilitate to carry out its research/innovation activities in its facility and use its infrastructure available in its premises. BBC may also facilitate focused discussions with its associates / experts on the work-flows, to understand any technical or clinical challenges and propose possible solutions, if any
2. BBC will facilitate IP facilitation such as for drafting and prosecution of Patents, Design, Trademarks, Copyright.

3. BBC will provide Instrumentation facility. The facility will be offered to students/ researchers/ faculty at subsidized rates on case to case basis.
4. BBC offers handholding to incubators attached to the academic institutes and the startups associated with the incubation centres.
5. BBC may provide feedback on proposed solutions and prototypes developed by startups at various stages of its development through its network of commercial partners
6. BBC shall provide its lab and incubation infrastructure for the RVCE startups as per the policies of BBC
7. BBC will facilitate to provide internship to students in the field of Life Sciences.
8. BBC will facilitate to provide customized programs such as Faculty Development programs to align with the requirements of IIC, NAAC, ARIIA etc
9. Share its expertise and best practices in startup development.
10. Provide access to its network of mentors and partners.
11. Organize and participate in joint events and activities.

#### **Responsibilities of ACADEMIA:**

1. Promoting BBC as one of the representative “mentor” to facilitate Collaboration.
2. To facilitate any industry collaborators or Investor groups who are seeking to setup a dedicated R&D facility at the BBC TBI ecosystem
3. Facilitate access to government programs and initiatives for startups.
4. Advocate for policies that support the growth of the startup ecosystem.
5. Promote the collaboration and its outcomes to stakeholders.

#### **Amendments**

This Memorandum of Understanding may be amended by mutual written agreement of the Parties. Unless otherwise agreed, amendments may apply only to agreed activities which have not yet been implemented.

#### **Entry into Force and Duration**

1. This Memorandum of Understanding shall enter into force on the date of its signature by both Parties.
2. This Memorandum of Understanding shall remain in force for Two years and shall be further renewable on mutual consent by the Parties.
3. This MoU may be terminated by either party upon 30 days written notice to the other party
4. In case of termination of this Memorandum of Understanding, the Parties shall cooperate during the period of notice to ensure orderly completion of all pending Agreed Activities.



### **Dispute Resolution**

Any dispute arising out of or in connection with this MoU shall be settled amicably through negotiations. If the dispute cannot be settled amicably, it shall be referred to arbitration in accordance with the laws of India


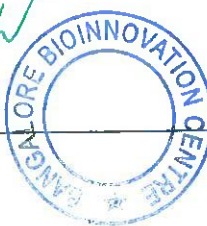

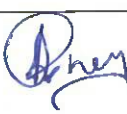
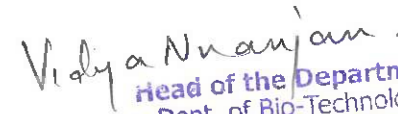
### **Governing Law**

This MoU shall be governed by and construed in accordance with the Indian Laws

### **Miscellaneous**

1. Any and all information exchanged under or in connection with this MOU shall be considered as confidential information of disclosing Party. Receiving Party shall not disclose confidential information of disclosing party to any third party or otherwise use such confidential information for any purpose other than for performing this MOU.
2. Each Party shall comply with all applicable laws including laws pertaining to privacy, data protection, confidentiality, drug control laws, and environmental laws in the performance of this MOU.
3. Either party does not make any representation or warranty that the proposed collaboration shall ensure commercial viability or success of any joint research project or any other warranty, expressed or implied.
4. If either Party is delayed in performing an obligation under this MOU by strike, lockout, or other labor troubles of a Third Party; by restrictive governmental or judicial order or by riots, insurrection, war, inclement weather, or Acts of God including any endemic or pandemic; performance is excused for the period of such delay. The Party affected by such Force Majeure event shall promptly notify the other in writing of the delaying event.
5. The relationship hereby established between the Parties is solely that of the independent contractors. This MOU shall not create any agency, partnership, or joint venture relationship.
6. This MOU is entered between the parties for common collaboration and exploring opportunities in the ecosystem which will benefit the startups and ecosystem at large. This is not a commercial arrangement but an MOU to collaborate and take initiatives for development.
7. This MOU may be executed in counterparts, each of which shall be considered an original and all of which shall constitute one and the same document for all purposes.

IN WITNESS WHEREOF, the parties have caused this MOU to be executed by their duly authorized representatives.

For Bangalore Bio Innovation Centre	For R V College of Engineering
  Authorized Signatory	 PRINCIPAL RV COLLEGE OF ENGINEERING BANGALORE - 560 059 Authorized Signatory
Witness: 	Witness:  Head of the Department Dept. of Bio-Technology R.V. College of Engineering BANGALORE - 560 059
Date: 18/04/24	Date: 18/04/24

## Industry Based Labs

### Objectives:

- To introduce the latest technology to the students as per industry standards.
- Students will know the testing procedure conducted as per Indian standards.
- Students will know the various domain on which the industry is focusing.

### Outcome:

- Students will have hands on experience on the various machines, which are existing in the market.





## **Suryamitra Skill Development Program**

The Ministry of New Renewable Energy, Government of India has taken an initiative to installed 100 GW solar project by 2022 in co-ordination with State Nodal Agencies. However, there are gaps in the capacity and quality of training infrastructure as well as outputs, insufficient focus on workforce aspirations, lack of certification and common standards and a pointed lack of focus on the unorganized sector. To achieve this mission more than 50,000 skilled manpower are required for installation, commissioning, operation and maintenance in the field of solar technology.

### **Objectives:**

- The main objective of this training program is to train 10+2 passed, ITI/diploma holders/ to execute and successful implement National Solar Mission across the country.
- Ensure sufficient, high quality options for long-term skilling, benchmarked to internationally acceptable qualification standards, which will ultimately contribute to the create a highly skilled workforce.
- Develop a network of quality instructors/trainers and maintain database as a portal for matching the demand and supply of skilled workforce in the country.
- Support weaker and disadvantaged sections of society through focused outreach programs and targeted skill development activities.



## Projects:









Bachchanth Sankaran Sankar Trust  
RV College of  
Engineering

Approved by AICTE,  
New Delhi/ Accredited  
By NAAC, Bengaluru  
And NBA, New Delhi  
Autonomous  
Institution Affiliated  
to Visvesvaraya  
Technological  
University, Bengaluru

Original

# TAX INVOICE

GSTIN : 29AAATR0758A1ZP  
PAN : AAATR0758A

Invoice No. : 10201802000124  
Date : 17.08.2021

## Billing Details (Bill To) :

Name : QTRONICS

## Shipping Details (Ship To) :

Name : QTRONICS

Address : "2nd Cross, Sanjeevini Nagar, Moodalpalaya Bengaluru-560072

Address : "2nd Cross, Sanjeevini Nagar, Moodalpalaya Bengaluru-560072

GSTIN : 29AAAFQ7225R1ZK  
PAN : AAAFQ7225R  
State Code : 29-Karnataka

GSTIN : 29AAAFQ7225R1ZK  
PAN : AAAFQ7225R  
State Code : 29-Karnataka

State Code : 29-Karnataka														
GST														
Sl.No	Description	HSN/SAC	Quantity	UOM	Rate / Item (Rs.)	Taxable Value (Rs.)	SGST			CGST			IGST	Total Amount (Rs.)
							Rate of Tax	Amount	Rate of Tax	Amount	Rate of Tax	Amount		
1	Institution Consultancy Projects Charges for the project "Design and Development of sensor - array based E-nose drone for Industrial Automation	998393	0.000		0.00	43,000.00	9.000	3,870.00	9.000	3,870.00	0.000	0.00	50,740.00	
Beneficiary details for NEFT/RTGS						TCS Rate of Tax							0.00	
Bank A/C Details						Discount							0.00	
R V College of Engineering 136010112055 Kotak Mahindra Bank						Round of Amount							0.00	
						Grand Total							50,740.00	

Bank A/C  
136010112055  
Kotak Mahindra Bank

Beneficiary details for NEFT/RTGS

Mysore Road, RV Vijayanagara  
Post, Bengaluru - 560058,  
Karnataka, India

080 - 67178000/ 8161

principal@rvce.edu.in  
rvce.edu.in

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RV College of Engineering

Approved by AICTE, New Delhi, Accredited by NAAC, Bangalore and NBA, New Delhi

Autonomous Institution Affiliated to Visvesvaraya Technological University, Bangalore

Original

Amount in Words : Rupees Fifty Thousand Seven Hundred Forty Only

Branch Address & IFSC  
R.V. College of Engineering Campus  
Mysore Road,, Bengaluru, 10  
KKBK0008053

R V College of Engineering

TERMS & CONDITIONS :-

1. Payment to be made at the earliest
2. Cheque in favour of Director/Principal/CEO/Head Mistress  
R V College of Engineering

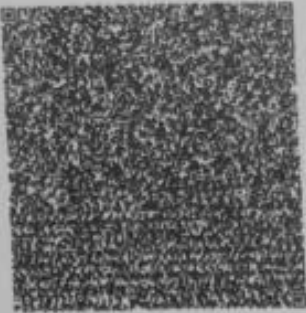
HO/AUTHORIZED SIGNATURE  
Principal  
RV College of Engineering  
Bangalore - 560 059

IRN : e0a653c917c7614b7e180caea6019c89013977fd1e62f51b79f2195d04dd85f8

Ack No : 112111462849701

Ack Date : 2021-08-17

e-Invoicing detail(s) generated from the Government's e-Invoicing system.



Mysore Road, RV Vidyaniketan  
Post, Bengaluru - 560056,  
Karnataka, India

Phn - 87178020/ 8161

principal@rvce.edu.in  
rvce.edu.in

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Engineering®**

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*Go, change the world*

# **Centre of Excellence in e- Mobility**

**AMPERE**  
By GREAVES



# Inauguration CoE e-Mobility











Name	Dept	Name	Dept
Prof K N Subramanya	Principal, RVCE	<b>Prof Vishnumurthy</b>	Chemistry
Prof Rudranna Nandihalli	HoD	<b>Prof Sudhakamath</b>	Phy
Dinesh M N	Co-ord EEE	<b>Prof Rachana Akki</b>	EI
Rajavidya	EEE	<b>Prof Bhagya</b>	TC
Suresh C	EEE	<b>Prof Durga prashanath</b>	CV
J R Nataraj	ME	<b>Prof Gajalakshmi K</b>	CV
Prof Krishna	ME	<b>Prof Benjamin</b>	AS
Prof Narahari	IEM	<b>Prof Vishalakshi prabhu</b>	CSE
Prof Geetha	EC	<b>Prof Ramya</b>	Phy
Prof Sudhakamath	Phy	<b>Prof Mohan Aradhya</b>	MCA
Prof C K Nagendra guptha	IEM	<b>Prof SriVidya P</b>	EC
Prof MN Vijaykumar	IEM	<b>Dr Srinivas ,</b>	Consultant with NDRF and Ex DRDO
Prof Kariappa	EC	<b>Prof Seetharam</b>	Rtd Director CPRI
Prof Ujwal meda	Chemical		



RV College  
of Engineering

EEE

e-Mobility

e-Mobility

e-Mobility

e-Mobility

e-Mobility

e-Mobility

e-Mobility

Battery Management System

Vehicle To Vehicle Communication

Go, change the v

*Charging Stations*

**ISSUES IN E-Vs**

Alternatives for lithium ion batteries

Wireless Power Transfer For Electric Veh

**Business Model**

**Security And Safety Issues In EV**

**Battery Management System**

SECURITY AND SAFETY ISSUES IN EV

Static Wireless Power Transfer

Conversion of normal fuel vehicles to Hybrid

**Regenerative**

DT LAB

# Activities : e-Mobility

- Signed an MoU with:

**Fachhochschule Dortmund University of Applied Sciences and Arts University of Dortmund , Germany.**

*( Faculty exchange, student exchange Program: 4 students and 3 prof visited RVCE)*

- **Signed an MoU with : GREAVES COTTON**

Set up E-mobility Lab equipped with computers loaded with software, 5 electric vehicles from Greaves and accessories for the lab,

**Employment for 7 students(2019)**

**Internship for 5 (M.Tec students, 2020) , all got absorbed by the company**

**Internship for 2 (B.E students,2020)**

**Internship for 17 students (2021)UG and PG , 10 students got absorbed by GC (2022)**

**Project funded by Greaves:** Design of motor controller for 2 wheelers

**Fund received : 8<sup>th</sup> mile as Gold sponsors' (and projects)**



- Design Thinking Lab:

4<sup>th</sup> sem Students : Topic e-Mobility

- Webinars conducted:

10 topics (june 6<sup>th</sup> to June 13<sup>th</sup> 2020)

- Industry Institute Interaction:

On line internship to students for 4 weeks (2020)

(14 topics,12 faculty, 48 students from other colleges and RVCE participated )

On line internship to students for 4 weeks (2021)

( 38 students , from other colleges and RVCE participated)

# **AICTE Sponsored One-Week Online Short-Term Training Program**

On

## **“Advances in Electric Vehicles”**

- (Phase-1) 9<sup>th</sup> to 14<sup>th</sup> November 2020
- (Phase-2) 7<sup>th</sup> to 12<sup>th</sup> December 2020
- (Phase-3) 21<sup>st</sup> to 26<sup>th</sup> December 2020

**Co-ordinators: Dr Srivani, Mr Suresh.C, Smt Sunanda C. Dept of EEE, RVCE**

- Mr Rahul V , final year Telecommunication Engineering student has built an Electric bike ,  
**(Funded by RSST)**
- Runs at 130 kph speed,
- 150 km / charge
- Charging time < 4hours





Motor controller.

Battery management system

Charging

Chassis designing

Safety and security

Harness / lights , etc

Marketing/ survey etc

# Online Internship

- One month Internship on the topic of their choice
- Guided by faculty
- Jointly organised by Institute and Industry.
- A platform for students to explore their interest.

