

FACULTY OF ENGINEERING  
DAYALBAGH EDUCATIONAL INSTITUTE (Deemed University)  
(I.1 Institute of TEQIP-III)

MINUTES of THE MEETING  
Of  
BOARD OF GOVERNORS

Venue: Seminar Hall Complex  
D.E.I.

On

Saturday, February 29, 2020

At 11:00 AM



Faculty of Engineering  
Dayalbagh Educational Institute (Deemed University)  
Dayalbagh, Agra – 282005  
Uttar Pradesh, INDIA

**Meeting of Board of Governors – 29.02.2020**

Venue: Seminar Hall Complex, D.E.I. Date: 29.02.2020

Time: 11:00 AM

Following were Present

S. No	Name	Designation	Position in BoG
1.	Sh. Ravi Kumar Sinha (through video conferencing)	Former Joint Managing Director, DCM Shriram Limited	Chairman
2.	Sh. Rajiv Sinha (through video conferencing)	Senior Advisor, DCM Sriram Ltd., New Delhi	Member
3.	Prof. Prem Kumar Kalra	Professor, Indian Institute of Technology, Delhi	Member
4.	Dr. Vijai Kumar	Advisor, Medical Education & Healthcare Practice, Dayalbagh, University Nominee	Member
5.	Prof. Rahul Swarup Sharma	Professor, Faculty of Engineering, D.E.I., Nodal Officer, Procurement, TEQIP-III	Member
6.	Prof. A. K. Saxena	Prof. & Head, Electrical Engg., Faculty of Engineering, D.E.I., Institutional Project Director TEQIP-III	Member Director
7.	Prof. D. Bhagwan Das	Professor, Faculty of Engineering, D.E.I., Coordinator, TEQIP-III.	Member Coordinator
8.	Prof. V. Soamidas	Dean, Faculty of Engineering, D.E.I.	Member Secretary
9	Prof. Bh. Nagabhushana Rao	Mentor, DEI-TEQIP	Special Invitee
10	Sh. Guru Dayal Prasad	Nodal Officer, Finance	Special invitee
11	Dr. G. S. Sailesh Babu	Assoc. Professor, Faculty of Engineering, Start-up Cell Coordinator, TEQIP-III	Special invitee
12	Sh. Kumar Ratnakar	Asst. Professor, Faculty of Engineering, MIS Officer, TEQIP-III	Special invitee
13	Sh. Ishant Singhal	Assistant Prof., Civil Engineering, Coordinator, Twinning	Special invitee
14	Dr. Ashok Yadav	Asst. Professor, Faculty of Engineering, Coordinator, Environment Management Plan	Special invitee

Following members / special invitees had conveyed their inability to attend the meeting due to other commitments and duties and requested for leave of absence

1	Prof. S. P. Gupta	Former Professor Emeritus, Indian Institute of Technology, Roorkee, AICTE Nominee	Member
2	Prof. B. Venkateshwara Rao	Director, Institute of Science & Technology, JNTU, Hyderabad	Member
3	Sh. Ram Chand Gupta	Assoc. Professor, Faculty of Engineering, Nodal Officer, Academic, TEQIP-III	Special invitee
4.	Sh. Anurag Gupta	Asst. Professor, Faculty of Engineering, Coordinator, Equity Action Plan, TEQIP-III	Special invitee
5	Prof. K. Hans Raj	Head, Mechanical Engineering	Special invitee
6	Prof. D. K. Chaturvedi	Head, Footwear Technology	Special invitee

The Chairman of BoG approved the Leave of absence to above members / invitees.




**Faculty of Engineering**  
**Dayalbagh Educational Institute (Deemed University)**

**MEETING OF BOARD OF GOVERNORS**

Venue: Seminar Hall Complex, DEI, on Saturday, 29<sup>th</sup> February 2020, at 11:00 AM

**AGENDA Summary**

Item No.	Description of Item	Responsible member(s) and target date wherever applicable
<b>PART: I Confirmation of Minutes of BoG meeting held on 30.11.2019</b>		
01/ BoG_Feb-20	Presentation of minutes of BoG Meeting held on 30.11.2019 (Annexure 1)	
<p>Minutes of BoG Meeting held on 30.11.2019 were presented by the Secretary and resolved that the minutes are approved.</p> <p>Chairman welcomed Prof. Nagabhushan Rao, Mentor.</p> <p>Agenda papers were circulated very late. TEQIP team was advised to ensure timely circulation in future.</p>		
<b>PART: II TEQIP-III Activities report after BoG meeting on 30.11.2019</b>		
02/ BoG_Feb-20	A. Action Taken Report (Annexure 2A)	
<p>Prof. A.K. Saxena, Project Director, TEQIP-III, presented the action taken report regarding duties and responsibilities of various committees and other procedures. Salient observations and deliberations are as follows</p>		
<p>i) Procurement of equipment for FAB Lab and software to be processed by March 31, 2020. Help to be sought from Director, DEI for creating a faster mechanism to enable expenditure by end of March, 2020.</p>		Prof. Rahul Swarup; 31.3.2020
<p>ii) A request may be sent to NPIU seeking permission to process payment beyond current financial year to make payments for orders placed by end of financial year.</p>		Already implemented by NPIU
<p>iii) A report on Processes, bottlenecks etc. of Startup Cell may be presented by Dr. G.S. Sailesh Babu, Prof. Bhagwan Das and Prof. A.K Saxena in the next BoG meeting</p>		Prof. G.S.S.Babu; 10.5.2020
<p>iv) Justification for proposals must be included in the Finance committee report for placing them in BoG meeting</p>		Prof. V.Soamidas; 10.5.2020
<p>v) TEQIP Coordination Committee must meet ten days in advance to BoG meeting and the agenda items must be circulated to BoG members well in advance before the meeting.</p>		Prof. A.K.Saxena; 11.5.2020
<p>vi) Notes and minutes of R&amp;D committee clearing the proposal must be included before placing a proposal before BoG</p>		Prof. V. Soamidas; 10.5.2020
<p>vii) Steps proposed for enhancing in-house capacity to cater to the needs of GATE Training may be formally proposed by Academic coordinator to Dean, Engineering. The Dean would take necessary actions and put up in appropriate academic bodies</p>		Prof. V. Soamidas, with a plan; 10.5.2020
<p>viii) An induction session by TEQIP office bearers may be conducted to induct new person taking charge as Dean and relevant documents, files, papers to be handed over to him along with taking over the charge</p>		Prof. A. K. Saxena with a list of documents / papers, 10.5.2020






<p>ix) Impact analysis with mentioning gaps, targets and procurement to cover up the gap may be presented by Prof. Rahul Swarup Sharma through circulation by March 15, 2020</p> <p>Further observed that the action taken report submitted lacks in capturing all decisions of previous meeting. In future, Action Taken Reports must include decisions taken followed by actions taken.</p>		<p>Prof. Rahul Swarup; 10.5.2020 Date extended due to lockdown</p> <p>Prof. V. Soamidas Prof. D. Bhagwan Das 10.5.2020</p>
	<p>Presentation of report of TEQIP-III activities: Expenditure, Procurement, Academic, and Twinning (Annexure 2B)</p>	
	<p>Chairman was concerned that all Reviews were missing. The same for Procurement, Academics, and Expenditure may be circulated by 3<sup>rd</sup> March, 2020</p>	<p>Prof. V. Soamidas; combined reports for previous and forthcoming BoGs; 10.5.2020</p>
<p><b>PART-III: Items for Consideration and Approval</b></p>		
<p>03/ BoG_Feb-20</p>	<ul style="list-style-type: none"> <li>• Supporting papers were circulated very late. To ensure timely circulation.</li> <li>• Proposals must be backed by justification.</li> <li>• The proposals must show linkage to relevant project being implemented under TEQIP.</li> </ul> <p>Procurement proposals</p> <ol style="list-style-type: none"> <li>1. Chairman, Advisory Committee on Education has provided a large number of reference books and other material. 10 almirahs are required to store these in the Library. A proposal has been received from Prof. D. Bhagwan Das for purchasing 10 Almirahs at a total cost of Rs. 3 lakhs</li> <li>2. A proposal for procurement of ANSYS (perpetual license) and STAAD PRO (3-year license) software has been received from Prof. V Soamidas. The total cost is Rs. 11 lakhs, inclusive of GST. ANSYS will be useful for students of Civil, Electrical, Mechanical and Footwear branches, while STAAD PRO is necessary for Civil students.</li> <li>3. A proposal has been received from Dr. G.S.S.Babu for purchasing ION-CUDOS software for assistance in outcome based education. The total cost is Rs. 18 lakhs, inclusive of GST, for 1 year + 5 years AMC (total 6 years)</li> <li>4. A proposal has been received for purchasing 100 stools and 4 tables for use in Heat Transfers labs and Hydraulics Lab and drawing halls of the faculty. Total expected cost is around Rs. 1,50,000/-.</li> <li>5. The Ph.D. Synopsis of Mr. Satinder Singh, research scholar under Prof. D G Rao, has been approved in the RDC meeting in February 2020. As per the norms of research assistantship, he is now eligible to receive a support of Rs. 25,000/- per</li> </ol>	<p>Prof. A.K. Saxena and Prof. V. Soami Das, for next BoG's agenda; 10.5.2020</p>