(Across college there will be many CoEs who will offer internships on diversified domains)



## from **e-Mobility** Team (2020)

Sl. No	Title	Co-ordinator
1.	Modelling, simulation and analysis of performance of a super capacitor for e-vehicles	Dr. Sudha kamath (Phy) Dr Ramya P, (Phy) Prof. Suresh C (EEE)
2	Propose a Scheme and Solution on time to recharge a battery by reducing the charging time.	Raja Vidya, EEE
3	A simulation model to study the behavior of a metal air battery(Fuel Cell) at different discharging current and temperature.	Raja Vidya, EEE
4	Design and Develop a BMS system involving active balancing topology and develop an algorithm to implement the same.	Raja Vidya,EEE
5	Design and Develop Electrical vehicle propulsion model using MATLAB Simulink.	Raja Vidya, EEE
6	A Smart System to avoid congestion at the Charging Pool	Dr.Mohanaradhya, MCA Dept
7	Design and simulation of isolated power supplies for e-vehicles.	Dinesh M N , EEE
8	Design and Simulate Motor Equations to predict its Power, Torque etc. which can be further used to predict the power consumption of vehicle and Range	Rachana S Akki / MND
9	Designing LED/LCD Cluster to Display Speed, Battery SOC bar, Odometer .	Rachana S Akki / MND
10	Design of Hall effect Sensors in Motors to calculate speed of the vehicle in terms of Rpm and Km/Hr.	Rachana S Akki / MND





Sl. No	Title	Co-ordinator
9	Designing LED/LCD Cluster to Display Speed, Battery SOC bar, Odometer .	Rachana S Akki / MND
10	Design of Hall effect Sensors in Motors to calculate speed of the vehicle in terms of Rpm and Km/Hr.	Rachana S Akki / MND
11	Aluminium air battery for electric vehicles	Dr.Vishnumurthy K A
12	Development of a Fuel Cell Vehicle / Electric Vehicle via renewable energy route	Ujwal Srenag M
13	Accurate State-of-Charge Indication for Battery-Powered Electric Vehicle.	Kariappa E&C, Suresh C , EEE
14	Battery Management System for Electric Vehicles	Kariyappa, E&C
15	Connected Electric Vehicles - Infrastructure Functions through Communication	Vishalakshi Prabhu, CSE
16	A Business Process Model for the Reverse Logistics of Used Electric Vehicle Batteries	Dr.C K Nagendra Guptha, HoD , IEM
17	Cost-effective supply chain for electric vehicle battery remanufacturing	Dr. C K Nagendra Guptha, HoD , IEM
18	Technological benchmarking study of E-Vehicles with focus on Electric Vehicles in the Indian automotive sector.	Dr. N S Narahar Professor, IEM
19	Standards Practices and Certification guidelines for Electric Vehicles	Dr. M N Vijaya Kumar Associate Professor
20	Customer journey mapping process of a typical Indian E-vehicle customer	Prof Bhaskar M G Assistant Professor,



# List of topics - 2021

List of topics from e-Mobility Team(2021)

## List of topics from e-Mobility Team

Topic
Super capacitors – Futuristic energy storage devices for e-vehicles
Battery Management System(BMS):Active and Passive Cell Balancing, State-of-Charge Estimation
Power Converters for Charging station
Design and Simulation of Synchronous Reluctance Motor for Traction Application
EMI EMC Issues in Electric Vehicles
FPGA implementation of communication protocols for E-vehicles
Simulation of basic E-vehicle model using Matlab Simulink
Develop & Simulation of Communication protocols in Electric Vehicles using Labview / Matlab Simulink / NS2
Simulation of Advanced driving assistance system (ADAS) using wireless sensors in Electric Vehicles
IoT based dashboard
IoT based battery monitoring system.
A Smart System to avoid congestion at the Charging Pool
Reimagining the vehicle parking spaces to suit solar charging
Design and Analysis of e-Vehicle Dynamic System Model
Design of Thermal Management system for Batteries in e-Vehicles



# List of topics - 2021

List of topics from e-Mobility Team(2021)

## List of topics from e-Mobility Team

Topic
Electricity generation system from a renewable energy source for a self-sustained Fuel Cell Vehicle (Floating PV solar power stations)
Renewable energy powered electrolyzer system to generate hydrogen gas for a self-sustained Fuel Cell Vehicle
Development of a simple fuel cell system powered by an electrolyzer
Integration of a self-sustained fuel cell with an indigenous vehicle
Design of Eco friendly Metal air Battery Technology for sustainable e-mobility systems
Design and simulation of Motor controller for e-Vehicles
A Business Process Model for the Reverse Logistics of Used Electric Vehicle Batteries
Cost-effective supply chain for electric vehicle battery remanufacturing
Digital Closed Loop Supply Chain Network Design for Electric Vehicles
Market segmentation of electric two wheelers in indian context
Comparative study of charging infrastructure in India and the rest of the world.





# Internship Program in association with Industry

- 2020 – 48 students
- 2021 – 38 students
- 2022- 02 students

**Facilities, SW available from RVCE** : For Controller development, Garuda Team works with Greaves cotton. Following equipment are available.

Sl No	Material	Qty
1	ESD Benches	3
2	Benches - 12" x 3"	1
3	Benches	1
4	Workstation	3
5	Ansys Software	1
6	Solidworks Software	2
7	Computer	3
8	OrCAD Simulation software	1
9	IOT java development software	1
10	Oscilloscope	1
11	MAT lab	1
12	Psim	1
13	Android Studio	1
14	MP IDE	2
15	Ki Cad software	1
16	Ms Fatigue Software	1
17	EMI / EMC Lab	1
18	CFD simulation Software -Fluent	1



- **Title: Supercapacitors – Futuristic energy storage devices for electric vehicles**

Authors: Ramya P, Sudha Kamath M K, Shwetha K P, J Abhilash Preetham, Devesh Joshi

Presented the paper in "First International Conference on Technologies for Smart Green Connected Society 2021" held during 29th and 30th November 2021 virtually.

- **Paper Title : Battery Charging Techniques for an Electric Vehicle — A Comprehensive Survey.**

Author: Raja Vidya

Journal Name : GIS SCIENCE JOURNAL : ISSN NO : 1869-9391. Publication Details: Dec 2021.

- **Review article: “ A comprehensive review on advanced battery technologies for E mobility”,**

Scopus indexed Journal , Indian Journal of Chemical Society, Elsevier.

– by Dr Vishnumurthy K A

- **Review on the recent advances, “ Solid Electrolyte Interphase (SEI), a boon or a bane for lithium batteries”,**

Journal of Energy Storage, (In Press) , Article No. 103564, 2021.

- by Ujwal Shreenag Meda, Libin Lal, Sushantha, Paridhi Garg.



# Papers Presented by Faculty contd...

- Paper Titled “ Consumer Preferences for Mid segment Electric Cars- An Indian Perspective”,

International Journal of Engineering Research and Technology  
(IJERT) ISSN: 2278-0181, Vol 9, issue 07, July 2020

- by Prof Bhaskar M G, Dr N S Narahari, Dr C K Nagendra Guptha.

# Skill Development Prog

To set up a **E-MOBILITY** Lab:

To conduct 3 months certificate course:

( Theory + lab + internship + industrial visit)

In Association with Greaves cotton .

We have finalized the following topics :



Sl No	Topic	Mode of training	
1	Theory : Introduction to EV / Market scenario / Agencies involved/ challenges in this field		
2	Assembly of 2 wheeler / 3 wheeler vehicles	In house practical training + field visit	
3	Assembly of 4 wheeler vehicles		
4	Trouble shooting : Issues in EV's	In house training by experts + Laboratory	
5	Debugging in electronic circuits used in EVs	Specialized training	
6	Servicing of vehicles	In a workshop for 15 days	Internship
7	Personality Development , communication skills / behavior	Experts to train students	





	Topics to be covered	Approx. budget In lacs
1	SENSORS AND INSTRUMENTATION	1.0
2	FUEL CELL TECHNOLOGY	2.87
3	IOT ENABLED E-VEHICLES AND SMART GRIDS	0.75
4	BATTERY MANAGEMENT SYSTEM	2.0
5	MOTOR AND MOTOR CONTROLLER	5.0
6	WIRELESS SENSORS & PROTOCOLS IN E VEHICLES	1.0

# Skill development program contd..

- **Faculty** : Identified faculty to be deputed for a max of 2 weeks on a **specific objective** along with students ( one faculty + 2 students or 2 faculty + 2 students to get trained)
- **Challenge** : to identify faculty and interested students for specific topics and place of training
- Lab setup: Equipment's required for all the activities

**To interact with Greaves cotton and discuss the topics for skill development training of faculty and students , Visit.**

- Team Chimera : working for e-bicycle powertrain (E-Tigona.)
- One week workshop on e-vehicles : ON LINE workshop  
“Trends and Opportunities in E-vehicles 2022”, 2<sup>nd</sup> May to 7<sup>th</sup> May, 2 sessions daily
- Meeting with engineers from Greaves :  
MND and CSS
- Been to Ampere vehicle assembly line at Ranipet on 14<sup>th</sup> May 2022: Prof Narahari, Prof Sudhakamath, Prof Rachna Akki, Prof Mohanaradhya, Prof Suresh , and Dinesh M N





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Engineering**

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# AMPERE



- Regular meetings with GC team
- Proposal sent to GC for a fuel cell based 2 wheeler (2 kW Approx 9.5 lacs and 1kW approx 7 lacs)
- Proposal to send 2 faculty and 2 students for one week training at their assembly plant in Ranipet.





## ipgi Instruments

New No.46, Old No.15/1, Nallakumar Street, West Vandalam,  
Chennai - 600 033. India | E mail: [ipgi-ins@yahoo.in](mailto:ipgi-ins@yahoo.in) | [www.ipgi.co.in](http://www.ipgi.co.in)  
Phone : +91 44 - 4336 2589, Mob: 9094968589, 9444345824

Ref: ipgi/CK/358/2k22

October 15, 2022

Dr. ir. Ujwal Shreenag Meda, PDEng (The Netherlands)  
Assistant Professor  
Department of Chemical Engineering  
RV College of Engineering  
R V Vidyanikethan Post  
Mysuru Road Bengaluru - 560 059  
Ph: 08068188445  
Mob: 8050842363

Dear Sir,

Sub: Quotation for PEM fuel cell

Ref: Email

With reference to the discussion we had with you, kindly find below the quotation for your kind consideration.

S.No	Item	Qty	Price in Rupees.
1.	<b>2KW fuel cell</b>  Specifications Performance Rated power 2kW Rated output voltage VDC 48V Cooling air cooled Size mm 190*120*410 Weight Kg About 6 Hydrogen supply requirements Flow requirements slpm 24 Input pressure Bar 0.45~0.65 Hydrogen purity % ≥99.995 Operating environment Storage temperature °C -10~55 Working temperature °C 5~45 Relative humidity %RH 10~95 Working altitude m ≤2000	One	9,51,233
2.	<b>1KW fuel cell</b>  Specifications	One	6,86,200

- Conducted 3 week workshop for 1<sup>st</sup> sem students (21<sup>st</sup> Nov 2022 to 9 12-2022)

(7 students took e mobility as their internship topic , this is for 1<sup>st</sup> year students )

Discussions are on with Mr Ranjan Mishra (Product design head)

Formed 2 groups of 4 students each and they have to do market research and given new 2 wheeler they have to give feed back after riding it from our college students .

Planning to training 2 faculty and 2 student for assembly plant.





**NOW THE PARTIES MUTUALLY AGREE ON THE FOLLOWING TERMS AND CONDITIONS:**

**1. Definitions:**

- i) "Affiliates" shall in relation to GCL mean and include the subsidiary company/ies and parent company/ies of GCL and its other group companies.
- ii) "Confidential Information" shall mean and include without limitation all information relating to the Pre-existing IP of GCL and its Affiliates and Foreground IP that may be generated under this MOU, the Deliverables and other sensitive and proprietary information of GCL and its Affiliates including but not limited to documents, drawings, plans, technical, technological, commercial, financial, data, components and the like which contain know how and experience which are beyond the state of the art and which may be patentable, whether in writing, orally or by any other means or of such confidential nature that if divulged will adversely affect GCL and its Affiliates.
- iii) "Deliverables" shall mean the research results whether in the form of drawings, documents, reports, CAD data, prototype, know-how and software program developed during the term of this MOU and under the research project.
- iv) "Intellectual Property" shall mean copyright, patent, design patent, registered designs, design rights, trademarks, service marks, any report or any presentation or paper, an application for any of these or rights to apply for the same, trade secrets, know-how, database rights, moral rights, confidential information, trade or business names, domain names, and any other rights of a similar nature including industrial and property rights and other similar protected rights in any country and any licenses under or in respect of such rights.
- v) "Background IP" shall mean the Intellectual Property of GCL and its Affiliates created or acquired by GCL and its Affiliates before the execution of this MOU.
- vi) "Foreground Intellectual Property" shall mean the Intellectual Property which has been generated during the term of the MOU as a result of the research project.

**2. Purpose of the MOU:**

Under this MOU, RVCE shall undertake the research project for GCL based on the requirement of GCL. RVCE shall complete the research project within the time period agreed by the Parties and as mentioned in Section 3 of this MOU.

**3. Details of Activities under this MOU**

The Following scope would be covered under the Vision of "Centre of Excellence for Electric Mobility" (COEEM) :

**a. Competence Development :** GCL would create competence in RVCE through its Internship and training Exchange program in the following areas :

- i. Electric vehicle Design
- ii. Electric vehicle Architecture
- iii. Functional Safety in Electric vehicles through ISO26262
- iv. Vehicle Styling and Industrial Design



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- v. Sub Systems Design like Controller, Motor, Battery Systems, Regenerative Braking, Connected Vehicles etc.
- vi. Verification and Validation of Sub Systems and Reliability Engineering
- vii. Concepts of HALT, HAST and MEOST in Accelerated testing.
- viii. EMI/EMC of sub systems and Vehicles

b. **Projects to be done Together:** During the 1<sup>st</sup> year of the 'COEEM' – GCL and RVCE would work on following projects :

- i. Controller Design for 1.2 kw and 3 kw BLDC Traction Motors
- ii. BMS Design for Lion battery
- iii. CAN Based telematics Gateway Unit for Preventive Diagnostics
- iv. Application Software for Special Features in EV's – IP shared by RVCE and GCL
- v. Research in developing Hybrid battery solution with Ultra Capacitors

c. **Ways of Working :**

- i. Interns would be taken every year at Undergraduate and Postgraduate levels from all streams including ME, EEE, E&C, CS and E&I
- ii. The Interns would work between Jan~May and would use the infrastructure and software and hardware of both GCL and RVCE
- iii. There would be a GCL guide and also RVCE guide for the projects
- iv. The Projects would be selected based on the Industrial Viability for the project.
- v. The Project would be concluded based on satisfactory achievement of the results or milestones and would be carried forward in case needed.
- vi. On Specific Research / Product / Sub Systems Projects: While most of the resources would be used from GCL or RVCE; any specific investments would be mutually agreed and signed Off and milestones would be defined for achievement.
- vii. The Incubation Centres space would be provided by RVCE for the COEEM –Centre of Excellence for Electric Mobility.
- viii. RCVE and the Interns should not work on any other similar projects during and post this engagement with GCL as per the terms of this MOU.
- ix. RCVE and the Interns shall not use the IPR and Confidential Information for any other projects or engagements.

#### 4. **Terms of MOU:**

This MOU shall be effective from \_\_\_\_\_ and shall be reviewed every year.  
This MOU may be renewed by the parties on mutually agreed terms and conditions.

#### 5. **Confidentiality:**

- i) During the term of the MOU or during the research project, GCL may be required to disclose to or give access to RVCE, to its Confidential Information for the purpose of the research project.