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	<p>monththrough TEQIP, from March 1, 2020, till the project lasts. Financial Clearance for all the above items is already approved by the finance committee from the appropriate head of accounts.</p> <p>6. If finance is available, the proposal received from Dr Gufran Ahmed to purchase a Simulation Software for simulating Power devices, Semiconductor devices, Solar cells, etc. for lab and research purpose costing Rs. 10,00,000 will be considered</p> <p>Resolved that above mentioned items 1, 2, 3, 4 and 5 are approved. Ref. to 6, a proposal presenting justification, alignment of proposal to TEQIP objectives, clearance from R&amp;D committee and financial committee through their minutes may be circulated. Once cleared by these committees the proposal may be put for BoG approval.</p>	<p>Respective proposers; 31.3.2020 Dr. Gufran Ahmad; to put up the proposal accordingly to respective committees by 5.5.2020 and if approved, for BoG approval by 9.5.2020</p>
04/ BoG _Feb-20	<p>Approval for providing seed money of Rs. 2,00,000 each for R&amp;D to faculty members of Faculty of Engineering: Some minor research proposals for funding have been received from staff of the Faculty of Engineering. Research students will also join this activity. These proposals are approved by the Finance Committee.</p> <ol style="list-style-type: none"> <li>1. Dr. V Soamidas, Dr. A Sahai, Dr. A Yadav, Dr. S Saxena – Riverbank Filtration – Annexure 4-1</li> <li>2. Dr. Ashok Yadav – Direct sub-surface water recharge system – Annexure 4-2</li> </ol> <p>Resolved that the proposals 1 and 2 are approved for providing the seed grant of Rs. 2.0 Lakhs each.</p>	
05/ BoG _Feb-20	<p>Twinning Activities: Twinning Proposals received from IST-JNTUH may be considered for matching funding of Rs. 2,00,000.00 from DEI-TEQIP. The proposal is approved by the finance committee.</p> <ol style="list-style-type: none"> <li>1. Ch. Sasikala - Ashok Yadav, Ranjit Kumar / Bioaerosol (revised proposal being resubmitted) (Annexure 5-1)</li> </ol> <p>Resolved that funding of Rs. 2 Lakhs for the above proposal is approved. Proposals in future should have executive summary page capturing, inter-alia, Objective, Benefits / rationale, Cost and time, user or beneficiary of the R&amp;D project. It should also be clearly mentioned if R&amp;D Committee has cleared the proposal. Action-Secretary to ensure.</p>	
<b>PART-IV: ITEMS FOR INFORMATION</b>		
06/ BoG _Feb-20	<ol style="list-style-type: none"> <li>1. The following programs of Faculty of Engineering have been accredited by the National Board of Accreditation for three years (July 2019 to June 2022): <ol style="list-style-type: none"> <li>A. B.Tech. in Electrical Engineering</li> <li>B. B.Tech. in Mechanical Engineering</li> </ol> </li> </ol>	



	<ol style="list-style-type: none"> <li>2. Dayalbagh Educational Institute has been awarded the FIRST RANK in the prestigious UTKRISHT SANSTHAN VISHWAKARMA AWARD-2019 for its significant contributions in the growth and development of adopted village.</li> <li>3. The following workshops were conducted since the last meeting of the BoG: <ol style="list-style-type: none"> <li>A. Workshop on Waste Management, December 20-21, 2019</li> <li>B. IIC Workshop conducted during 3-4 January 2020</li> <li>C. Hindi Kavita Workshop, February 5-10, 2020</li> </ol> </li> <li>4. A 5-day Short Term Course on "Microgrid Opportunity: Renewable Energy Resources and Buildings" is proposed to be conducted during March 23-27, 2020, by Dr. Gufran Ahmed, Dr. Rajeev Chauhan, and Dr. Subho Upadhyay for students, staff, and research scholars (open for all).</li> <li>5. Most of the items proposed to be supported by TEQIP for Agile Manufacturing Lab., were already approved for procurement of Fab. Lab. and are proposed to be procured by March 2020 by Prof. Rahul Swarup Sharma. These items were already approved by Institute G.B. in 2018.</li> <li>6. The NBA accreditation of the Department of Civil Engineering is due and the department is in the process of preparing its Pre-Qualifier. Once it is approved by NBA, then SAR will be filed. A meeting by SPIU is scheduled on March 5, 2020 where the Institute has to give its consent for the same, which is mandatory. The necessary funding (application and processing fees) will be taken from TEQIP.</li> <li>7. The duties of various office bearers and the charge handing over process of the officials are attached in the Annexures.</li> <li>8. Following students are selected to be supported a one-time grant of \$4000 CA and balance from the host Institution of CANADA as per the list given below under MITACS scheme and will spend three months at Canada under their mandatory internship program. <ol style="list-style-type: none"> <li>a. Ms. Kritika Arora (Electrical Engg.) Ontario Tech University</li> <li>b. Ms. Gauri Sharma (Electrical Engg.) McGill University</li> <li>c. Mr. Rishabh Singhal (Electrical Engg.) University of Northern British Columbia - Prince George</li> <li>d. Mr. Gur Ratan Satsangee (Mechanical Engg.) Simon Fraser University - Surrey</li> </ol> </li> </ol> <p>Faculty of Engineering will be applying to AICTE seeking approval for starting B.Tech. Agriculture Program.</p>
07/ BoG_Feb-20	<b>Any other item(s) with the permission of the Chairperson (Annexure 7.1, 7.2)</b>
	<b>Resolved that date of the next BoG meetings will be 16th May and 29th August 2020. Correspondingly, Coordination Committee meetings should be held on or prior to 6th May and 19th August 2020 respectively.</b>

The meeting ended with a vote of thanks to the Chair, Members of the BoG, and special invitees to the Meeting, including Prof. Nagabhushana Rao. Mentor DEI-TEQIP.

  
 Secretary  
 Board of Governors

  
 CHAIRMAN  
 Board of Governors

FACULTY OF ENGINEERING  
DAYALBAGH EDUCATIONAL INSTITUTE (Deemed University)  
(1.1 Institute of TEQIP-III)

MINUTES of THE MEETING of BOARD OF GOVERNORS

Venue: Seminar Hall Complex  
D.E.I.

On

Saturday, 30<sup>th</sup> November 2019, at 11:00 AM



Faculty of Engineering  
Dayalbagh Educational Institute  
(Deemed University)  
Dayalbagh, Agra – 282005  
Uttar Pradesh, INDIA

Minutes of the Meeting of Board of Governors, TEQIP-III, DEI, Dayalbagh  
held on 30.11.2019 at 11:00 A.M.  
Venue: Seminar Hall Complex, D.E.I.  
Dayalbagh, Agra

**Following were present**

S. No	Name	Designation	Position in BoG	Presence
1.	Ravi Kumar Sinha	Former CEO and Managing Director, SRF Ltd., New Delhi	Chairman	Present via Video Conferencing
2.	V. Soamidas	Professor & Dean, Faculty of Engineering, D.E.I.	Member Secretary	Present
3.	Rajiv Sinha	Senior Advisor, DCM Sriram Ltd., New Delhi	Member	Present via Video Conferencing
4.	Prem Kumar Kalra	Professor, Indian Institute of Technology, Delhi	Member	Present
5.	Vijay Kumar	Advisor, Medical Education & Healthcare Practice, Dayalbagh, University Nominee	Member	Present
6.	A. K. Saxena	Professor & Head, Electrical Engg., Faculty of Engineering, D.E.I., Institutional Project Director – TEQIP-III	Member	Present
7.	B. Venkateshwara Rao	Director, Institute of Science & Technology, JNTU, Hyderabad	Member	Present
8.	Rahul Swarup Sharma	Professor, Faculty of Engineering, D.E.I., Nodal Officer, Procurement, TEQIP-III	Member	Present
9.	K. Hans Raj	Professor and Head, Mechanical Engineering Department, Faculty of Engineering, D.E.I.	Special invitee	Present
10.	Ram Chand Gupta	Assoc. Professor, Faculty of Engineering, Nodal Officer, Academic, TEQIP-III	Special invitee	Present
11.	G. S. Sailesh Babu	Assoc. Professor, Faculty of Engineering, Start-up Cell Coordinator, TEQIP-III	Special invitee	Present
12.	Kumar Ratnakar	Asst. Professor, Faculty of Engineering, MIS Officer, TEQIP-III	Special invitee	Present
13.	Anurag Gupta	Asst. Professor, Faculty of Engineering, Coordinator, Equity Action Plan, TEQIP-III	Special invitee	Present







## ANNEXURE 1

14.	Ishant Singhal	Assistant Professor, Civil Engineering, Coordinator, Twinning, TEQIP-III	Special invitee	Present
15	Ashok Yadav	Assistant Professor, Faculty of Engineering, Coordinator, Finance, Environment Management Plan	Special invitee	Present
16	Guru Dayal Prasad	Nodal Officer, Finance	Special invitee	Present
17.	D. Bhagwan Das	Professor, Faculty of Engineering, D.E.I, Coordinator, TEQIP-III.	Member	Present

## Leave of Absence

1.	S. P. Gupta	Professor Emeritus, Indian Institute of Technology, Roorkee, AICTE Nominee	Member	Requested for leave of absence due to other engagements
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Following was the Agenda of the meeting

M No.	Description of Item															
<b>PART: I Confirmation of Minutes of BoG meeting held on 29.09.2019 and BoG approvals by circulation dated 05.11.2019</b>																
01/ BoG _Nov-19	Presentation of minutes of BoG Meeting held on 29.09.2019, BoG approvals by circulation dated 05.11.2019															
<b>PART: II TEQIP-III Activities report after BoG meeting on 29.09.2019</b>																
02/ BoG _Nov-19	A. Action Taken Report B. Presentation of report of TEQIP-III activities: Expenditure, Procurement, Academic, Audits (Financial Audit and Performance Audit), and Twinning															
<b>PART-III: Items for Consideration and Approval</b>																
03/ BoG _Nov-19	Procurement proposals 1. A proposal has been received for purchasing maintenance free batteries for UPS systems installed in Microprocessor Lab, Multimedia Lab, and Electronics Lab 2. A proposal has been received for purchasing some equipment for the Environmental Engineering Lab in the Civil Engineering Department. Total funding required for all equipment is around Rs. 5 lakhs. 3. A proposal for setting up an Agile Manufacturing Research Lab has been received.															
04/ BoG _Nov-19	Approval for providing seed money for R&D to faculty members of Faculty of Engineering: Some proposals for funding have been received from staff and research scholars of DEI Faculty of Engineering. They may be considered for appropriate funding: 1. Sh. Lakhn Agarwal, Dr. Ashok Yadav – Grain Dryer 2. Dr. V S Das, Dr. Ankit Sahai, Dr. Ashok Yadav, Dr. Sachin Saxena 3. Dr. G S S Babu, Prof. D. Bhagwan Das – Mobile Solar System 4. Sh. Amol Gupta, Dr. G S S Babu – IOT for precision agriculture															
05/ BoG _Nov-19	Twinning Activities: Twinning Proposals received from IST-JNTUH may be considered for matching funding from DEI-TEQIP <table border="1"> <thead> <tr> <th>JNTUHIST</th> <th>DEI</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td>1. K V Rao</td> <td>- R S Sharma</td> <td>LPG Sensing</td> </tr> <tr> <td>2. Ch. Shilpa Chakra - I Singhal, A Sahai, R S Sharma</td> <td></td> <td>3D printing</td> </tr> <tr> <td>3. Ch. Sasikala</td> <td>- Ashok Yadav, Ranjit Kumar</td> <td>Bio-Aerosol</td> </tr> <tr> <td>4. Dr. L. Saida</td> <td>- Radhika Singh</td> <td>Biomass Conversion</td> </tr> </tbody> </table>	JNTUHIST	DEI	Project	1. K V Rao	- R S Sharma	LPG Sensing	2. Ch. Shilpa Chakra - I Singhal, A Sahai, R S Sharma		3D printing	3. Ch. Sasikala	- Ashok Yadav, Ranjit Kumar	Bio-Aerosol	4. Dr. L. Saida	- Radhika Singh	Biomass Conversion
JNTUHIST	DEI	Project														
1. K V Rao	- R S Sharma	LPG Sensing														
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3. Ch. Sasikala	- Ashok Yadav, Ranjit Kumar	Bio-Aerosol														
4. Dr. L. Saida	- Radhika Singh	Biomass Conversion														
<b>PART-IV: ITEMS FOR INFORMATION</b>																
06/ BoG _Nov-19	Three workshops are being organized by DEI-TEQIP in December 2019 and in January 2020 as follows: 1. 20-21 December 2019 – Workshop on Waste Management (Exp. : INR 2.25 Laes) 2. January/February 2020 – Workshop on Environment, in collaboration with Indian Institute of Technology, Kanpur 3. February 2020 – Conference on “Social Responsibility and Community Engagement”, in collaboration with SoE, DEI. Dates for the workshops at S. Nos. 2 and 3 are to be finalized.															
07/ BoG _Nov-19	Any other item(s) with the permission of the Chairperson															






## MINUTES

1. Request for Leave of absence of Prof. S.P. Gupta, IIT Roorkee was approved by the Chairman, BoG

**PART: I Confirmation of minutes of previous BoG meeting**

01/ BoG _Nov-19	A. Presentation of the minutes of previous meeting of BoG, held on 29.09.2019 B. BoG approvals by circulation dated 05.11.2019
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- Minutes of BoG meeting held on 29.09.2019 were approved and permissions obtained from BoG through Circulation also on 05.11.2019 were ratified.
- It was also advised by the Chairman that agenda must be circulated well in advance (at least 15 days) along with all pertinent reports. This was in the context of circulation of agenda only one day before this meeting. Prof. V. Soami Das, Member Secretary, will ensure timely circulation of the agenda.
- Resolved that next BoG meeting would be held on 28.02.2019

**PART: II TEQIP-III Report of Activities conducted after BoG meeting on 29.09.2019**

02/BoG _Sept-19	A. Action Taken Report B. Presentation of report of TEQIP-III activities: Expenditure, Procurement, Academic, Audits (Financial Audit and Performance Audit), and Twinning
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Action taken report was presented by Member Secretary, BoG. Salient points and deliberations are as follows

***A. Action Taken Report*****Manpower**

- Request for one additional accountant was submitted to NPIU and approval from their end is awaited.
- Four new staff members were appointed by DEI in the Department of Electrical Engineering.

**GATE Training**

- New agency for GATE Training was engaged and all material etc., are delivered to students.
  - It was felt that present method of hiring external agencies for GATE training is a temporary method and gradually in-house capacity building must be done.
  - Resolved that Prof. A.K. Saxena may hold meetings to design modalities of GATE Training transfer from external to internal agencies. He may also obtain advice from Hon. Director, DEI in this regard.
  - Action taken to be reported in next meeting.

**Financial Audit**

- Satisfactory Report from Auditors was presented
  - Favorable report from Auditors was taken into cognizance and efforts of TEQIP team were commended.

**Governance System**

- Reported that committees for different activities were constituted.
  - Advised that each committee must mention names of chair and coordinator, roles of each member may clearly be mentioned.






- Prof. A.K. Saxena may hold a meeting with these committees to formulate working models.
- Review meetings with TEQIP office bearers is scheduled on 15.12.2019
- Prof. Saxena to propose a system for internal planning, coordination and review by the team involved in TEQIP including Director, Secretary and Coordinator, Committee heads, which is overdue.
- Action to be taken by Prof. A.K. Saxena and report in the next BoG.

#### **Charge Handover**

- A protocol may be formulated for exchange of information and induction of new incumbent.
- Formal procedure for changeover/handover of duties be formulated by Prof. A.K. Saxena and circulated by 15<sup>th</sup> February, 2020.

#### ***B. Presentation of report of TEQIP-III activities: Expenditure, Procurement, Academic, Audits (Financial Audit and Performance Audit), and Twinning***

A report of Expenditure done, Procurement activities and academic activities were presented by individual nodal officers, TEQIP Coordinator and Program Director, TEQIP

- Reply to all Audit objections raised by Auditors was appreciated and commended.
- Resolved that following reports pertinent to October- December 2018 will be circulated in proper format within 10 days of circulation of these minutes
  - Prof. V. Soamidas – Action Plan and Action taken report in proper format
  - Prof. R.S. Sharma – Expenditure with performance benchmarks
  - Sh. R.C. Gupta – Academic targets and Activities undertaken for action plan.