*[Handwritten signature]*



- ii) RVCE and the Interns agrees and undertakes to keep confidential the Confidential Information during the term of the MOU and thereafter the expiry of the MOU.
- iii) RVCE and the Interns shall not disclose the Confidential Information to any third party without the prior written consent of GCL and/or its Affiliates to whom such Confidential Information belongs to.
- iv) RVCE and the Interns shall be responsible for and shall take all reasonable measures to ensure the security of the Confidential Information for so long as that confidential information is within its control and in doing so shall ensure that it is protected from access, use or misuse, damage or destruction by any person not authorized by the Agreement to have access to it.
- v) RVCE may disclose the Confidential Information to its employees, officers, personnel, research fellows on a need to basis and RVCE shall ensure that all such employees, officers, personnel, research fellows to whom the Confidential Information is disclosed, execute a confidentiality undertaking containing confidentiality obligations corresponding to the confidentiality obligations contained herein in this MOU.
- vi) RVCE and the Interns shall not copy, decompile, reverse engineer the Confidential Information or exploit it for commercial purpose. RVCE shall use the Confidential Information only for the purpose of the research project to be undertaken under this MOU.
- vii) Upon expiry of this MOU or upon request from GCL or upon earlier termination of this MOU, RVCE and the Interns shall return all Confidential Information to GCL and its Affiliates without retaining any copies thereof.
- viii) The confidentiality obligations contained herein shall survive post expiry or termination of this MOU for indefinite period.

#### **6. Indemnification and limitation of liability**

RVCE agrees and undertakes to indemnify GCL and its Affiliates from all claims, suits, losses, damages, expenses, costs, fines, penalties that GCL and its Affiliates may suffer or may be levied on GCL and its Affiliates as a result of infringement of Intellectual Property of any third party as a result of the research project, breach of confidentiality and or breach of any of the terms of this MOU.

Notwithstanding anything contrary contained herein or elsewhere, in no event shall GCL and its Affiliates be liable to RVCE and/or any third party for any direct and/or special, incidental, indirect and consequential losses even if GCL and its Affiliates have been advised of the possibility of such losses or even if GCL has repudiated this MOU.

#### **7. IPR**

- 7.1. GCL retains ownership of its Background IP;
- 7.2. The Foreground Intellectual Property will be absolutely owned by GCL and RVCE will provide the required assistance for filing an application with the necessary authorities for registration of the intellectual property.;
- 7.3. **Assignment** - RVCE hereby assigns GCL entire right, title and interest in the Foreground Intellectual Property. RVCE will execute such documents and do such things as are necessary or desirable for the purpose of formalising the assignment of Foreground Intellectual Property with GCL with appropriate patent office or other authority;
- 7.4. **Power of attorney** - RVCE appoints GCL as its true and lawful attorney for the purpose of executing such documents and doing such things as are necessary or



*Handwritten signature*



desirable for the purpose of formalising the assignment of Foreground Intellectual Property in GCL's ownership or recording the GCL's ownership of Foreground Intellectual Property with the appropriate patent office or other authority;  
7.5.No License - No licence of any Intellectual Property of GCL is granted by GCL to RVCE pursuant to this Agreement.

**8. Assignment:**

RVCE shall not during the term of this MOU assign its right, title or interest in this MOU to any other party without the prior written consent of GCL.

9. GCL will provide opportunity to RVCE faculty members to attend workshops, training programs and skill development training that may be conducted at GCL premises. RVCE and GCL will jointly work to impart personality development skills and soft skills to students, which will be beneficial for their professional life.

**10. Termination of MOU:**

Either party shall have the right to terminate this MOU by giving the other Party 60 days prior written notice.

**11. Notices:**

Any notices to be issued under this MOU shall be made to the address mentioned above or at such addresses as informed by the Parties.

**12. Governing Law and Dispute Resolution:**

This MOU shall be governed by the laws of India. Any disputes arising out of or in relation to this MOU shall be referred to arbitration in accordance with the provisions of the Arbitration and Conciliation Act, 1996. The place of arbitration shall be Bangalore and the language of arbitration shall be English. Each Party shall bear its respective arbitration costs.

Subject to the arbitration provisions, the courts of Bangalore shall have the exclusive jurisdiction over all disputes.

**13. Agreement:**

This MOU is the complete understanding between the Parties and supersedes all prior understanding and discussions. No amendment or modification to the terms of this MOU shall be valid unless in writing and signed by the authorized signatories of the Parties.

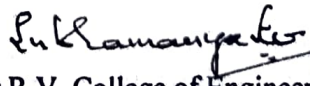
IN WITNESS WHEREOF, the Parties hereto have executed this Agreement by proper persons thereunto duly authorized.

  
For Greaves Cotton Ltd.-Electric Mobility Business  
Name: Mr Nagesh Basavanahalli

Title: M D, Greaves Cotton

Witness 1:

Witness 2:

  
For R.V. College of Engineering  
Name: Dr K. N. Subramanya

Title: Principal  
RV College of Engineering  
Mysuru Road

Witness 1:

Witness 2: 

## Topics: Internship 2020

### Centre of Excellence in e-Mobility Team

Sl. No	Title	Co-ordinator	Objectives and Outcomes
1.	Modelling, simulation and analysis of performance of a super capacitor for e-vehicles	Dr. Sudha kamath (Phy) Dr Ramya P, (Phy) Prof. Suresh C (EEE)	Yes
2	Propose a Scheme and Solution on time to recharge a battery by reducing the charging time.	Raja Vidya, EEE	Yes
3	A simulation model to study the behavior of a metal air battery(Fuel Cell) at different discharging current and temperature.	Raja Vidya, EEE	Yes
4	Design and Develop a BMS system involving active balancing topology and develop an algorithm to implement the same.	Raja Vidya,EEE	Yes
5	Design and Develop Electrical vehicle propulsion model using MATLAB Simulink.	Raja Vidya, EEE	Yes
6	A Smart System to avoid congestion at the Charging Pool	Dr.Mohanaradhya Dept. Of M C A	Yes
7	Design and simulation of isolated power supplies for e-vehicles.	Dinesh M N , EEE	Yes
8	Design and Simulate Motor Equations to predict its Power, Torque etc. which can be further used to predict the power consumption of vehicle and Range	Rachana S Akki / MND	Yes
9	Designing LED/LCD Cluster to Display Speed, Battery SOC bar, Odometer .	Rachana S Akki / MND	Yes
10	Design of Hall effect Sensors in Motors to calculate speed of the vehicle in terms of Rpm and Km/Hr.	Rachana S Akki / MND	Yes

11	Aluminium air battery for electric vehicles	Dr.Vishnumurthy K A	Yes
12	Development of a Fuel Cell Vehicle / Electric Vehicle via renewable energy route	Ujwal Srenag M	Yes
13	Accurate State-of-Charge Indication for Battery-Powered Electric Vehicle.	Kariappa E&C, Suresh C , EEE	Yes
14	Battery Management System for Electric Vehicles	Kariyappa, E&C	Yes
15	Connected Electric Vehicles - Infrastructure Functions through Communication	Vishalakshi Prabhu, CSE	Yes
16	A Business Process Model for the Reverse Logistics of Used Electric Vehicle Batteries	Dr.C K Nagendra Guptha, HoD , IEM	Yes
17	Cost-effective supply chain for electric vehicle battery remanufacturing	Dr. C K Nagendra Guptha, HoD , IEM	Yes
18	Technological benchmarking study of E-Vehicles with focus on Electric Vehicles in the Indian automotive sector.	Dr. N S Narahar Professor, IEM	Yes
19	Standards Practices and Certification guidelines for Electric Vehicles	Dr. M N Vijaya Kumar Associate Professor	Yes
20	Customer journey mapping process of a typical Indian E-vehicle customer	Prof Bhaskar M G Assistant Professor,	Yes







*Go, change the world*

CoE/E-Mobility/Internship/032/20-21

**RV COLLEGE OF ENGINEERING®**  
(Autonomous Institution affiliated to VTU, Belagavi)  
**RV Vidyaniketan Post, Mysuru Road, Bengaluru - 560 059**

**AMPERE**

By **GREAVES**



## *Internship Certificate*

*This is to certify that **Mr./Ms. Nachikethan B.N.**, 1RV19ME071, IV Semester B.E. Mechanical Engineering of RV College of Engineering®, Bengaluru, has satisfactorily completed Internship on '**e-Mobility - Design of Thermal Management System for Batteries in e-Vehicles**', during September-October 2021 (4 weeks).*

**Dr. M.N. Dinesh**  
Coordinator  
CoE-E-Mobility, RVCE

**Dr. K.N. Subramanya**  
Principal  
RV College of Engineering®



*Go, change the world*

CoE/E-Mobility/Internship/026/20-21

**RV COLLEGE OF ENGINEERING®**  
(Autonomous Institution affiliated to VTU, Belagavi)  
**RV Vidyaniketan Post, Mysuru Road, Bengaluru - 560 059**

**AMPERE**

By **GREAVES**



## *Internship Certificate*

*This is to certify that **Mr./Ms. Nitish Jadhav**, 1RV19EE031, IV Semester B.E. Electrical and Electronics Engineering of RV College of Engineering®, Bengaluru, has satisfactorily completed Internship on '**e-Mobility - Simulation of Battery Cooling System and Estimation of SOC**', during September-October 2021 (4 weeks).*

**Dr. M.N. Dinesh**  
Coordinator  
CoE-E-Mobility, RVCE

**Dr. K.N. Subramanya**  
Principal  
RV College of Engineering®



- **Project discussion (22/7/2022)**



**T. Sajitha T (HPS)** <sajitha@hpe.com>

Thu, Jul 14, 2022, 5:56 PM



to PRERANA, Mashood, AKSHAY, SURBHI, Porno, me, PANKAJ ▾

Hi All,

I am trying to schedule your final presentation to **HPE** technical reviewers next week – does it mean only 22<sup>nd</sup> Friday the option?  
Regarding another dry run, you all can meet Mashood & Shome when you come to **HPE** on Thursday.

Some general points for your final presentation:

1. Duration

Total - 30 mins; 20 mins - Demo / Presentation ; 10 mins - Q & A

2. Items to cover

- I) All students /contributors should be part of the Presentation / Demo
- I) Quick Introduction to the project , Problem statement ,Overall architecture and Flow
- Ii) Any specific Tools , technologies , challenges and learning you would like to highlight
- Iii) PoC / Demo
- Iv) References



**Hewlett Packard  
Enterprise**



## **OPENFAM: A LIBRARY FOR PROGRAMMING DISAGGREGATED MEMORY**

*Under the guidance of,*


**Mr. Mashood Abdulla**  
**Fabric Attached Memory Expert,**  
Hewlett Packard Enterprise (HPE)

**Mr. Shome Porno**  
**Fabric Attached Memory Expert,**  
Hewlett Packard Enterprise (HPE)

AKSHAY SHANKAR	1RV19CS012
PANKAJ KANKANI	1RV19EI033
PRERANA M	1RV19ET038
SURBHI CHOUDHARY	1RV19ET056

Start date of project: 4th April 2022  
End date of project: 12th July 2022

- **Expert Session (23/07/2021)**


**Chatterjee, Soumitra (HP-UX Compilers / Java)** <soumitra@hpe.com>  
 to Deepika, Sneha, CHANDRA, me, Sajitha

Thu, Jul 22, 2021, 4:19 PM
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<div>Jul</div> <div>23</div> <div>Fri</div>	<b>Compiler design credit course</b> <a href="#">View on Google Calendar</a> <div> <div>When</div> <div>Fri Jul 23, 2021 9:30am – 12pm (IST)</div> </div> <div> <div>Where</div> <div>Microsoft Teams Meeting</div> </div> <div> <div>Who</div> <div>Deepika Dash, Sneha M, GHAE, CHANDRA, T, Sajitha T (HPS), Chatterjee, Soumitra (HP-UX Compilers / Java)*</div> </div>	<b>Agenda</b> Fri Jul 23, 2021 <i>No earlier events</i> 9:30am Compiler design credit course <i>No later events</i>
---	--	---


(Please forward as appropriate)

Agenda:

- Understanding translators
- Compiler Architecture
- Introduction & overview of popular compilers
  - GNU gcc/g++
  - LLVM
- Compiler Optimizations
  - Intermediate Code
  - Basic Blocks
  - Control Flow Graphs
  - Value Numbering
  - Dead Code Elimination
- Virtual Hands-on Session  
*(Please install clang/clang++ for the session)*

• Project Discussion (7/8/2020)

**HPE** Final project presentation
 📧
Inbox x
🖨
🔗


**T, Sajitha T (HPS)** <sajitha@hpe.com>  
 to Umesh, Manideep, me, akanksham.cs18@rvce.edu.in, mcsohan.cs18@rvce.edu.in, Yarlagaadda, Srividya, Shubham, ramakanthkp@rvce.edu.in

Fri, Aug 7, 2020, 12:35 PM
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<div>Aug</div> <div>7</div> <div>Fri</div>	<b>HPE Final project presentation</b> <a href="#">View on Google Calendar</a> <div> <div>When</div> <div>Fri Aug 7, 2020 2pm – 3pm (IST)</div> </div> <div> <div>Where</div> <div>Skype Meeting</div> </div> <div> <div>Who</div> <div>AKANKSH A MANJUNATH, Shubham Jain, Manideep devireddy, M C SOHAN, Srividya M S, Ramakanth Kumar P....</div> </div>	<b>Agenda</b> Fri Aug 7, 2020 10am <a href="#">Day 3 Morning - Centre of Excellence ...</a> 2pm HPE Final project presentation 2:30pm <a href="#">Day 3 Afternoon - Centre of Excellenc...</a>
--	---	--

Agenda (CTY Project presentation & **HPE**/RVCE Senior folks connect) :-

- Opening – Sajitha
- Students project presentation – Students
- Remarks from **HPE** project mentors – Umesh, Vasu
- Remarks from **HPE** leaders – Suhas, Vijay, Suri, Dharam
- Remarks from RVCE Professors – Prof Srividhya, Prof Anala, Prof Ramakanth

• Industry Visit(24/1/2020)



- Expert Session: Mr.Kiran B A and Mr.Milind of H P



e on 1st Apr 2019



- Panel Members for best project(UG Project)



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## Eligibility

- Graduation Year: 2020
- Degree: B.E / B.Tech / MCA / M.E. / M.Tech – 65% / 6.5 CGPA
- Branch: CS / IT / Robotics / ISE / EE / ECE / EIE / AEIE / EEE / ENTE
- SSLC / Xth, HSC / PUC / XII, Diploma or Equivalent - 60% / 6.0 CGPA
- Designation: Associate Developer
- Compensation (M.E / M.Tech): INR 7.85 Lakh per annum + one time settling allowance of INR 25000
- Compensation (B.E / B.Tech & MCA): INR 7.25 Lakh per annum + one time settling allowance of INR 25000



## Selection Criteria (all rounds are elimination rounds)

1. Cognitive Ability Games (Cognify)
2. Learning Agility Assessments
3. English Language Test
4. Coding Test
5. Interview(s)



---

**Re: IBM Campus Hiring: Batch 2020 - R. V. College of Engineering**

---

**Adyasha Sahu1** <adyasha.sahu@in.ibm.com>

To: placement@rvce.edu.in

Cc: Akanksha Singh &lt;sakanksha@in.ibm.com&gt;, Aman Arora &lt;aman.arora@in.ibm.com&gt;, Upasana Sinha61 &lt;usinha61@in.ibm.com&gt;, Shuvajit Chowdhury1 &lt;shuvajit.c@in.ibm.com&gt;, Sa &lt;saumish5@in.ibm.com&gt;

Dear Sir,

Greetings from IBM!