#### **Performance Audit**

- Analysis of low scoring points in performance audit were presented by Coordinator, TEQIP
  - Points where considerable improvement is difficult/not possible were discussed.
  - Resolved that a formal case may be raised with NPIU/SPIU putting forward DEI-TEQIP's point of view so as to improve scoring system adopted by NPIU.
  - Action by project Director and TEQIP Coordinator with the relevant authorities by 15<sup>th</sup> February, 2020

#### **Twinning Activities**

- A report of activities under Twinning was presented by Coordinator, Twinning Activities.
  - Advised that a revised report may be submitted by Sh. Ishant Singhal, clearly stating action taken by whom and when.
  - Action: By Sh. Ishant Singhal and shall be reported in the next BoG meeting.

#### **Impact Analysis**

- A report may be resubmitted with gaps, targets, quantity of equipment to be added to cover the gap
- Impact of equipment procured may be presented with courses being catered to, number of students benefited, new experiments designed (if any)
- 3D Printer: Clear mentioning of the intent of procuring 3D printer is required.
- Action By: Prof. Rahul Swarup Sharma in consultation with other teachers
- Action by Prof. Rahul Swarup Sharma by 15<sup>th</sup> February, 2020

#### **Constitution of Committee for evaluation of R&D Proposals**

- Action is pending. Committee needs to be constituted and all R&D proposals through it.



- Action By: Prof. A.K.Saxena: It is submitted that the R & D committee already exists and the same was reported in the last BoG. All the R & D proposals reported in this BoG meeting were approved by R & D committee after the approval of funding from Finance Committee. One proposal under Twinning Activity is now resubmitted and shall be reported in the next BoG for ratification.

### PART-III: ITEMS FOR CONSIDERATION AND APPROVAL

03/ BoG _Nov-19	<p>Procurement proposals</p> <p>A. A proposal has been received for purchasing maintenance free batteries for UPS systems installed in Microprocessor Lab, Multimedia Lab, and Electronics Lab</p> <p>B. A proposal has been received for purchasing some equipment for the Environmental Engineering Lab in the Civil Engineering Department. Total funding required for all equipment is around Rs. 5 lakhs.</p> <p>C. A proposal for setting up an Agile Manufacturing Research Lab has been received.</p>
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#### Procurement of Batteries

- Resolved that procurement of Batteries as per proposal is approved.
- Advised that treatment of said item as consumable stock may be checked with Accounts team of SPIU/NPIU

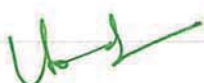
#### Equipment for Environmental Engineering Lab

- Resolved that procurement of said equipment as per proposal is approved.
- Advised that proposal may mention requirement of new lab citing curriculum requirement.
- Advised that the items being procured must be part of the vision and linkages must be mentioned.

#### Agile Manufacturing Lab

- The proposal is to be routed through Finance Committee before submission to BoG.
- Proposal should clearly mention objectives, benefits and expected impact of such lab.
- Revised proposal can be approved by circulation in view of any urgency.
- It has to be mentioned which equipment from the approved procurement plan is to be dropped to procure items for this Lab, if funds are short.
- The proposer should also submit the approval of space for this Lab from the competent authority of DEI, where the equipment procured for this lab to be located. It is not advisable to keep the equipment used for long as auditors need utilization report/feedback of the students for the same.

04/ BoG _Nov-19	<p>Approval for providing seed money for R&amp;D to faculty members of Faculty of Engineering: Some proposals for funding have been received from staff and research scholars of DEI Faculty of Engineering. They may be considered for appropriate funding:</p> <p style="text-align: center;"><b>Faculty (Project)</b></p> <p>A. Sh. Lakhan Agarwal, Dr. A Yadav (Grain dryer)</p> <p>B. Dr. V S Das, Dr. A Sahai, Dr. A Yadav, Dr. S Saxena (RBF)</p> <p>C. Dr. G S S Babu (Mobile Solar System)</p> <p>D. Sh. Amol Gupta, Dr. G S S Babu (IOT for precision agriculture)</p>
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Four proposals seeking seed money for R&D were received from Faculty members. Each proposal was presented by the proposing faculty.

- Resolved that proposals A, C, and D are approved and R&D seed money of amount proposed, capped to 2.0 Lacs, is approved for each of the projects.
- Regarding proposal B, it was advised that the proposer should verify that the method specified in the proposal is conclusive. Alternate methods for establishing filtration of river water through its banks may also be studied and the most suitable method be chosen for actual work.
- Advised that these proposals may be modified in record as per a standardized format (UGC/DST) containing Objective, comparison with current solutions available, Target groups / audiences etc. R&D committee may formulate a format for the same.
- Project duration would be one year from the date of sanction. The grant would be used for meeting expenditure under the heads of Contingency, Consumables and Hiring Services. Procurement of equipment would not be permitted.
- A provision for extension for one more year and a grant up to 2.0 Lacs, on submission of new proposal, subsequent evaluation and approval, is also approved.

05/ BoG _Nov-19	<p>Twinning Activities: Twinning Proposals received from IST-JNTUH may be considered for matching funding from DEI-TEQIP</p> <table border="1"> <thead> <tr> <th>JNTUHIST</th> <th>DEI</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td>A. K V Rao</td> <td>- R S Sharma, A Sahai</td> <td>Sensing</td> </tr> <tr> <td>B. Ch. Shilpa Chakra</td> <td>- I Singhal, A Sahai, R S Sharma</td> <td>3D printing</td> </tr> <tr> <td>C. Ch. Sasikala</td> <td>- Ashok Yadav, Ranjit Kumar</td> <td>Bio-Aerosol</td> </tr> <tr> <td>D. Dr. L. Saida</td> <td>- Radhika Singh</td> <td>Biomass Conversion</td> </tr> </tbody> </table>	JNTUHIST	DEI	Project	A. K V Rao	- R S Sharma, A Sahai	Sensing	B. Ch. Shilpa Chakra	- I Singhal, A Sahai, R S Sharma	3D printing	C. Ch. Sasikala	- Ashok Yadav, Ranjit Kumar	Bio-Aerosol	D. Dr. L. Saida	- Radhika Singh	Biomass Conversion
JNTUHIST	DEI	Project														
A. K V Rao	- R S Sharma, A Sahai	Sensing														
B. Ch. Shilpa Chakra	- I Singhal, A Sahai, R S Sharma	3D printing														
C. Ch. Sasikala	- Ashok Yadav, Ranjit Kumar	Bio-Aerosol														
D. Dr. L. Saida	- Radhika Singh	Biomass Conversion														

Four proposals seeking seed money for joint R&D projects from investigators of DEI and JNTU-IST were received.

- Resolved that proposals B and D are approved and R&D seed money of amount proposed capped to 2.0 Lacs is approved for each of the project.
- Proposals A and C may be resubmitted in proper format for consideration.
- A provision for extension for one more year and a grant up to 2.0 Lacs, on submission of new proposal, subsequent evaluation and approval, is also approved.
- Further noted that
  - Both the institutions would be granting an amount of 2.0 Lacs per project.
  - Seed money would be utilized by investigators from the respective granting institution.
  - Outcome of these projects will be shared by both the institutions equally in the form of joint publications and joint IPR.

#### PART-IV: ITEMS FOR INFORMATION

06/ BoG _Nov-19	<p>Three workshops are being organized by DEI-TEQIP in December 2019 and in January 2020 as follows:</p> <p>A. 20-21 December 2019 – Workshop on Waste Management (Exp.: INR 2.25 Lacs)</p> <p>B. January/February 2020 – Workshop on Environment, in collaboration with Indian Institute of Technology, Kanpur</p> <p>C. February 2020 – Conference on “Social Responsibility and Community Engagement”, in collaboration with SoE, DEI.</p> <p>Dates for the workshops at S. Nos. B and C are to be finalized.</p>
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- Noted that three workshops as mentioned will be conducted under the aegis of TEQIP-III

**PART-V: ANY OTHER ITEM(S) WITH THE PERMISSION OF THE CHAIR**

07/ BoG_Nov-19	Any other item(s) with the permission of the Chairperson
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Reported that a portion of the amount allocated to Heat Transfer Lab for procurement of equipment (as per Procurement Plan) is left unspent due to lower cost of equipment than proposed cost.

Permission to procure other items in the unspent amount was sought.

- Advised that the request may be submitted through proper channel for consideration.
- 

The meeting ended with a Vote of Thanks to the Chair, the Members of the BoG and the special invitees to the meeting.