We would like to thank you for extending your support to identify best talent for IBM from your esteemed Institute.

As discussed, we would like to confirm the proposed date i.e. &lt;31-Aug-19; 9AM &gt; for Test and Interview Process.

Kindly share us the Slot Consent, Candidate Database &amp; infrastructure details in the attached format by 26-Aug-19.

Also attached is the JD.

Looking forward for your support for a successful event.

Thanks and Regards,

**Adyasha Sahu**

TAS-EPH Hiring

Contact Number: 8800356900

E-mail: [adyasha.sahu@in.ibm.com](mailto:adyasha.sahu@in.ibm.com)

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-----Shuvajit Chowdhury1/India/IBM wrote: -----

To: [placement@rvce.edu.in](mailto:placement@rvce.edu.in)

From: IBM University Talent Acquisition/India/IBM

Sent by: Shuvajit Chowdhury1/India/IBM

Date: 08/19/2019 05:59PM

Cc: Akanksha Singh/India/IBM@IBMIN, Aman Arora/India/IBM@IBMIN, Upasana Sinha61/India/IBM@IBMIN, Shuvajit Chowdhury1/India/IBM@IBMIN, Saurabh Mishra50/India/IBM@Sahu1/India/IBM@IBMIN

Subject: IBM Campus Hiring: Batch 2020 - R. V. College of Engineering

Dear Professor,

Greetings from IBM!

We value our ongoing relationship with your institute and are excited to share our plan for 2020 Batch Campus hiring. As always, we look forward to your support to identify the best

Here's attaching the complete details about the Campus 2020 plan. Please note as our on going effort to transformation, we have revamped and made changes to the graduate hiring changes to the profiles along with the compensation and benefits. With these changes we are aiming at the exclusive slots with you.

Kindly go through the below criteria and share us a confirmed date for our proposed Campus event. We will reach out to you shortly to discuss the same.

(See attached file: Slot Consent Form\_IBM.xlsx)(See attached file: Candidate Information Template-2020.xlsx)





**IBM India**  
Campus Season 2020

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IBM is transforming to lead. Join the next generation of innovators, inventors and entrepreneurs. Use breakthrough Cognitive computing to help doctors transform patient care, bankers reduce risk, businesses extract critical insights and clinicians diagnose and treat rare pediatric diseases.

 **Eligibility**

- Graduation Year: 2020
- Degree: B.E / B.Tech / MCA / M.E. / M.Tech – 65% / 6.5 CGPA
- Branch: CS / IT / Robotics / ISE / EE / ECE / EIE / AEIE / EEE / ENTE
- SSLC / Xth, HSC / PUC / XII, Diploma or Equivalent - 60% / 6.0 CGPA
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 **Selection Criteria** (all rounds are elimination rounds)

1. Cognitive Ability Games (Cognify)
2. Learning Agility Assessments
3. English Language Test
4. Coding Test
5. Interview(s)




IBM conducts assessments interactive, and time-efficient. We respect your time in short hence we want to give you a environment to truly demonstrate what you can bring to the job



**Cognitive Ability Games:** It leverages Science underlying the Cognitive machine learning and game design experience in approximately 20 minutes



**Learning Agility Assessment:** You will complete a series of paired personality statements and choose statements most true to you



**Coding Test:** This involves coding, write and compile code against test case choice questions – helping us understand your knowledge or mindset. The new format also provides a coding interview in a virtual face-to-face interaction.



**English Language Test:** Helps us assess your proficiency in understanding English based and you will be presented with multiple choice questions



No arrears at the time of application and joining



Calculation of qualifying marks = Sum total of marks obtained / Sum total of maximum marks obtainable. All subjects will be included including elective/optional subjects)

IBM is committed to crafting a diverse environment and being an equal opportunity employer. You will receive consideration for employment without regard to your race, color, religion, gender identity or expression, sexual orientation, national origin, genetics, disability, age, or veteran status. We are in full compliance with all fair employment practices regarding hiring and immigration status

Thanks and Regards

**Shuvajit Chowdhury**  
TAS - EPH Hiring

Contact Number: 9748374278 | E-mail: [shuvajit.c@in.ibm.com](mailto:shuvajit.c@in.ibm.com)



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#### 4 attachments

 **Slot Consent Form IBM.xlsx**  
11K

 **Candidate Information Template-2020.xlsx**  
10K

Domestic Low Value (NEFT)  
Payment Category: Low Value/ACH  
Status: Confirmed by Bank  
Transaction ID: 193L52245MHY1812

Debit Account Information	
Debit Bank:	BOFAIN4XMAA
Debit Account:	621570088047
Debit Account Name:	3080 - R and D India - BofA - CSR INR
Debit Currency:	INR

Beneficiary Details	
Beneficiary Name:	RASHTREEYA SIKSHANA SAMITHI TRUST
Beneficiary Address:	R.V Vidaniketan Post
Beneficiary City:	Bangalore
Beneficiary Postal Code:	560059
Beneficiary Country:	IN - India
Beneficiary Account:	1073023254
Beneficiary Bank ID:	CBIN0281658 Central Bk of India No.547(New No.50/4 and 5), Acharya Bangalore IN
Beneficiary Email:	 (0)
Beneficiary Mobile Number:	<div></div>
Note: For text messages, standard messages and data rates may apply.	

Payment Details	
Credit Currency:	INR
Credit Amount:	248,400.00
Value Date:	03/21/2019

Optional Information	
Sender's Reference Number:	CSR 3080
Beneficiary Information:	CSR RD



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## Proposal to work on corporate Problem statements - CITRIX

---

Placement RVCE <placement@rvce.edu.in>

Sat, Jul 25, 2020 at 9:23 AM

To: "Karuna Shettnavar (3P)" <karuna.shettnavar@citrix.com>

Dear Sir/Madam,

Greetings from RV College of Engineering,

RVCE is planning to make use of the talent to solve industrial problems and we are approaching your esteemed organization to provide us certain industrial problem statements to our students to solve. Excellent facilities and infrastructure is an added advantage to our proposal for Problem statement. The students' involvement in research under 15 innovative clubs of RVCE has enhanced the research culture of faculty and students. The following centre of excellence has strengthened the research ability of RVCE.

1. Large area flexible and Microelectronics
2. Computational Genomics
3. E- Mobility in association with Greaves Cotton Company.
4. Smart Antenna Systems and Measurements
5. Bosch Rexroth Process Automation Centre.
6. RVCE-Mercedes Benz centre for Automotive Mechatronics.

RVCE has completed 16 projects to the tune of Rs.18 Cr and there are 64 ongoing projects to the tune of 10 Cr under inter disciplinary research and innovation in the last three years. RV College of Engineering has an exclusive Industry Institute Interaction Cell with an agenda of nurturing close association between academics and industries. The cell is providing an opportunity to both faculty members and students get acquainted with the latest industry practices. The institution currently has 85 active MoU's with industries and research establishments.

Further, RVCE curriculum recommends an internship programme for each of the students in their 4<sup>th</sup> semester. The Problem statements would provide them an opportunity to carry the internship and because of Covid 19 situation, it will be a virtual internship. In this regard, we would request you once again to provide the industrial problem statements to our students to solve and come out with the required outcome.

Kindly contact us for any clarification or information if required

PFA the RVCE brochure containing detailed information and achievements

Looking forward to hear from you for the further process

Dr.D.Ranganath

Dean-Placement & Training  
RVCE, Bangalore  
9886130504, 08067178052



RVCE Brochure\_May 2020.pdf

5857K



# Infineon Hackathon Tracks

May, 2022



restricted

# AI/ML On Edge

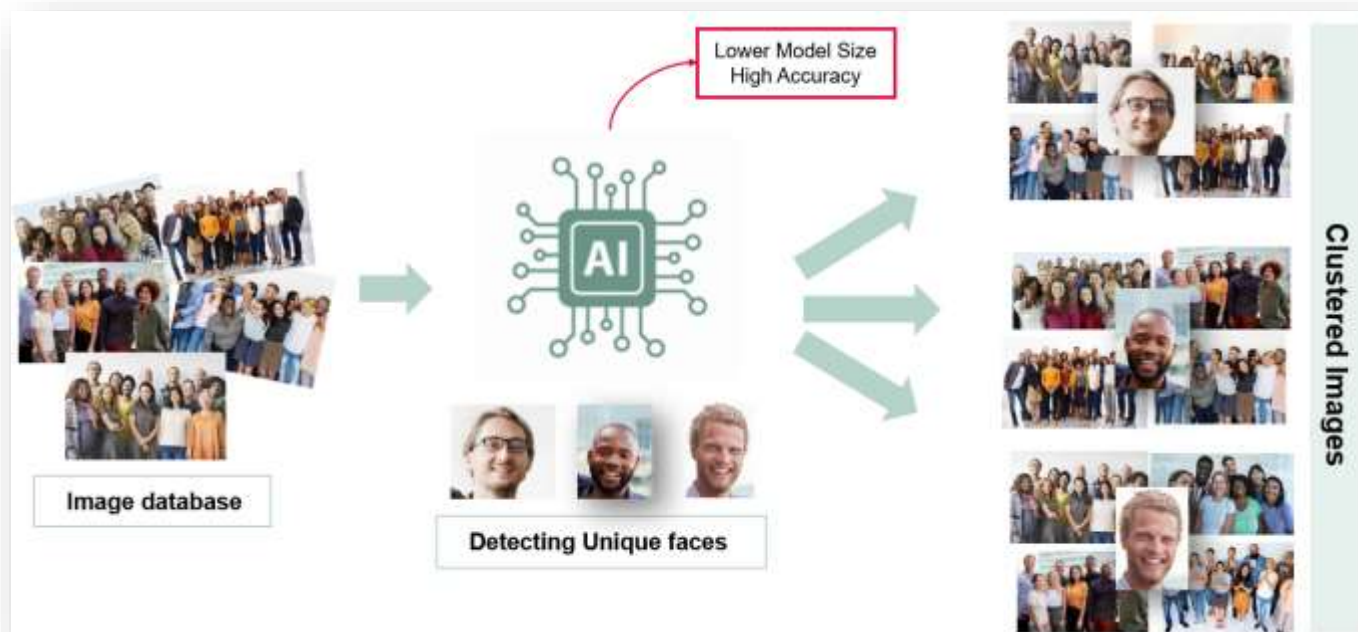
## Voice Control with PSoC 6 MCU

- › **Description of the track** – Learn how to use Neural Networks (NN) on ARM cortex microcontrollers to run offline speech recognition. Learn end to end system development, from audio detection and acquisition, NN model training, deployment of the trained model on to the MCU, integration and testing.
- › **Who can attend?** - Students with Electrical, Electronics or Computer science knowledge can attend the event. Of course, other students with the enthusiasm to learn are welcome. There will be enough help in the event to enable students from scratch on both MCU and ML/NN sides.



# Automatic Image Clustering

- › **Description of the track** – Develop an AI/ML model to group the images into clusters based on **unique faces**, such that all the images on a **particular cluster** should contain that person to which the cluster belongs to. The intention is to create a AI/ML model with **lesser size & higher accuracy**.
- › **Key Learnings** – Students will get to learn & contribute in the area of Image Processing, Computer Vision, Neural Networks (CNNs), Image Pre-Processing, Clustering algorithms etc.
- › **Target Group** – Students with beginner level experience in python, ai/ml domain can participate.



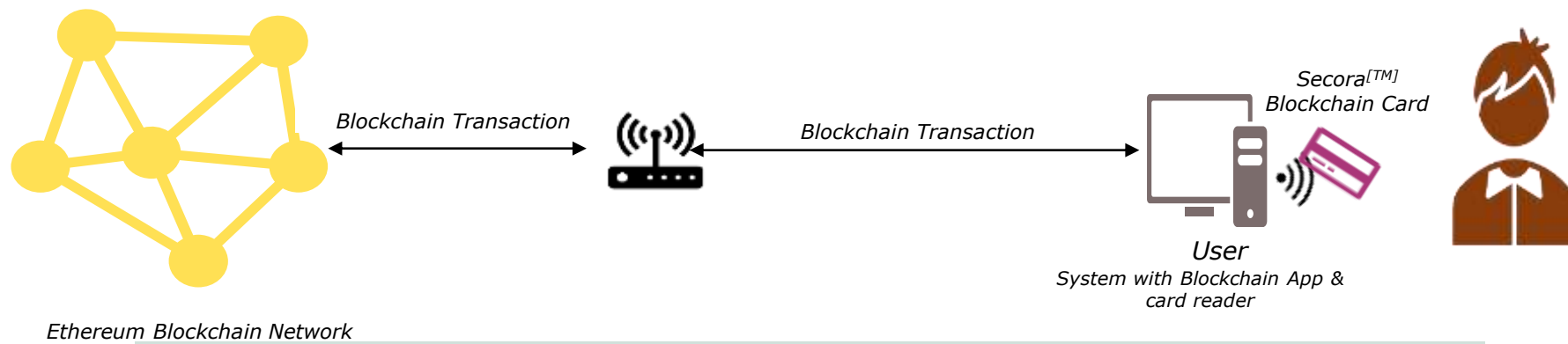


# Electric Vehicle Charge Station using Blockchain with SECORA<sup>TM</sup> Blockchain Card

- › **Description of the track** – Learn how to use SECORA<sup>TM</sup> Blockchain Card in Ethereum Blockchain Network. Learn Blockchain based system development, that is development of Smart Contract, interaction with Smart Contract using GUI, integration of hardware security [SECORA<sup>TM</sup> Blockchain Card] in system, its uses and need.

A Blockchain Based EV Charging Station solution needs to be developed by students during the event.

- › **Who can attend?** - Students with computer programming background can attend the event. Of course, other students with the enthusiasm to learn are welcome. There will be adequate help provided in the event to enable students to understand and work on Ethereum Blockchain.