**The roles and responsibilities of various committees, reported in the last BoG, are given below and will be reported in the next BoG meeting**

- **Procurement Committee:** This committee is headed by Prof. Rahul Swarup Sharma. The responsibilities of the coordinator are to ensure timely purchase of the items approved by BoG. In case any items to be dropped or added for procurement, he should request the concerned head of the department to provide satisfactory reasons for addition/deletion. Any new item proposed by any department in addition to the approved plan, the concerned HoD will communicate the items to be dropped from the approved plan to make the funds available for the new items. Once this internal process is complete, the Procurement coordinator will report to Project Coordinator/Director and SPIU / NPIU to modify the procurement plan and report in BoG. The convener will also hold meetings with the teachers concerned to accelerate their procurement activities.
- **Academic Activity Committee:** This committee is headed by Mr Ram Chand Gupta. All proposals for academic activities related to students: Students project proposals, Students participation in conference/workshops, payment of allowances to Research students/ internship etc. is routed through this committee. Selection of vendors for GATE coaching, Employability skill training etc, is initiated and executed by this committee. Finally, the recommendation of this committee is submitted to Finance Committee for approval.
- **Twinning Activity Committee:** This committee is headed by Sh. Ishant Singhal. All twinning activities with Mentor Institute (JNTUIST) i.e. student exchange, joint conference / workshop, Faculty Development Programmes / Joint R & D activities mentoring of students of both the institutions by respective faculties etc. is initiated by the convener of this committee and all finances involved is submitted to finance committee for its approval.
- **Start-Up Committee:** This committee is headed by Dr. G. S. S. Babu. The committee is entrusted with to make a startup / incubation cell and encourage the students to engage themselves in these activities. Organisation of Students competitions / Hackathon etc. are managed by this committee.
- **Finance Committee:** This committee is chaired by the Dean (member secretary ) and Nodal Officer Finance. The committee approves all the finances required for academic activities / procurement activities and other activities.
- **Member Secretary:** The continuing Dean is the member secretary of BoG. The responsibility of the Member Secretary is to ensure timely conduct of BoG meeting, collecting the BoG agenda from head of the various committees, hold the BoG meeting, interaction with the BoG members and timely preparation and approval of BoG minutes. All the proposals related to TEQIP must be endorsed / approved by the Dean.
- **Project Coordinator:** Prof. D. Bhagwan Das is the TEQIP Coordinator. He is responsible for the coordination with the SPIU & NPIU for any documents / information required after collecting information / Data from various committees. He has to ensure timely submission of all information sought by the SPIU / NPIU in consultation with the project Director.
- **Project Director:** Prof. A.K.Saxena is the project Director. He has to ensure the proper coordination among various committees and timely execution of all activities. Any communications to be done with SPIU/NPIU is done by project director & project coordinator. All presentations at various forums in SPIU/NPIU is coordinated with the help of project coordinator and other members. Monitoring of progress in the project and addressing any issues in smooth completion of the project is also done by him.
- **The R & D committee:** The committee is in place in the faculty. Prof. A.K.Saxena is the convener and other HoDs are the members of the committee. All R & D proposals by individual Faculty members or under twinning activities are first approved by this committee.

The HoDs recommend the proposals by the members / Scholars of the respective departments to the finance committee. The FC then submits its recommendations to R & D committee. After approval of the R&D Committee, the proposal is put up before BoG for its approval.



## Action Taken Report

### GATE Training

- The following actions would help in enhancing in-house capacity to cater to the needs of GATE training.
  - Inclusion of questions at par with GATE papers in DHAs, DCAs and other tests
  - Appropriate questions from previous GATE papers may be included in question banks and subsequently in CTs
  - Preparation material for different subjects may be developed as a long term measure
  - Teachers would be requested to start implementing above as soon as possible in respective subjects
  - If need arises some expert lectures can be arranged for students
  - A few mock test would be organized for the GATE aspirants.

### Governance System

#### *The roles and responsibilities of various committees*

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- **Procurement Committee:** This committee is headed by Prof. Rahul Swarup Sharma. The responsibilities of the coordinator are to ensure timely purchase of the items approved by BoG. In case any items to be dropped or added for procurement, he should request the concerned head of the department to provide satisfactory reasons for addition/deletion. Any new item proposed by any department in addition to the approved plan, the concerned HoD will communicate the items to be dropped from the approved plan to make the funds available for the new items. Once this internal process is complete, the Procurement coordinator will report to Project Coordinator/Director and SPIU / NPIU to modify the procurement plan and report in BoG. The convener will also hold meetings with the teachers concerned to accelerate their procurement activities.
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- **Project Coordinator:** Prof. D. Bhagwan Das is the TEQIP Coordinator. He is responsible for the



coordination with the SPIU & NPIU for any documents / information required after collecting information / Data from various committees. He has to ensure timely submission of all information sought by the SPIU / NPIU in consultation with the project Director.

- **Project Director:** Prof. A.K.Saxena is the project Director. He has to ensure the proper coordination among various committees and timely execution of all activities. Any communications to be done with SPIU/NPIU is done by project director & project coordinator. All presentations at various forums in SPIU/NPIU is coordinated with the help of project coordinator and other members. Monitoring of progress in the project and addressing any issues in smooth completion of the project is also done by him.
- **The R & D committee:** The committee is in place in the faculty. Prof. A.K.Saxena is the convener and other HoDs are the members of the committee. All R & D proposals by individual Faculty members or under twinning activities are first approved by this committee.

The HoDs recommend the proposals by the members / Scholars of the respective departments to the finance committee. The FC then submits its recommendations to R & D committee. After approval of the R&D Committee, the proposal is put up before BoG for its approval.

Individual teams are working accordingly.

### **Charge Handover**

The following actions are proposed to ensure seamless exchange of information and introduction of new incumbent

All HoDs may be invited to the BoG meetings to ensure that they are well acquainted with TEQIP activities and state of matters.

The HoD whose appointment as the next Dean is due must be actively involved in the proceedings of BoG meetings and he will help Dean, the member Secretary of BoG, in conducting BoG meetings to understand the detailed proceedings.

An additional point regarding TEQIP responsibilities may be added to the charge handover document of Dean to his successor.

### **Constitution of Committee for evaluation of R&D Proposals**

Action By: Prof. A.K.Saxena: It is submitted that the R & D committee already exists and the same was reported in the last BoG. All the R & D proposals reported in this BoG meeting were approved by R & D committee after the approval of funding from Finance Committee. One proposal under Twinning Activity is now resubmitted and shall be reported in the next BoG for ratification.

### **Meetings of Finance Committee:**

The meetings of finance committee is conducted whenever a few proposals are received by the committee. In case of any emergency, the committee meets without schedule and evaluate & approve the proposals. A few minutes are attached.

### **Impact Analysis:**

The impact analysis of the various facilities created from TEQIP is being done by collecting feedback from the staff members and the students who are the actual users. This feedback is also to be submitted to SPIU/NPIU. A visit of SPIU official is due in the first week of March 2020.

**Academic Targets:**

1. **GATE Coaching:** Approximate 184 students of third year have been provided with GATE material. About 170 students of Final Year have appeared in GATE examination this year.
2. **Employability Skill Training:** All students of Third Year and Final Year are being provided 200 hours of this training by an empanelled vendor. Training of 4 hours per week for both the classes are being held.
3. **Funding for Final Year Projects:** The students projects are funded from TEQIP after receiving proposals from the various project groups.
4. **Funding for Third Year Projects:** The students projects are funded from TEQIP after receiving proposals from the various project groups.
5. **Funding for students activities:** All students participating in any competitive activities, paper presentations, participation in Hackathon are being reimbursed their expenditures as per TEQIP norms.

**Performance Audit**

- Various issues related to performance audit was raised before SPIU/NPIU and world bank officials. They have assured to resolve the issue after talking to the Auditor. They also advised us to put our remarks before accepting the audit report from the auditor.

**Twinning Activities**

- Like last year this year also students of Civil Engg. branch shall be visiting JNTU for summer training.
- JNTU has promised to arrange for five month internship for our students in the Industries where they have some influence and also help in arranging campus selections.
- A joint R & D project between Dr. Ranjeet Kumar and Dr. Sasikala is approved by BoG of JNTU and also presented for approval of BoG after approval from finance committee.
- A joint Workshop on Energy Storage system is proposed in June 2020 by JNTU.
- A short term course on Microgrids is being organized by DEI during 23-27 March 2020. A few participants form JNTU are expected to participate.
- A Faculty Development Programme is also proposed with JNTU at DEI in May 2020.



**Dayalbagh Educational Institute (Deemed to be University),  
Dayalbagh, Agra - 282005, Uttar Pradesh**

**Minutes of the Finance Committee Meeting of 04.11.2019**

<b>Present</b>	Prof. V. Soami Das	Chairman
	Prof. A.K.Saxena	Project Director
	Prof. D. Bhagwan Das	TEQIP-Coordinator
	Prof. Rahul Swarup Sharma	Procurement Coordinator
	Dr. Ashok Yadav	Member
	Sh. Gur Dayal Prasad	Nodal Officer Finance

<b>In Attendance</b>	Dr. G. S. S. Babu	Teacher Concerned Convener, R & D
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**Statement of Interest** The Committee noted and approved the minutes of the Finance Committee submitted for earlier procurements (Annexure-I)

**FN/19-20/01 Replacement of SMF Batteries**

1.	12 Volt, 150 Ah SMF Batteries	08 Nos.	INR 96000.00
2.	12 Volt, 65 Ah SMF Batteries	32 Nos.	INR 105600.00
3.	12 Volt 100 Ah SMF Batteries	05 Nos.	INR 50000.00

The committee referred to the proposal for the purchase and replacement of SMF batteries used in Multimedia Laboratory (32), Electronics Lab (5) and Microprocessor Lab (8) for an estimated cost of INR 2,51,600.00. The committee was informed that these batteries are 5 to 8 years old and have outlived their life and need replacement.

**Actions 1.1** The committee is satisfied with the justifications given for the replacement and approve the purchase of batteries under Shopping method after calling quotations for the same.

**Actions 1.2** Dr. G. S. S. Babu be and is hereby authorised to place orders for the batteries as mentioned above

The Committee noted that the next Finance Committee meeting is scheduled for Monday 18 November 2019 at 3.00 PM in the Faculty Seminar Hall

Prof. V. Soamidas

Nodal Officer Finance





**Dayalbagh Educational Institute (Deemed to be University),  
Dayalbagh, Agra - 282005, Uttar Pradesh**

**Minutes of the Finance Committee Meeting held on 15.02.2020**

**Present**

Prof. V. Soami Das	Chairman
Prof. A.K.Saxena	Project Director
Prof. D. Bhagwan Das	TEQIP-Coordinator
Prof. Rahul Swarup Sharma	Procurement Coordinator
Dr. Ashok Yadav	Member
Sh. Gur Dayal Prasad	Nodal Officer Finance

**In Attendance**

Dr. G. S. S. Babu	Teacher Concerned Convener, R & D
-------------------	--------------------------------------

**Statement of Interest** The Committee noted and approved the minutes of the Finance Committee submitted for earlier procurements (Annexure-I)

**FN/19-20/03**

Procurement of Book Almirah for keeping Reference Books

4. Standard Book Almirah for Library Use: 10 Nos. INR 3,00,000.00

The committee referred to the proposal for the purchase of Book Almirah for keeping the reference/rare books provided by the Chairman, Advisory Committee on Education. These books will be kept at different libraries for use by the students/staff for an estimated cost of INR 3,00,000.00.

**Actions 1.1**

The committee is satisfied with the justifications given for the purchase and approve the purchase.

**Actions 1.2**

Prof. D. Bhagwan Das be and is hereby authorised to place orders for the Almirahs as mentioned above.

**FN/19-20/03**

**Procurement of ANSYS TOOLS and STADD PRO for students of all branches.**

Procurement of ANSYS and STADD PRO software for use by Civil / Electrical / Footwear / Mechanical students for INR 11,00,000.00

The committee referred to the proposal for the purchase of ANSYS and STADD PRO Tool for the students of various branches for teaching and research.

ANSYS is a Multiphysics Simulation software capable of performing FEA, CFD, and Electromagnetic Simulation and has data connectivity with all major Mechanical CAD and Electronics CAD Software.

**Actions 2.1**

The committee is satisfied with the justifications given for the purchase and approve the purchase.

**Actions 2.2**

Prof. Rahul Swarup Sharma be and is hereby authorised to place orders for the software as mentioned above.

**FN/19-20/03 Procurement of Stool (100) and Tables (4) for Labs.**

**5. Procurement of Stools and Tables for Labs: INR 1,50,000.00**

The committee referred to the proposal for the purchase of Hundred Stools and Four Tables for Labs (Heat Transfer Lab. and Hydraulics Lab) for use by students. The total cost of these items would be Rs. 1,50,000.00

**Actions 3.1** The committee is satisfied with the justifications given for the purchase and approve the purchase.

**Actions 3.2** Dr. Ashok Yadav be and is hereby authorised to place orders for the items mentioned above.

**FN/19-20/03 Procurement of IonCUDOS OBE/NBA Software for NBA Accreditation**

**6. Procurement of IonCUDOS OBE/NBA Software for INR 18,00,000.00**

The committee referred to the proposal for the purchase of Software tool IonCUDOS OBE/NBA software for preparing various reports for NBA accreditations. The NBA accreditation for Civil Engineering is due and for other courses it will again be due in 2022. Therefore the above software is proposed to be procured for 1 year validity with five years AMC with all upgrades. The total cost of this package would be Rs. 18,00,000.00

**Actions 4.1** The committee is satisfied with the justifications given for the purchase and approve the purchase.

**Actions 4.2** Dr. G.S.S.Babu be and is hereby authorised to place orders for the above software on Proprietary Article Basis.

The Committee noted that the next Finance Committee meeting is scheduled for Monday 18 March 2020 at 3.00 PM in the Faculty Seminar Hall

Prof. V. Soamidas

Nodal Officer Finance

## ANNEXURE 2-B

<b>Action Plan March - June 2020</b>		
<b>Activity proposed</b>	<b>Key Persons Involved</b>	<b>Dates</b>
NBA e-SAR filling for civil engineering program	IST JNTUH	March, 2020
A joint R & D project on Bio-Aerosol	Dr. Ranjeet Kumar, DEI and Dr. Sasikala, IST JNTUH	March, 2020
A joint R & D project on LPG Gas sensing	Dr. K Venkateswara Rao, IST JNTUH, Dr. Rahul Swarup Sharma, DEI	March, 2020
A short term course on Microgrids	DEI	23 - 27 March, 2020
Five month Coop internship for 3rd Year students	IST JNTUH and Industry persons	April 20 -Sep. 20
Placement opportunities	IST JNTUH and Industry persons	April, 2020
Faculty Development Programme	DEI and IST JNTUH	May, 2020
Civil Engg. Student exchange for summer training	IST JNTUH Faculty members	June, 2019
A joint Workshop on Energy Storage system	IST JNTUH and DEI	June, 2020



<b>Name of the Institute</b>	<b>Dayalbagh Educational Institute</b>		
<b>Address</b>	Mechanical Engineering Department, Faculty of Engineering, Dayalbagh Educational Institute (Deemed University), Dayalbagh, Agra 282005 (UP)		
<b>Contact details</b>	vsoamidas@dei.ac.in	0562-2801226	8433019794
<b>Permanent Id of the Institute</b>	1-482451854		
<b>Department</b>	Mechanical Engineering Department		
<b>Strength &amp; Weakness of the Institute</b>	<p><b>Strength: Institute graded "A+" by NAAC</b>, Excellent Academic Work, Innovative Educational Programmes, Campus completely Powered by 520 kWp Solar Power Plant, All hostels using Solar Thermal Cooking, Several MHRD MCIET programmes worth Rs. 40 crores are running, Several AICTE R&amp;D and MODROB projects completed, Institute has an innovative Vision 2031 to bring Institute among top 20 Institutes of the country.</p> <p>Weakness: Industry based research</p>		

**Technical Field of proposal**

Water filtration

**Title of proposal**

River Bank Filtration

**Abstract**

Water is the essence of life and for human need most of it is being extracted from the underground water. Riverbank filtration is one of the techniques used to filter the water for potable use. A Riverbank Filtration project has recently been set up by DEI with the support of DST near the Yamuna river in Dayalbagh, Agra. One aspect of such a project is establishing that

the water being drawn from the borewells is actually surface water from the river that has seeped through its banks and is not sourced from underground water aquifers.

For an accurate analysis it is required that several borewells be drilled at varying distances from the riverbank. At each borewell location, water has to be drawn from the underground water source closest to the surface and analysed for the presence of various chemicals.

In the present work, a comparison of the results of these analyses would give an idea of the content of river water in the water being drawn at any of the locations where wells have been drilled.

**Keywords:** river bank filtration

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### **Objective - Project Significance / Relevance with ongoing academic activities**

- 1) To establish the fact that the water obtained is not underground water.
- 2) To carry out chemical analysis of the samples of water obtained from ground and riverbank.
- 3) To achieve the desired parameters of filtered water for potability.

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### **Project Impact -Expected outcome**

A Riverbank Filtration project has recently been set up by DEI with the support of DST near the Yamuna river in Dayalbagh, Agra. One aspect of such a project is proving that the water being drawn from the borewells is actually surface water from the river that has seeped through its banks and is not sourced from underground water aquifers.