Blockchain Transaction Signed with SECORA<sup>TM</sup> Blockchain Card of User

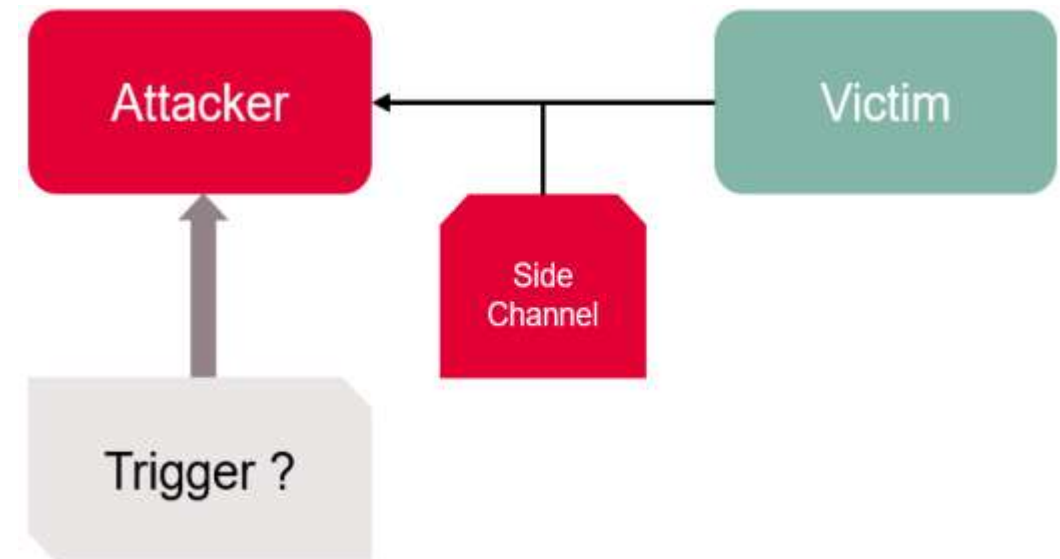
# SCA (Side Channel Analysis) on AES-128 (Advanced Encryption Standard)

## › Description of the track

- Use cryptanalysis technique of Side Channel Analysis (SCA) to crack the Cipher Key used for AES-128 encryption/decryption on an embedded system
- Key learnings on cryptography, cryptanalysis
- Need for security, especially HW based security

## › Who can attend

- Electrical, Electronics or Computer Science students





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Engineering®

Placement RVCE <placement@rvce.edu.in>

## Fwd: Regarding workshop/Hackathon from Infineon Technologies

**ELECTRONICS & COMMUNICATION ENGINEERING, RVCE** <hod.ec@rvce.edu.in> Thu, May 30, 2024 at 4:07 PM  
To: "Ranganath D." <ranganathd@rvce.edu.in>, Placement RVCE <placement@rvce.edu.in>

Sir,  
For your information

----- Forwarded message -----

From: <Nimish.Thakkar@infineon.com>

Date: Tue, May 31, 2022 at 12:57 PM

Subject: Regarding workshop/Hackathon from Infineon Technologies

To: <hod.ec@rvce.edu.in>

Cc: <Bala.Munjuluri@infineon.com>, <Surya.Musunuri@infineon.com>, <Jaya.Bindra@infineon.com>, <govindarajum@rvce.edu.in>

Dear Dr Geetha,

I am glad to e-connect with you. I am Nimish Thakkar from Infineon Technologies Bangalore. This is regarding our intent to organize hackathon for the RVCE students in the month of June-July 2022. The objective of this Hackathon is to engage with student and to provide them a platform to explore and showcase their technical talent.

**With this mail I am attaching covering letter and topics/tracks for Hackathon.** Please go through and let us know how we can take this forward.

Regards,

Nimish Thakkar

**Infineon Technologies**

**Bangalore**

[Nimish.thakkar@infineon.com](mailto:Nimish.thakkar@infineon.com)

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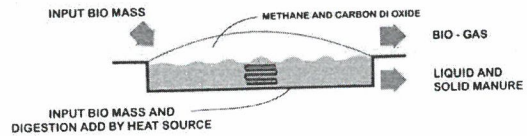
With Regards

**Dr. Ravish Aradhya H V**

**Professor and HOD, E and C Dept.,\***

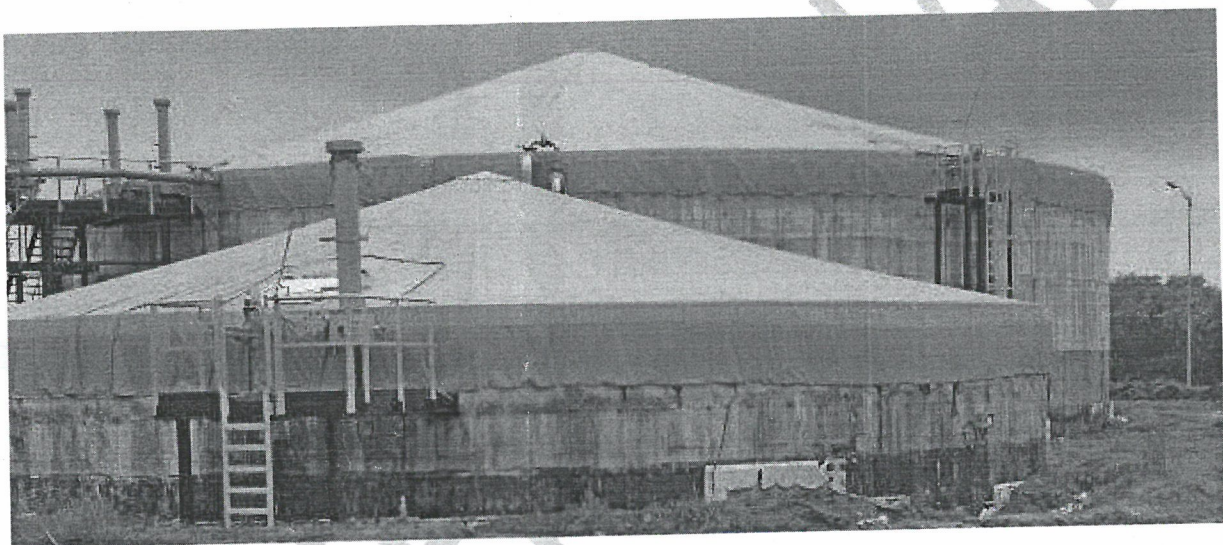
**RV College of Engineering, Bengaluru 560 059. M: 9449542583 \***

**\*"Better to be a person of VALUES than to be a person of SUCCESS"\***



# TECHNO COMMERCIAL PROPOSAL FOR 200KG/DAY FOODWASTE TO BIOGAS PLANT

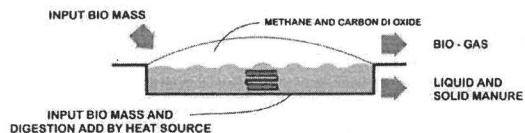
**BIOGAS PRODUCTION: 26-30 CUM/DAY**



PREPARED FOR:  
RV College of Engineering,  
Bangalore

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Published on January 28, 2019

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## 1. ABOUT US

**SLPP RENEW LLP** is engaged in the Development, Ownership, Realization of Biogas plant installations and Production-sales of Bio-CNG, Bio-Power and enriched Bio-fertilizer. The company consists of highly qualified team with well experienced Engineers, Biologists & Agronomists who has more than 15 years of experience in this sector. Our Team is a pioneer in terms of Design, Construction, Operations, Service and Consultation of Bio-Energy plants. We offer unique and economic Biogas to BioCNG Up-gradation with Membrane technology. We have indigenously developed world class technologies for Double Membrane Biogas Holder and Biological H<sub>2</sub>S Scrubber for Biogas. We have established ever growing marketing ecosystem for Bio Fertilizer.

### Company Vision

- ☐ To be the best partner for reliable and efficient bio- energy solutions. We strive to be the most valued partner, be responsible corporate citizens.

### Mission, we strive to

- ☐ Partnership Marketing: Be the preferred strategic partner. Be a creator of solid financial returns. Be a great and challenging place to work.
- ☐ Trustworthy: We are credible and act with integrity in all aspects of our work. We are straightforward, diligent and proactive in our approach to business. We strive to meet our commitments with respect to quality, time and budget.

### Values

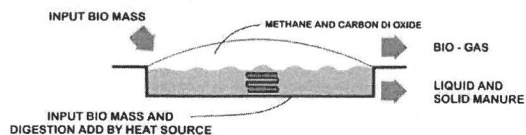
We focus on opportunities and meet challenges with dedication. We value clarity of expectations as a key element in long-term cooperation. Through dedicated project management and teams we achieve results on projects.

## 2. SLPP RENEW PRESENT ACTIVITY IN SOUTH-ASIA

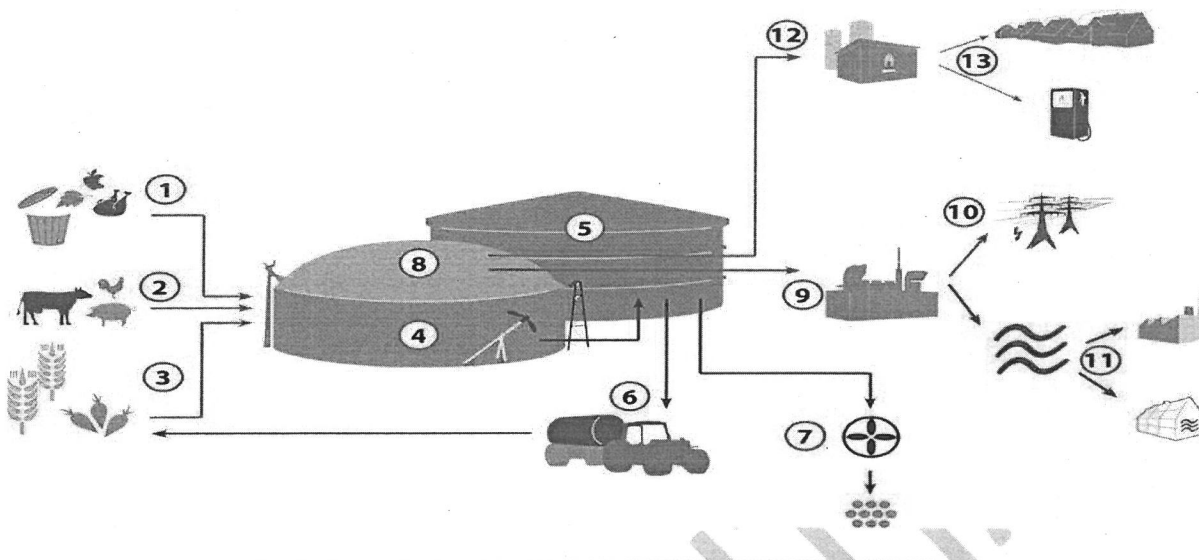
Our ongoing projects -

1. 1.5 TPD membrane base Biogas to Bio-CNG plant, Bhairahawa- Nepal- Commercial production commenced in Dec 2017.
2. 400 kW Biogas power plant, Pokhara ☐ Nepal
3. 2 MW biogas power plant commissioned & plant operation, Punjab
4. 7 TPD membrane base biogas to Bio-CNG plant, Haryana
5. 1.7 TPD membrane base Biogas to Bio CNG plant, Ranipauwa-Nepal

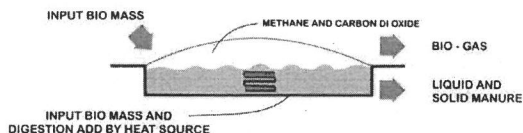




### 3.HOW DOES A BIOGAS PLANT WORK?



1	Organic input materials such as Industrial waste (Press mud), vegetable market waste, and food waste can be fed into the biogas plant as substrate.
2	Cow manure, poultry manure, pig manure and other animal excreta are added to balance the biological activity in the digester.
3	Renewable resources such as corn, beets or grass, agro residues can serve as feed for biogas plant. Both for animals such as cows and pigs as well as for the microorganisms in the biogas plant.
4	In the fermenter, heated to approx. 35-40 °C, the substrate is decomposed by the microorganisms under exclusion of oxygen. The final product of this fermentation process is biogas with methane as the main ingredient. But aggressive hydrogen sulphide is also contained in the biogas. A fermenter made of RCC or other corrosion resistant material is essential as it withstands the attacks of the hydrogen sulphide and is usable for decades.
5	Once the substrate has been fermented, it is transported to the fermentation residues end storage tank and can be retrieved from there for further utilization.
6	The residues can be utilized as high quality manure. The advantage: Biogas manure has a lower viscosity and therefore penetrates into the ground more quickly. Furthermore, the fermentation residue quite often has a higher manure



	value and is less intense to the olfactory senses.
7	But drying it and subsequently using it as dry manure is also an option.
8	The biogas generated is stored in the biogas holder.
9	Then it is treated to remove H <sub>2</sub> S and moisture
10	The pretreated biogas is passed for final use.

#### 4. PLANT SIZING

##### 4.1 Biogas plant sizing

Biomass details	Qty	Biogas production	Biogas Production
(BM)	TPD	L/kg of Food Waste	per day in CUM
Food waste	200	130-150	26-30
Total per day	200		

\* The specific biogas content of each feedstock assumed

\* When the plant is operated at 37 +/- 2 degree C, with above feedstock and upon reaching the steady state, the system would produce the following results:

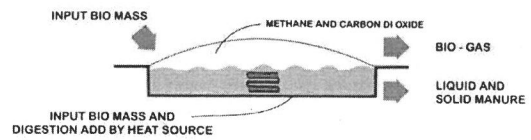
**Biogas Generation @ 55-60% methane : 26-30 m<sup>3</sup>/day**

The digestate will be recycled in required quantity for dilution of feedstock to make the feed slurry of 8-10% solids. However, fresh water will be used to dilute accumulated salts / dead cells. **It is assumed that the kitchen waste is source segregated and does not contain any inhibitory substance for the biological process.** The performance of the plant is subject to meeting the above parameters.

##### 4.2 Feedstock Treatment and Anaerobic Digester (AD)

To get optimum performance out of Anaerobic Digester (AD), it is necessary to maintain organic load to the digester, this is achieved by feeding at uniform rate. To achieve this, we propose:

1. Segregation panel and food waste crusher.
2. Primary Digester cum equalization tank : We propose primary digester for hydrolysis food waste before adding to secondary digester.

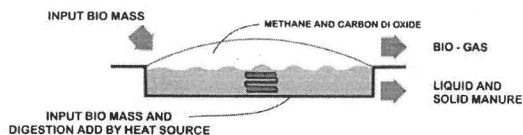


3. Pumping station and mixing tanks equipped with a suitably designed agitator for feedstock along with fresh water and recycled digestate would be batched through the mixing tank before pumping it to Anaerobic Digester. The total solids in feed slurry would be about 12-15 % and this slurry would be fed to Primary digester at a uniform rate for the entire 24 hours in batches.
4. Secondary Digesters: Slurry from primary digester will be fed to the secondary digester throughout the day in batch manner. This will ensure uniform biogas generation over a period of 24 hours.

### Anaerobic Digester Design

- It is a non-medium, CSTR - Continuously Stirred Reactor. It is based on Mesophilic digestion i.e. it operates best in temp around 37° C and with pH maintained constantly at 7-8.
- Digester Gas holder will be Single Membrane stand alone balloon with safety system.
- In digester the raw waste and recycled sludge are introduced from top of digester. This mixed liquor travels downward. Inside digester, agitators/mixers provide adequate mixing of raw waste and recycled sludge.
- The digester content is kept well mixed with set of agitators/mixers. This constant agitation helps to maintain active bacteria in suspension. These bacteria utilize organic matter present in input slurry and produce consistent biogas.
- The recirculation of settled solids helps to maintain adequate population of active bacteria inside digester. The digester is provided with following accessories to ensure efficient performance and safety:
  - Digester will be equipped with double membrane flexible roof (gas holder), slurry mixers/agitators.
  - Slurry overflow point designed to serve as pressure breakers in case of emergency.
  - In biogas line Pressure breaker and Vacuum breaker, in case pressure goes out of operating range.
  - pH & temperature monitoring system. Biogas blower for consistent flow biogas.
- The treated effluent of digester is discharged from the top of digester will be collected in spent slurry tank. The biogas produced by anaerobic digestion inside the digester is collected from digester roof/gas holder.



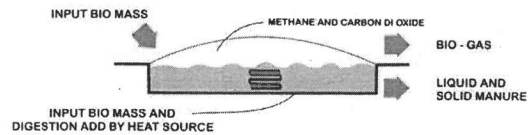


#### 4.4 List of about plant & machinery #085

S.No	Main Details	Capacity	Qty	Unit
A	Tanks			
1	Digester <span style="border: 1px solid black; padding: 0 2px;">#085</span> Sealed containers	11-12KL	1 each	no
2	Primary Digester	1-2KL	1	nos
3	Feed preparation tank	50L	1	no
B	Machinery			
1	Feeding system			
1.1	Feed Pump	1 Cum/hr	1	no
1.2	Crusher for food waste	200kg/hr	1	no
2	Digester area			
2.1	Agitators	3-5 Kw	1	nos
2.2	Inspection Windows		1	nos
2.3	Man Hole		1	nos
C	Biogas Holder			
1	Single membrane Gas Roofs	10-12 cum	1	set
2	Gas treatment	1cum/hour	1	set
3	Gas stoves	80-100LPM	1	Nos
4	Biogas blower / booster	80-100LPM	1	Nos
E	Flaring Unit			
1	Gas Flaring System with accessories	1 m3/hr	1	nos
F	Electrical & automation			
1	Total Plant Automation		1	set
G	Miscellaneous			
1	PVC & SS Piping			
2	Valves	Manual-Auto		
3	Erection			

#### 4.6 Utility Requirements for AD

S. No	Items	Specifications	
1.	Utility Power	Operating Power	Approx. 10-12 kwh/day
		Connected Power	Approx. 6 kW
2.	Water required for substrate preparation	Approx. 100-150 L/day of fresh water after plant stabilization	



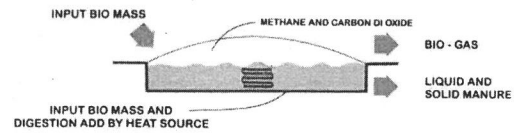
#### 4.7 Division of Scope

Description	SLPP Scope	Scope
Technology, Engineering, Design, Procurement, Construction & Commissioning of biogas plant		
Trial r		
Identification & land acquisition		
Land Topography, soil analysis & water source of site		
Internal roads, Peripheral fencing/compound, landscaping, Power and Water for construction.		
Feedstock survey, availability documentation & feedstock supply contract		
All statutory sanctioning / clearance		
Supply of feedstock, chemicals, micronutrients, etc. during seeding and stabilization.		
Manpower training, Providing operating manual & Process manual		
Maintain total confidentiality of all information drawings and technical know-how.		
Lodging, Boarding , Local Conveyance for SLPP Engineers Near site (if out of Bangalore)		
Power & water supply during construction and commissioning will be arranged by the client		
Security & local conveyance of SLPP project implementing team		
Civil works All civil and land development works		
Detailed engineering and drawing works for civil structures		

#### 5. TECHNOLOGY FOR BIOGAS PRODUCTION

For proposed set of substrates, -

- ☐ Anaerobic down flow Mesophilic fermentation.
- ☐ Feedstock feed- continuous type.
- ☐ Fermentation at constant temperature & pH.
- ☐ Continuous agitation of fermented slurry.
- ☐ Effective scrubbing in order to achieve cleaner and safer biogas.



Summary of Plant - Based on the technical criteria & feedstock availability typically biogas plant will consume around 200kgs of feedstock every day producing 26-30 cum of Biogas production per day with minimum 55-60 % of methane content.

## 6. PRODUCT GAS

- a. Methane CH<sub>4</sub>: 55-60%
- b. Carbon dioxide CO<sub>2</sub>: 40-45%

## 7. SCOPE SUPPLY

- a) Process Technology
  - Sizing of plant
  - Setting the process parameters
  - Semi Automated plant operations
- b) Project Engineering
  - Biogas plant lay out
  - Preparation of engineering drawings
  - Sourcing/short listing/specs of equipment - Imported/Indigenous
  - Preparation of tender documents for civil, mechanical and electrical works
  - Over all supervision of construction and erection.
  - Stabilization of Biogas plant including start-up and commissioning.
- c) Project Management
  - Project Handing over Documentation
  - Operation and maintenance manual
  - In Plant personnel training.

## 8. WARRANTIES

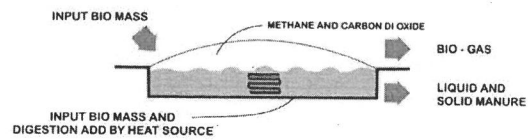
All major machinery/equipment suppliers will be providing warranty up to one year. Any equipment vendor that does not provide warranty then SLPP RE-NEW will provide the warranty for the same for one year from the date of commissioning.

## 9. COMMERCIALS

S.NO	DESCRIPTION	TOTAL – INR*
1	Biogas plant inclusive of Feeding system, primary, mixing and digester tank and gas storage	14,95,000/-

- Taxes and duty extra as applicable – As on date it is 5% GST.
- Ex works JP Nagar Workshop, Bengaluru





E0  
87

1. 50% advance along with PO
2. 40% Before dispatch
3. 10% After commissioning.

### Pay back calculations:

[illegible]

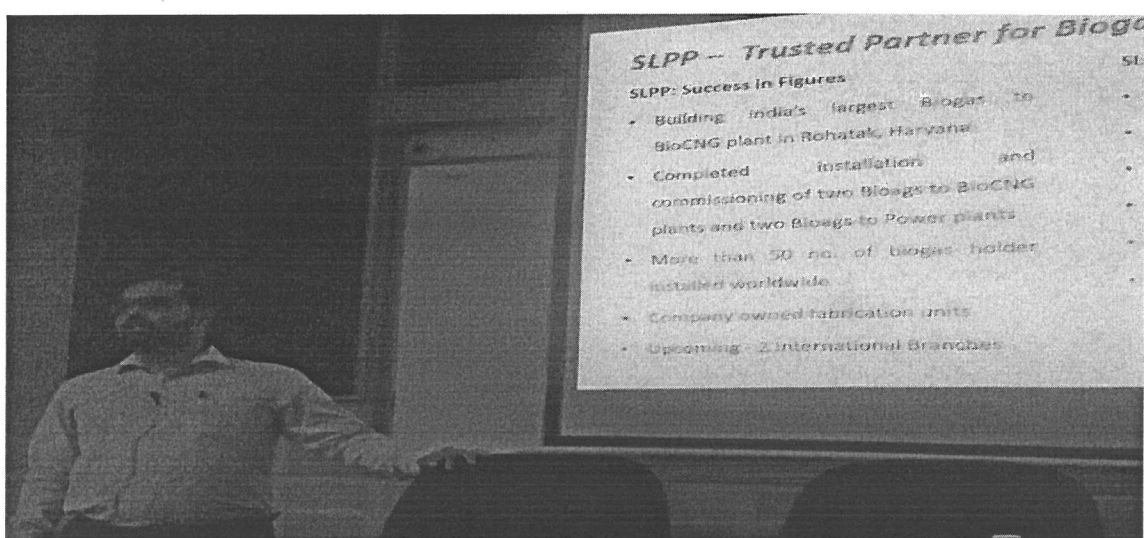
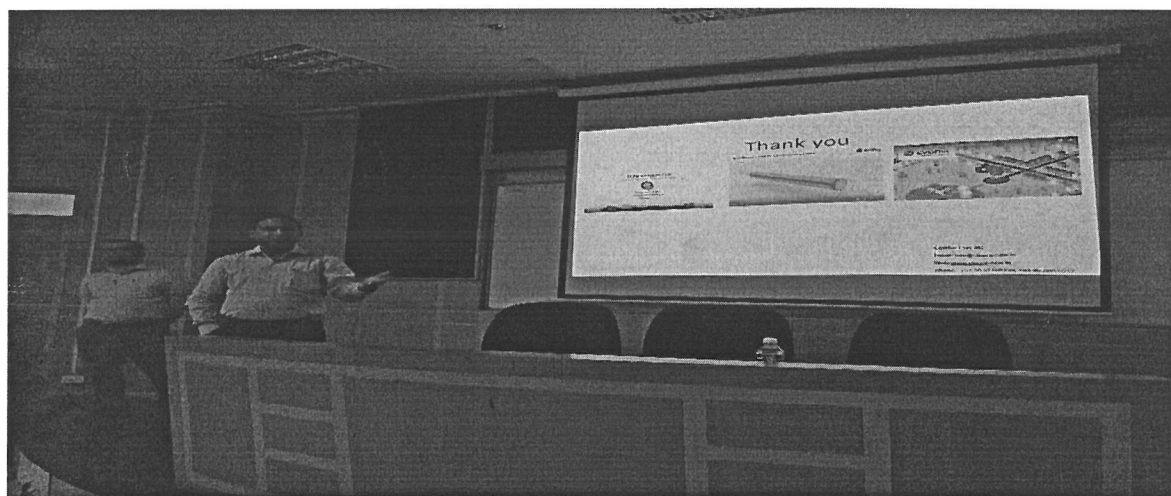
Note:-

- EO 06** Price Exclusions:-The above budgetary price excludes any services noted in the as
- EO 06** Project schedule:-The plant shall be ready for the commissioning within 8-12 weeks from the date of signing PO and initial payment.
- EO 06** Validity:-This offer is valid for 30 days from the date of submission.

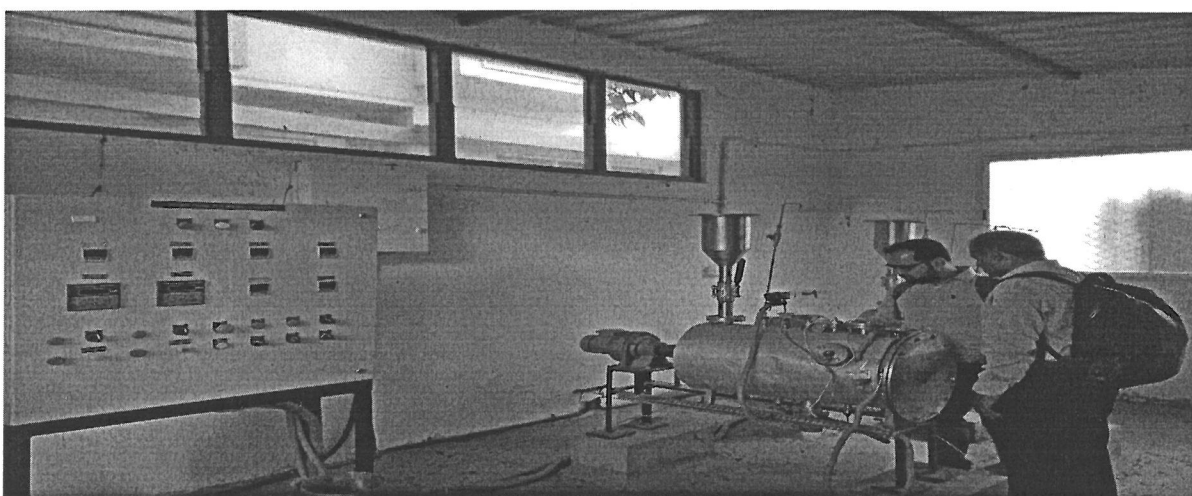
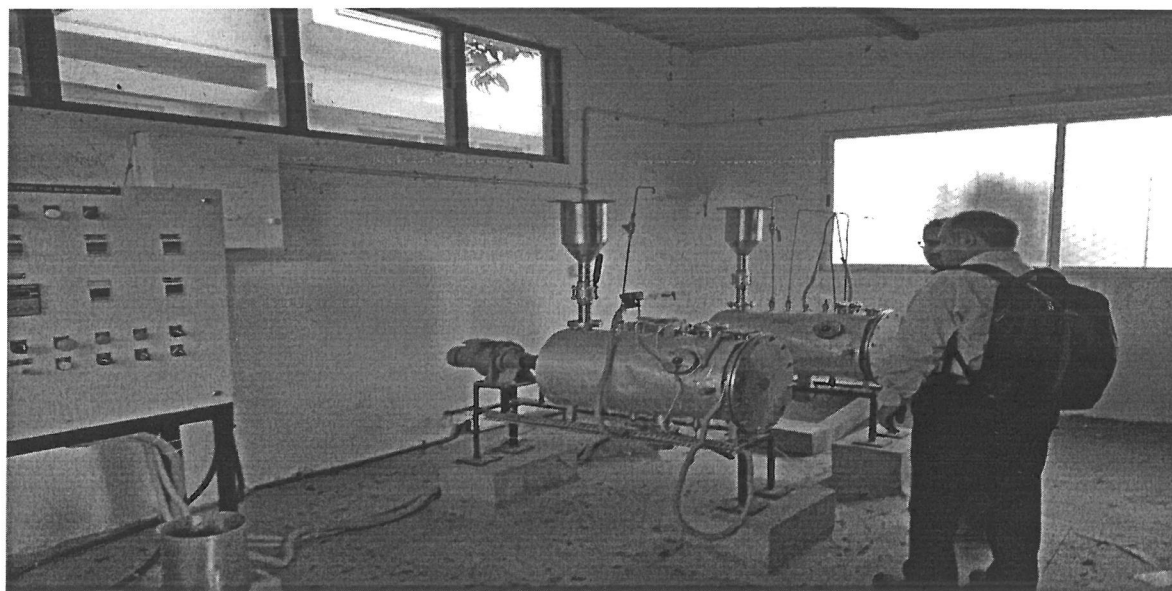
Best Regards

**SLPP RENEW LLP TEAM**

## Invited Talk on "Role of Biogas Industries in Sustainable Energy Production"



Speech by Mr. Praveen Badger and Sankalp, Team member from SLPP-RE-NEW



Visit to Biogas Plant at RVCE Campus by SLPP-RE-NEW Team Members

Invited Talk on “Role of Biogas Industries in Sustainable Energy Production” by Mr. Praveen Badger and Sankalp team members from at BT Seminar hall, SLPP-RE-NEW On 23<sup>rd</sup> Jan- 2019



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Academic Year 2022-23



Overview on

Industry Based Special Skill Tr

(Sponsored by IOAC and ASME)



DEPARTMENT OF  
MECHANICAL ENGINEERING



# Executive Summary

Nine out of ten jobs in developing countries are provided by private-sector companies. Yet globally, 38% of private-sector employers report difficulties in filling vacant positions owing to the unavailability of adequately trained staff. The result is a serious mismatch: on the one hand, all those job vacancies; on the other, vast numbers of jobseekers who do not have the skill set employers are looking for. These so-called skills gaps – the difference between the skills needed for a job and those possessed by a worker – represent a major constraint on development.