The tests performed during the project duration were not conclusive. For an accurate analysis it is required that several borewells be drilled at varying distances from the riverbank. At each borewell location, water has to be drawn from the underground water source closest to the surface and analysed for the presence of various chemicals.

---

### **Methodology:**

A comparison of the results of analyses of water samples drawn from wells at varying distances from the river would give an idea of the content of river water in the water being drawn.

An accurate result would be forthcoming if several borewells are drilled at varying distances from the riverbank. At each borewell location, water drawn from the underground water source closest to the surface would be analysed for the presence of various chemicals.

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**Budget Estimates –  
Installations/Consumable/service**

Proposed work	Specifications	No of units	Cost in Rs.
<b>Drilling of borewells</b>	4' diameter bore up to depth of water table,	10	1,00,000
<b>Analysis of water samples</b>		-	1,00,000

**Total Estimated Cost**

***Rs 2,00,000/- (Two Lakhs only)***

**Details of Project Coordinator**

Name	PROF. V. SOAMIDAS		
Exact designation	Professor	Date of joining	1994
Appointment Type	Regular	Scale of Appointment (payband)	
Department	Department of Mechanical Engineering		
Qualifications	UG (B.Tech., Mechanical Engg.)	PG (M.Tech., Machine Dynamics)	PhD (Analysis of Fiber reinforced composite annular disks)
Experience in years	Teaching (29 years)	Industry (Nil)	Research (35 years)



Students guided	UG (25 batches)	PG (3)	PhD (1)
Publications	National (1 journals + 5 conferences)	International (11 journals + 2 conferences)	Books (NIL)
Relevant experience	Worked on river bank filtration in recently completed DST Project		
Other information	The proposed work complements the recently completed DST project		
Cell number	8433019794 / 9258771514		
Email	<a href="mailto:vsoamidas@dei.ac.in">vsoamidas@dei.ac.in</a>		
Signature			

The proposal had been presented in the BoG Meeting on 30-11-2019, where it was advised that opinion of some experts may be obtained regarding the suitability of the method suggested for the purpose envisaged. Accordingly, the problem only (without specifying the method of solution) was posed to an online group working on water and this method came up as one of the solutions. Further, the problem was also submitted to Dr Suresh, from the Central Ground Water Board, Faridabad, who also approved of the suggested method.

In view of the above, the proposal is being submitted again with revision in the financial requirements.

<b>Name of the Institute</b>	<b>Dayalbagh Educational Institute</b>		
<b>Address</b>	Mechanical Engineering Department, Faculty of Engineering, Dayalbagh Educational Institute (Deemed University), Dayalbagh, Agra 282005 (UP)		
<b>Contact details</b>	ashokyadavaca@gmail.com	0562-2801226	9412893447
<b>Permanent Id of the Institute</b>	1-482451854		
<b>Department</b>	Mechanical Engineering Department		
<b>Strength &amp; Weakness of the Institute</b>	<p><b>Strength: Institute graded "A+" by NAAC, Excellent Academic Work, Innovative Educational Programmes, Campus completely Powered by 520 kWp Solar Power Plant, All hostels using Solar Thermal Cooking, Several MHRD MCIET programmes worth Rs. 40 crores are running, Several AICTE R&amp;D and MODROB projects completed, Institute has an innovative Vision 2031 to bring Institute among top 20 Institutes of the country.</b></p> <p>Weakness: Industry based research</p>		

**Technical Field of proposal**

Ground water recharge

**Title of proposal**

Development of direct sub-surface water recharge system for enhancement of water table

**Abstract**

Water is the essence of life and for human need most of it is being extracted from the underground water. Hence water table is fast depleting. Seriousness of the problem can be visualized with the fact that the water table at 80 feet in 2008 has gone down to 150 feet 2018 and continuously declining. The traditional way of rainwater harvesting is a slow process,

dependent on infiltrate rate of the soil at that place and hence unable to infiltrate all the runoff water. So, there is an urgent need to device a mechanism to replenish the ground water.

In the present work, direct sub-surface water recharge system will be developed in Faculty of Engineering buildings. There is lot of roof surface area of the building from where clean rainwater will be collected at suitable points on the ground and artificial aquifer recharge systems will be developed at these points for direct sub-surface recharge of the water table.

**Keywords:** direct sub-surface recharge, artificial recharge, aquifer, rainwater harvesting, rainfall.

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#### **Objective - Project Significance / Relevance with ongoing academic activities**

- 1) To evaluate various aquifer recharge technologies available in the market.
  - 2) To carry out technical feasibility of direct injection well for aquifer recharging.
  - 3) To design and develop an artificial aquifer recharge system through injection well.
  - 4) To carry out the economic analysis of the system.
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#### **Project Impact -Expected outcome**

There is a fast depletion of water table in Agra region as a result of which inferior quality and low quantity of water is available to the general public. Due to the fast expansion of residential area in and around Dayalbagh, there is ever increasing demand for ground water. Seriousness of the problem can be visualized with the fact that the water table at 80 feet in 2008 has gone down to 150 feet 2018 and continuously declining. The traditional way of rainwater harvesting is a slow process, dependent on infiltrate rate of the soil at that place and hence unable to infiltrate all the runoff water. So, there is an urgent need to device a mechanism to replenish the ground water.

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#### **Methodology:**

Initially, assessment of site will be carried out based on suitability of drilling the injection well. This will include the assessing the buildings area where plenty of rainfall water may be collected. Number of injection wells will be drilled based on the rainfall. Finally, a water chamber will be prepared for filtering the rainwater.

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**Budget Estimates – Consumable**

Proposed equipment/s	Specifications	No of units	Cost in Rs.
<b>PVC Pipe</b>	4' diameter, Standard specification	50	70,000
<b>Masonry work (Cement, chambal sand, brick etc)</b>	4 -6 concrete tanks, covers, channels etc	-	20,000

Add rows as required

**Budget Estimates –Installation/service**

<b>Boring well</b>	Rs 50,000
<b>Masonry Labour</b>	Rs 50,000

Add rows as required

**Testing Charges**

Testing charges	Rs. 10,000
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**Total Estimated Cost**

***Rs 2,00,000/- (Two Lacs only)***

Details of Project Coordinator

Name	DR ASHOK YADAV		
Exact designation	Assistant Professor	Date of joining	21/07/2011
Appointment Type	Regular	Scale of	15600-39100

		Appointment (payband)	
Department	Department of Mechanical Engineering		
Qualifications	UG (B.Sc. Engineering, Mechanical Engg.)	PG (M.Tech., Engineering Systems)	PhD (Biofuels)
Experience in years	Teaching (20 years)	Industry (Nil)	Research (14 years)
Students guided	UG (12batches x4)	PG (8)	PhD (1)
Publications	National (1 journals + 15 conferences)	International (6 journals + 9 conferences)	Books (NIL)
Relevant experience	<p>worked on biodiesels during PhD Research,</p> <p>worked on renewable energy like solar energy for thermal modeling of solar assisted cooking system and evacuated tube water heaters,</p> <p>worked for energy extraction from petha waste.</p>		
Other information	<p>As crop residues as fuel are already being used by kiln owners, this becomes very essential to establish the facts that these alternate fuels are promising fuels for kilns. No study on these fuels for brick kilns is so far done.</p>		
Cell number	9412893447		
Email	ashokyadavaca@gmail.com		
Signature			

# **BIOAEROSOL AND HEALTH**

A

## **PROJECT PROPOSAL SUBMITTED TO IST TEQIP-III**

BY



**Dr. (Mrs) Ch. SASIKALA**  
**Principal investigator**  
Bacterial Discovery Laboratory,  
Centre for Environment,  
IST., JNT University Hyderabad,  
HYDERABAD - 500 085  
TELANGANA



**Dr. ASHOK YADAV**  
**Principal Investigator**  
&  
**DR. RANJIT KUMAR**  
**Co- Principal Investigator**  
Dayalbagh Educational Institute  
(Deemed University),  
Dayalbagh,  
Agra-282005 (U.P)