It is the aim of the initiative "Let's Work" to provide effective solutions to the global job crisis, by harnessing the potential of private sector to create more and better jobs in emerging and developing countries. In that spirit, this training, which involves special skills from the private sector, has the following objectives:

- to present good practises, and examples of their application, by and for industry-sector companies on three different levels: the current and prospective workforce, along the value chain, and in the local community.
- to present and showcase hands-on methods for assessing the costs and benefits of initiatives to bridge skill gaps;
- to provide concrete recommendations for identifying and addressing skills gaps step-by-step, by means of a practitioners' guide based on good practises that are applicable in various sectors and regions.

All courses are industry accredited and taught by fully qualified consultants or faculty with practical and on-site experience. The department arranged their training programs in different areas such as Automation and Robotics (Fanuc), Hydraulics and Pneumatics (Rexroth) , Automotive Mechatronics (Toyota), EV Technology (MG), 3D Experience (Dassault) and Lazer & 3D printing (ORLaser). The training programmes were conducted from May 29 to June 9, 2023 in respective labs. Well trained faculty and technical staff during training program.

The progress of participants is evaluated during the course through their participation in workshops, practical exercises, and discussion sessions where each module is discussed before proceeding to the next stage of the course. Depending on the length of the course and the specific objectives, a more exhaustive evaluation process is initiated. The best performer was selected in each training module to promote the interest of the students. At the conclusion of the training, the participants expressed their thanks and appreciation to the department leadership, faculty, and supporting staff for supporting the workshop and their concern with holding such a training session.

**Department Staff have a Strong Sense of Commitment and Ownership**

## HYDRAULICS AND PNEUMATICS SKILL TRAINING PROGRAM

Department of Mechanical Engineering at RVCE hosted an alternative skill training program in COE and COC for second-year students. As part of this initiative, the RVCE-BOSH Centre of Excellence in Automation Technologies organized a training program for two batches (34 Students) on Hydraulics and Pneumatics. The training program was conducted by Dr. S. K. Harisha, Dr. Keshav M, and Mrs. Hemalatha H. N., who are faculty members of the department. The training covered various topics, including the basic components of the system, the design and analysis of hydraulic circuits, and simulating circuits for different applications. Throughout the program, the students were actively involved and gained hands-on experience in building eight hydraulic circuits and six pneumatic circuits. To assess their understanding, a circuit simulation test and quiz were conducted at the end of the training program, and the students performed admirably well.

### Glimpse of the Training Program:



## Skill lab -3D Experience

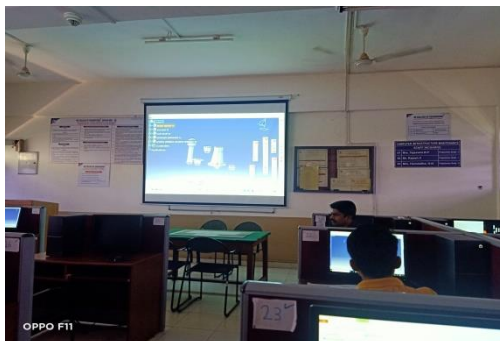
Skill lab training 3D modeling in CATIA delivers the unique ability not only to model any product, but to do so in the context of its real-life behavior. CATIA, powered by Dassault Systems 3 DEXPERIENCE platform, delivers a design environment built on a powerful 3D dashboard that drive business intelligence, real-time concurrent design and collaboration across all stakeholders including mobile workers.

An Instinctive 3D EXPERIENCE provides the students with world-class 3D modeling and simulation capabilities that optimize the effectiveness. An Inclusive product development platform that is easily integrated with existing processes & tools. This enables multiple disciplines to leverage powerful and integrated specialist applications across all phases of the product development process.

The course has been designed in stages where it will help one understand and start with the design in CATIA. It is designed such that it will enhance one's hands-on experience over the Design Software and improve CAD knowledge. The course is created in such a way that it will help gain knowledge on how to approach the design, how to understand the 2D drawings and developing a 3D model

1. Sketching
2. Part Design
3. Advanced part design and Drafting
4. Assembly Design
5. Surface design

### Glimpse of the Training Program:



## **RV-Toyota Centre of Excellence in Automotive Engineering**

RVCE in association with Toyota has been constantly involved in training students in the domain of Automotive Engineering since its inception in 2018. The objective of the training was to encourage experiential learning coupled with critical thinking and problem solving abilities. The present batch of students were trained on the modern systems of a passenger vehicle. The entire training was classified into the following modules: (i) Engine Module (ii) Power transmission and (iii) body electricals.

**Engine module:** This module involved identification of tools and dis-assembly of a Toyota engine followed by performing studies on various sub-systems that encompasses and supports the functionality of an internal combustion engine. (i) Intake system (ii) Turbocharger (iii) Cam shaft operation (iv) Fuel injection (v) Ignition (vi) Catalytic converter (vii) Drive train (viii) Lubrication & coolant system

**Power Transmission module:** This module involved identification of tools and dis-assembly of a Toyota 5 speed transmission followed by performing studies on various sub-systems that encompasses and supports the functionality of a transmission unit. The concept of (i) clutch assembly for engaging/dis-engaging with fly wheel (ii) Driver & driven gear (iii) Concept of gear ratios for high torque/low speed & low torque/high speed (iv) Torque vs speed characteristics (v) Sleeve, synchromesh, synchroniser, countershaft for smooth gear transition

**Body Electricals:** This module involved the skill sets for various electrical components of a passenger vehicle. (i) Assessment of battery condition (ii) fuse box configuration (iii) Assessment of faulty fuse condition (iv) Inspection of a relay switch (v) Cable harness continuity (vi) Fault diagnosis - Horn, Head light, wiper system etc.

### **Training Objectives**

- Modern vehicle engine technology along with its sub-systems
- Transmission system and types
- Material requirements and its properties for various components of an automobile
- Manufacturing methods and fabrication techniques used in making of a automobile components
- Mechatronics systems used in an automobile and principle of varieties of sensors and their importance.
- Fault detection and diagnosis

### **Training Outcomes**

- Usage of industry based standard tools
- Understand & demonstrate functionality of sub-systems & components of an engine and transmission unit
- Justify material properties, design, manufacturing techniques of automotive components
- Application of mechatronics system – sensors, actuators, control unit and wiring harness
- Demonstrate skills to assess battery, fuse & relay condition
- Problem solving skills in the diagnosis of faults on a real time passenger vehicle









Rashtriya Sikshane Samithi Trust  
**RV College of Engineering**

Autonomous  
Institution Affiliated  
to Visvesvaraya  
Technological  
University, Belagavi

Approved by AICTE,  
New Delhi

**Purchase Order**

Vendor Details				Purchase Order			
Vendor Name & Address: <b>Modtech</b> No. 95 KIADB Plot, Behind Omex Auto Jigani Post Bommasandra jigani link road Bengaluru-560105 Karnataka		Vendor Code : 15000807 Vendor GST Number : 29AALFM0521D2ZK Vendor PAN : AALFM0521D Kind Attention		PO No. / Version : 3200003420 / 0 Purchase Order Date : 23.03.2023 GST Number : 29AATR0758A1ZP PAN : AATR0758A Order Currency : INR Delivery Place Details : R V College of Engineering, R V Vidyanikethan Post, Bengaluru-560059			

Dear Sir / Madam,  
With reference to your quotation, you are requested to supply the below mentioned items

Sl No.	Material Code Description/Specification	HSN Code	Delivery Date	Quantity	UOM	Price	Warranty (in months)	Price		GST				Total
								Rate/Unit	Amount	SGST		CGST		
										Rate (%)	Amount	Rate (%)	Amount	
1	60005278 Fuel Injection System Instruction board for electronic fuel injection system of diesel engine (CRDI)		29.04.2023	1.00	No		000	349,272.25	349,272.25	9.00	31,434.50	9.00	31,434.50	412,141.25
2	60005279 Mock Layout of Car Wiring Cut section model of mock layout of a car wiring (Vehicle body electrical system) working (comprehensive type)		29.04.2023	1.00	No		000	84,236.50	84,236.50	9.00	7,581.29	9.00	7,581.29	99,399.08
3	60005280 Reverse Camera and Parking Assist System Instruction board for reverse camera and parking assist system		29.04.2023	1.00	No		000	31,066.90	31,066.90	9.00	2,796.02	9.00	2,796.02	36,658.94



Sl No.	Material Code Description/Specification	HSN Code	Delivery Date	Quantity	UOM	Warranty (in months)	Price		GST			Total	
							Rate/Unit	Amount	SGST		CGST		
									Rate (%)	Amount	Rate (%)		Amount
4	60000702 MUSIC SYSTEM Instruction board for infotainment and music system		29-04-2023	1.00	EA	000	92,816.90	92,816.90	9.00	8,353.52	8,353.52	109,523.94	
5	60003824 Attenuator 6db Panel board containing important sensors with their functions and specifications		29-04-2023	1.00	EA	000	100,225.00	100,225.00	9.00	9,020.25	9,020.25	118,265.50	
							Order Value (INR)						775,988.71
							Round off						0.00
							Total Value						775,988.71

Amount in Words: Rupees Seven Lakh Seventy Five Thousand Nine Hundred Eighty Nine

Terms & Conditions :

1. Total value of purchase order is inclusive of all taxes.
2. Warranty As mentioned above in purchase order for each item.
3. Delivery Date As mentioned above in purchase order for each item.
4. Delivery Place As per details mentioned in purchase order.
5. TDS will be deducted as per the standard.
6. Invoice should be submitted in triplicate.
7. In case of any delays in supplies or replacements, the undersigned reserves the right to cancel the purchase order.
8. Any deviation or departure from norms has to be brought to the notice of the undersigned.
9. 1 year warranty from the date of supply and installation.

For ( R V College of Engineering )

  
Authorized Signatory  
PRINCIPAL

RV COLLEGE OF ENGINEERING  
BENGALURU - 560 059



## **RV-Toyota Centre of Excellence in Automobile Engineering**

Since 2018, R.V. College of Engineering has established a dynamic partnership with Toyota, creating the RV-Toyota Center of Excellence to foster excellence in Automotive Engineering education. Through comprehensive training and internships, the RV-Toyota CoE emphasizes hands-on learning, critical thinking, and problem-solving. Tailored to contemporary passenger vehicle systems, students gain practical exposure to cutting-edge automotive technologies, ensuring a deep understanding of system intricacies. This strategic alliance reflects a joint commitment to prepare students for evolving automotive industry challenges, providing a holistic blend of theoretical knowledge and essential practical skills for success in the field.

### **Objectives:**

- Explore modern vehicle engine tech, gaining deep understanding of latest advancements.
- Study transmission systems for in-depth understanding of power transfer in automobiles.
- Analyze material requirements, ensuring comprehensive knowledge of automotive manufacturing components.
- Foster understanding of manufacturing methods in automobile production for hands-on appreciation.
- Explore automotive mechatronics, emphasizing sensor principles and their role in functionality.
- Cultivate skills in effective fault detection, diagnosis, and issue resolution in automotive systems.

### **Outcomes:**

1. Apply practical applications using tools widely adopted in the industry.
2. Demonstrate understanding of engine and transmission component functions.
3. Rationalize material properties, design, and manufacturing techniques in automotive part production.
4. Utilize mechatronics systems, encompassing sensors, actuators, control units, and wiring harnesses.
5. Assess the condition of batteries, fuses, and relays.
6. Hone problem-solving skills for real-time diagnosis of faults in passenger vehicles.

### **Facilities:**

<b>No</b>	<b>Description</b>
1	Innova cut section: Diesel engine, transmission system on 360° rotation stand.
2	Innova Crysta Diesel Engine Cut Section Model: Chassis and Subsystems.
3	Interactive CRDI Diesel Engine Fuel Injection System Instructional Board.
4	Car Wiring Cut Section Model: Practical Insight into Vehicle Electrical System.
5	Instructional Boards: Understanding Essential Systems in Vehicles for Enhanced Comprehension.
6	Sensor Feature Boards: In-Depth Insights into Functions and Specifications for Learning.

Dr. Anjaneya G

Dr. Sridhar R

Mr. Girish Kumar J  
S



Mr. Kiran



Mr. Somshekar





Rashtriya Sikshana Samithi Trust

**RV College of Engineering®**Autonomous  
Institution Affiliated  
to Visvesvaraya  
Technological  
University, BelagaviApproved by AICTE,  
New Delhi, Accredited  
By NAAC, Bengaluru  
And NBA, New Delhi

Original

**TAX INVOICE**GSTIN : 29AAATR0758A1ZP  
PAN : AAATR0758AInvoice No. : 10201802000608  
Date : 14.03.2022**Billing Details (Bill To) :****Shipping Details (Ship To) :**Name : GR AGRITEK LABS PRIVATE LIMITED  
Address : „Bannerghatta Main Road,,,,Clayworks Create, F30, No 11th KM, Arekere,  
Bangalore-560076  
GSTIN : 29AAHCG8702B1ZQ  
PAN : AAHCG8702B  
State Code : 29-KarnatakaName : GR AGRITEK LABS PRIVATE LIMITED  
Address : „Bannerghatta Main Road,,,,Clayworks Create, F30, No 11th KM, Arekere,  
Bangalore-560076  
GSTIN : 29AAHCG8702B1ZQ  
PAN : AAHCG8702B  
State Code : 29-Karnataka

Sl.No	Description	HSN/SAC	Quantity	UOM	Rate / Item (Rs.)	Taxable Value (Rs.)	GST						Total Amount (Rs.)
							SGST		CGST		IGST		
							Rate of Tax	Amount	Rate of Tax	Amount	Rate of Tax	Amount	
1	Institution Consultancy Projects Design and development of an insturmentation Amplifier to measure the low resistance_Final Instalment	998393	0.000		0.00	56,250.00	9.000	5,062.50	9.000	5,062.50	0.000	0.00	66,375.00
Beneficiary details for NEFT/RTGS						TCS Rate of Tax						0.00	
Bank A/C Details	R V College of Engineering 136010112055 Kotak Mahindra Bank					Discount						0.00	
						Round of Amount						0.00	
						Grand Total						66,375.00	

Mysore Road, RV Vidyaniketan  
Post, Bengaluru - 560059,  
Karnataka, India

080 - 67178020/ 8161

principal@rvce.edu.in  
rvce.edu.in*Go, change the world*





Rashtriya Siksha Samithi Trust

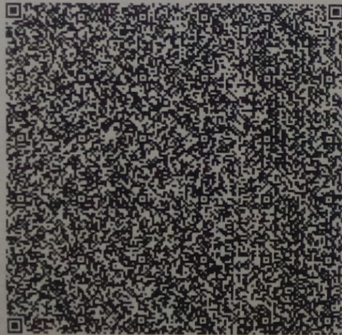
**RV College of Engineering**

Autonomous  
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Technological  
University, Belagavi

Approved by AICTE,  
New Delhi, Accredited  
By NAAC, Bengaluru  
And NBA, New Delhi

Original

Branch Address & IFSC	R.V.College of Engineering Campus Mysore Road,,Bengaluru,10 KKBK0008053	Amount in Words : Rupees Sixty Six Thousand Three Hundred Seventy Five Only
<b>TERMS &amp; CONDITIONS :-</b> 1.Payment to be made at the earliest 2 Cheque in favour of Director/Principal/CEO/Head Mistress <b>R V College of Engineering</b>		R V College of Engineering <i>Subramanya</i> <b>PRINCIPAL</b> HOI/Authorized Signature RV College of Engineering Bangalore - 560 059



IRN : 42cb8502581585de4d6084ebfa15606845fb60d75a4f2ed695bb90004043caba

Ack No : 112212693919927

Ack Date : 2022-03-14

e-Invoicing detail(s) generated from the Government's e-Invoicing system.

Mysore Road, RV Vidyaniketan  
Post, Bengaluru - 560059,  
Karnataka, India

080 - 67178020/ 8161

principal@rvce.edu.in  
rvce.edu.in

*Go, change the world*

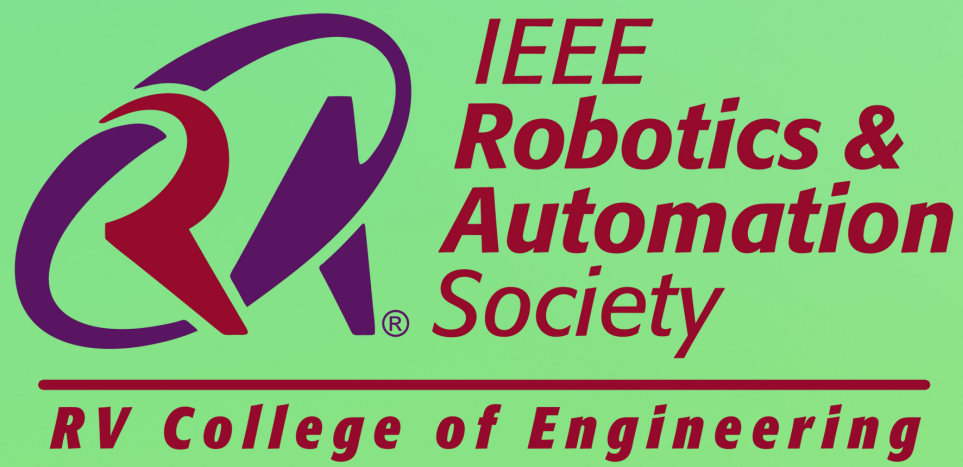




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by NAAC, Bengaluru



IEEE  
BANGALORE SECTION



RV College of Engineering  
IEEE Student Branch

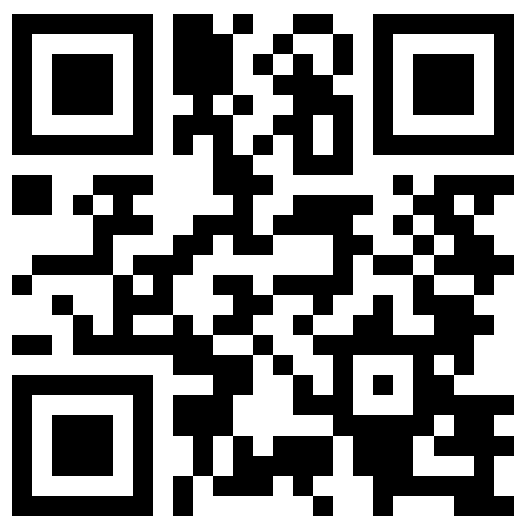
*Go, change the world*

IEEE Robotics and Automation Society, RVCE  
presents to you its virtual:

# INAUGURAL EVENT

An Online Expert Lecture On:

**OPPORTUNITIES IN ROBOTICS,  
BIONICS, ELECTRIC VEHICLE AND  
ALLIED DOMAINS TODAY**



Date: SEPTEMBER 1, 2021

Time: Between 11:30 AM - 1:30 PM

Registration Fee: Free for all Students and Professionals

Registration Link: [bit.ly/ras-inauguration](https://bit.ly/ras-inauguration)

Scan the Code to Register Now!

Event is Virtual (Last Date to register: 31st August, 2021)



**NAGENDRA R SETTY**

Founder, Managing Director, Ideas Unlimited

**DR. K N SUBRAMANYA**

Principal, RVCE

**DR. GEETHA.K.S**

Faculty in Charge, RAS.

**DR. ABHAY DESHPANDE**

Convener

**NAMAN MENEZES**

Student Chair, RAS

Contact: Rahul 95919 55645 | Ambu 94493 89298





# Industry-Academia Collaboration

## Advance Diploma in Automotive Mechatronics (ADAM)

Mercedes-Benz India



# Learning in Car-Bay



# Female Students @ADAM Program





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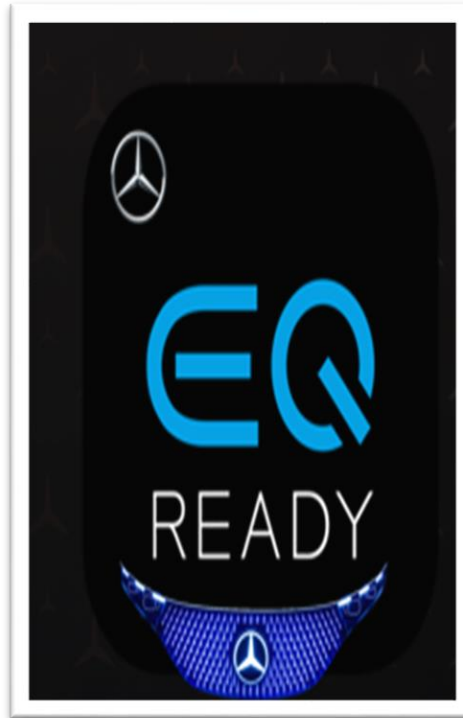
RV Educational Institutions®  
RV College of Engineer®

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University, Belagavi

Approved by AICTE  
New Delhi



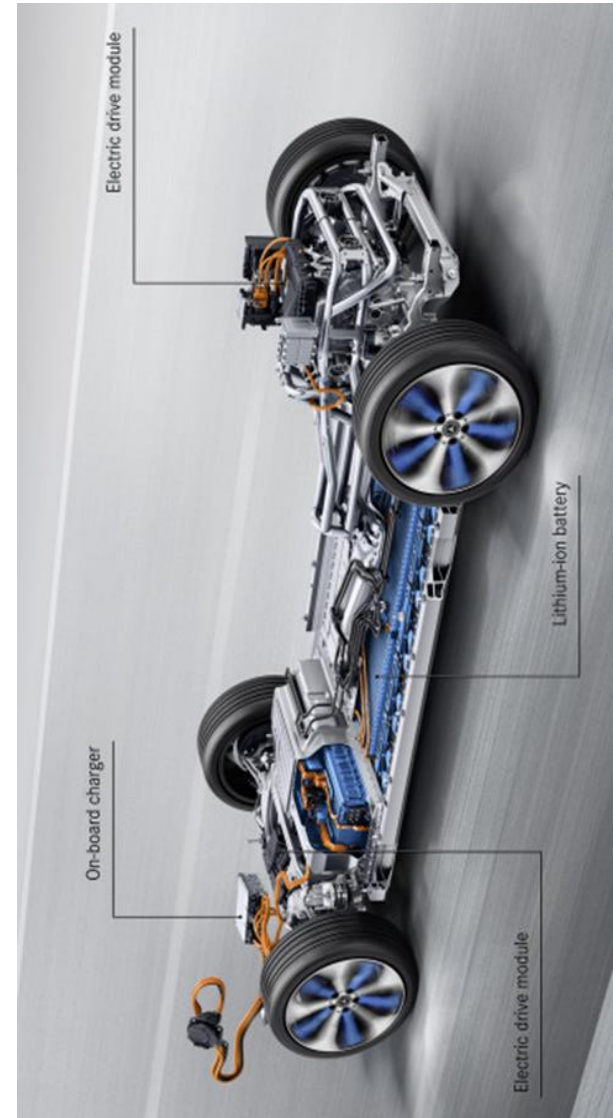
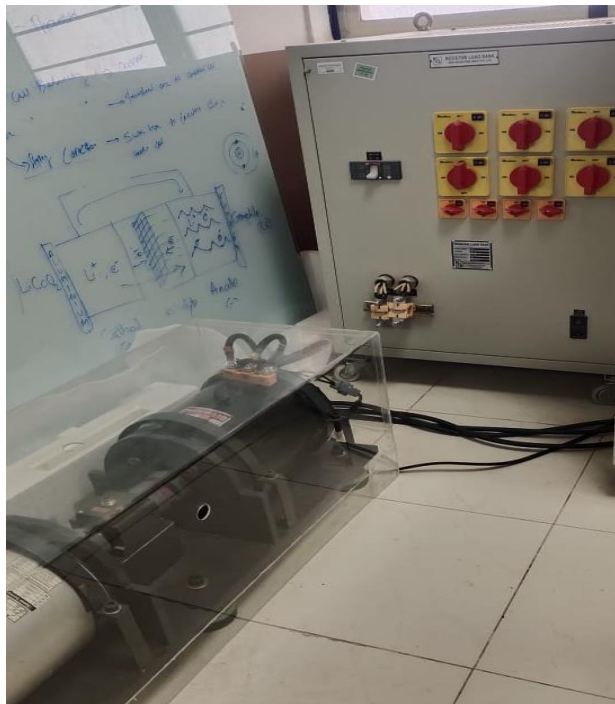
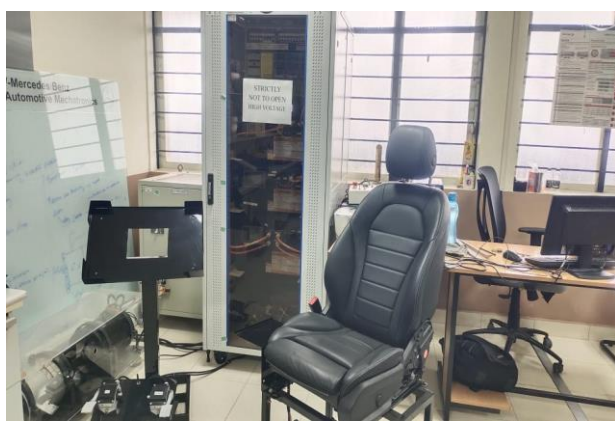
# Modelling & Simulation of Electric Vehicle Technology



Systems module, E Learnings, Awareness to High Voltage Systems, Safety - Do's and Don'ts, High Voltage measurements, practicals on HV car, simulation and modelling on HV test bench.



# Electric Vehicle Technology Lab





# Glimpses - EV Training @ MBR&D, Bangalore



# Placement Statistics

2018-2019 batch	
Organisation	No.
MB R&D	05
Volvo	01
Robert Bosch	01
Sponsored	05
Entrepreneurs	02
Dealers	05
MS	02

2019-2020 batch	
Organisation	No.
Robert Bosch	02
Suprajith Engineering	01
Start up-EV	02
Deevia Software	01
MB Dealers	02
Sponsored candidates	04
Wipro-IISc RVCE	01
VOLVO	01
Masters	03

2020-2021 batch	
Organisation	No.
Robert Bosch	01
Masters	03
OIA Electric	05
Engine CAL	01
LYKAN	01
Duroshox	01
Jeep INDIA	01
Amtronics	01
Saint Gobain	01
Dealers	05



# RV-ADAM students @ Hyundai Training & Learning Centre





# MB-Academy trainer at RV-ADAM Centre



THANK

9141272 A4 MB Adam CERTIFICATE 2019.ai

Mercedes-Benz Academy  
Passion | Performance | Excellence



## Certificate of Excellence



We hereby certify that

**Mr. XYZ**

Has successfully completed the one year full time course in  
**"Advanced Diploma in Automotive Mechatronics"**  
Conducted in collaboration with Mercedes-Benz India Pvt. Ltd.  
during the academic year 2018 - 2019.

**Prof. XXXXX**  
Principal RV College of Engineering,  
Bangalore

A handwritten signature in white ink.

**Santosh Iyer**  
Vice President  
Customer Services  
& Corporate Affairs

**Mercedes-Benz**  
The best or nothing.



YOU



# HappyMongo

presents



**The VR-enabled Public Speaking App  
to master**

**\* Public Speaking \* Job Interviews  
\* Company Presentations \* College VIVAS**



# HappyMongo Online Solution Pvt Ltd

We are an Educational Technology company involved in the research, creation and distribution of advanced educational products that cater to individual student needs. Each module is personalised towards a range of unique vital learning outcomes.

Our wide combination of interactive digital workbooks, web and mobile applications utilise technology to teach, train and encourage students to improve various skills and abilities to master their academic, professional and personal lives.

HappyMongo is headquartered in Bangalore with branches in Singapore and Sri Lanka. We have well-connected channel partners globally in the United Arab Emirates, Australia, the United Kingdom and the United States of America. Our strong clientèle base spreads across India and South East Asia.

## BigTalk - The Latest VR-enabled app

The Big-Talk application is a revolutionary tool downloadable on IOS and Android phones.

It's designed to offer various simulated environments via a VR set, for individuals who wish to practice their communication, discussion, question-answering and voice projection skills.

The simulated rooms include a mock board room, job interview scene, college VIVA set-up, group discussion scenario and a spacious auditorium. These rooms are interactive and offer real-time feedback for users to practice their speaking and presentation skills.



### BigTalk Simulations

#### Board Room

A round table with office colleagues that gives the impression of an actual meeting room scenario. It presents users with the opportunity to load PowerPoint Presentations that can be utilised to practice delivery and timing during sessions. The virtual set of colleagues present around the table can be used to practice eye contact, delivery styles, speech clarity and voice modulations.

#### Job Interview

A virtual depiction of real-time interviewers who sit across a table and present questions can be personalised and uploaded. This creates a genuine experience for a user to tackle interview questions with confidence and clarity.

#### College VIVAS

A virtual depiction of real-time interviewers who sit across a table and present college exam questions that can be personalised and uploaded. This creates a genuine experience for a user to practice answering questions accurately with confidence and clarity.

### Group Discussion

A set-up with virtual avatars of various individuals engaged in a group discussion. This specific room enabled users to sharpen their abilities to listen, express their opinions, speak clearly and manage constructive interactions with others.

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### Auditorium

A spacious simulation with more than 50 people that act as a natural audience would. Some leave and return; some check their phones, others listen and ask questions. This set -up helps in communicating with a large group, while maintaining eye contact and focus.

## *Pricing*

---

### Implementing “Big Talk”

To, RV College of Engineering Bangalore		Date: 03/02/2021 GSTN: 29AADCH8257L1ZY	
Sl. No	Particulars	Price per device	Total
1.	BigTalk Device (20 pieces)	2999	59,980
2	BigTalk App for 2 yrs	Free	

GST @ 18% will be applicable

The above price includes access to BigTalk App but  
not a personalised Trainer

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<b>Name of the Firm</b>	: HappyMongo Online Solution Pvt. Ltd.
<b>Address</b>	: Bangalore
<b>Year of Establishment</b>	2016
<b>Registered Under</b>	: The Companies Act 1956
<b>Partners</b>	: Unity