## **DEI and JNTUH Research Program under Twinning Activities**

### **Other Technical Details**

#### **1. Origin of the Proposal:**

The problem of air pollution is one of the most significant issues in our country. The presence of particulates, biological molecules, and many harmful substances into earth's atmosphere causes the various types of air pollutant viz., aerosols, particulate matter, SO<sub>x</sub>, NO<sub>x</sub>, heavy metal, etc. The aerosol is a mixture of solid and liquid particles which are suspended in the atmosphere, and it's ranged from 0.01 to 100 µm. The effect of the aerosol depends upon the physical, chemical, and biological constituents of the aerosols. Air often contain micro-organisms such as viruses, bacteria, and fungi, viruses and non-living pollens, debris, etc. which are known as bio-aerosols. Bioaerosols, a group of organic aerosols ranging from ~ 10 nm to 100 µm, are airborne particles or large molecules that are either alive, carry living organisms or are released from living organisms (e.g., bacteria, fungi, virus, pollen, cell debris, and biofilms). The bioaerosol particles can range in size from 0.02 to 100 micrometers in diameter, depending on the type and source. However, they also frequently agglomerate in clusters, thereby forming more massive particles. They can be found everywhere in the troposphere, stratosphere and even over Antarctica (the most remote continent on the earth). Bioaerosols are categorized into two significant classifications: viable and non-viable. Viable microorganisms like bacteria, fungi, yeasts, and molds originate from sprays or splashes of media, from the agitations of dust, and from sneezes and coughs of which only the small particles remain in the atmosphere. Spores, which can be formed by fungi and certain bacteria, can be both viable and nonviable and are responsible for causing various diseases. It causes many kinds of diseases viz., anthrax, asthma, influenza, measles, etc. Bio-aerosols play an essential role in climate change. It harms the health status of residents of the cities of both developed and developing country. When biological particles released into the atmosphere, they travel from one place to another place along with dust particles, gets incorporated into the cloud, affects radiations and deposited to earth surface through the dry and wet deposition. These biological particles cause various kinds of diseases but least studied over the Indo-Gangetic basin.

#### **2. Review of the status of Research and Development in the subject**

##### **2.1 International Status:**

Measurements of particle formation have been performed on different platforms and over different periods around the world. Previous studies have shown that particle size plays a vital role in predicting chemical content and microbial abundance and viability in atmospheric aerosols (Lighthart et al., 1997; Vignati et al., 1999). In 1978, Bovallius and colleagues observed that airborne bacteria concentration was dependent on location and that urban areas had higher concentrations than non-urban areas. Bioaerosols play roles in atmospheric chemistry by altering the chemistry of the atmosphere via microbiological degradation (Ariya and Amyot, 2004). Various studies have established that microbes can remain viable after aerosolization from terrestrial and aquatic surfaces and can travel long distances (several meters to thousands of kilometers) before deposition (Maron et al., 2005; Dueker et al., 2011). This aerial transport mechanism represents a potential public health

concern in many urban areas, where terrestrial and aquatic pollution is prevalent. Essential sources for microbial aerosol content include shedding from larger organisms (Lighthart et al., 1997), long-range transport of dust particles (Kellog et al., 2006) and emissions from marine surface waters (Blanchard et al., 1989). Because of long atmospheric residence times (days to weeks) and long-distance transport potential (100's to 1000's km), fine aerosols ( $D_p < 2 \mu\text{m}$ ) are the usual focus of atmospheric aerosol studies (Seinfeld et al., 2006). Wang et al., 2011, measured the contents of polycyclic aromatic hydrocarbons, polychlorinated biphenyls, organochlorine pesticides, and heavy metals in the surface sediments of biomonitoring sites. Deuker et al., 2011, examined the community composition and local deposition of bacterial aerosols. Lee et al., 2011, briefly reviewed the control methods against bioaerosols and offered suggestions for future research on airborne biological particles.

## **2.2 National Status:**

Bioaerosols are ubiquitous and play an essential role in climate change and have allergenic effects on human health. Mamta et al., 2014, measured and characterized the bioaerosol over Indo-Gangetic plain. They found that meteorological parameters play essential roles in the growth and presence of microorganisms in the air. According to them, the bacterial concentrations are governed mainly by temperature, while fungal concentrations are influenced by relative humidity. Kumar et al., 2004 measured atmospheric concentrations of gaseous  $\text{SO}_2$ ,  $\text{NO}_2$ ,  $\text{HNO}_3$ , and  $\text{NH}_3$  at a suburban and urban site and found that concentrations were higher at the urban site. Adhikari et al., 2006, have reported that in temperate regions, the temperature is probably the most essential meteorological parameter, affecting the spore concentration. Kumar et al., 2007, studied the characteristics of aerosols over the suburban and urban site of the semiarid region in India. They observed the seasonal and spatial variation of aerosol. Singh et al., 2011, investigated the effect of microbial source on size-fractionated concentrations of aerosol.

Ajay et al., 2016, observed significant diversity of fungal spores in the coarse particulate matter. Kumar et al., 2015, measured aerosol and trace gases and meteorological parameters in the winter season at Agra. The average TSPM level is higher than NAAQS values of India, and high wind speed from northwest direction influences the aerosol load. Valsan et al., 2016, quantified the number and mass size distributions and corresponding concentrations of biological aerosol for three distinct focus periods, namely, dusty, high bio, and clean, identified based on the prominent wind direction. Studies related to the bioaerosols are relatively few, and with analysis performed only by traditional techniques (Gangamma, 2011; Srivastava et al., 2011; Pachauri et al., 2013). Therefore it is essential to understand and quantify the impact of bioaerosols on biodiversity with more significant implication for human health and the ecosystem.

## **2.3 Importance of the proposed project in the context of current status**

Indo-Gangetic plain which hosts 40% of the country total population are experiencing drastic change in climate and common public health are suffering from many health related issues like, dengue, chickengunia, monkeygunia, malaria, typhoid, and respiratory and cardiovascular diseases. Increase in the mortality has been associated to the increase in the pollution. Primary biological aerosols are held responsible for deteriorating health status of common public in many urban areas and cities. The allergenic effect of bioaerosols increases in the presence of heavy metals. Hence, investigation on concentration of ambient aerosols and their microbial components are very important. Under twinning activities joint research activities on measurements of aerosol particles ( $\text{PM}_{10}$ , and  $\text{PM}_{2.5}$ ) in Agra, a site over Indo-Gangetic plain, determination of mass concentration, and identification of microbial components in aerosols will be carried out. This twinning activity

will also help in capacity building and start a new research programme on contemporary topics of environmental issues. This study and collaboration will have long term impacts and help in sustainable development.

#### **2.4 If the project is location specific, basis for selection of location be highlighted:**

The present study will be carried out in Agra over Indo-Gangetic Basin. Agra hosts a number of monuments including “Taj Mahal” which is famous all over the world and attracts about 30,000 tourists per day. At the same time it is highly polluted as per WHO. But, there are only a few studies on biological air pollution load and limited to culturable components only. Hence, such kind of study is very much required. Agra is located in north-central India. Two third of its peripheral boundaries are bounded by the Thar Desert of Rajasthan and Agra is, therefore, a semi-arid area. The soil type is a mixture of sand and loam, containing an excess of salts. The climate of Agra has been divided into four seasons winter (December to February), summer (March to June), monsoon (July to September) and post-monsoon (October to November). The wind speed in Agra is mostly calm or moderate condition ( $1-2 \text{ m s}^{-1}$ ). In Agra, sampling was carried out at Dayalbagh, a local site which is 10 km away from the industrial sector of the city where due to agricultural practices vegetation dominates. The entire samples were collected on the roof of the technical college in the campus of Dayalbagh Educational Institute (Deemed University), Dayalbagh, Agra. The sampling site lies at a distance of 2 km from a national highway (NH-2) which has dense vehicular traffic.

### **3. Work Plan:**

#### **3.1 Methodology:**

##### **Sample collection**

PM<sub>10</sub>/PM<sub>2.5</sub> samples will be collected at Dayalbagh during the study period. PM<sub>10</sub>/PM<sub>2.5</sub> will be obtained by using Polltech fine dust sampler. It is a high volume sampler which maintains exact flow rate (16.7 LPM) through the sampler. Glass fiber filter/PTFE will be used for PM<sub>2.5</sub> sample collection. Air sampler is equipped with the blower motor assembly, filter holder, volumetric flow controller, timer, and an anodized aluminum shelter. It draws precise volumes of air through a filter paper of known weight. The pre-desiccated and pre-weighed sterile filter paper will be mounted on the sampler, and sampling will be performed for 24 hours at a flow rate of 16.67 LPM for PM<sub>10</sub>/PM<sub>2.5</sub>.

##### **Mass concentration**

The total mass of aerosol was determined gravimetrically as follows:

$$\text{Concentration } (\mu\text{g} / \text{m}^3) = \frac{\text{Mass of filter paper after sampling} - \text{Mass of filter paper before sampling}}{\text{Total air volume } (\text{m}^3)}$$

Here, the mass of aerosol deposited on the filter paper is the difference in the wt. of filter paper before the sampling and after the sampling, and total air volume ( $\text{m}^3$ ) is the multiplication of flow rate ( $\text{m}^3 / \text{min}$ ) and sampling periods (minutes).



### **Biological characterization of aerosols**

The filter of aerosol samples of PM<sub>10</sub>/PM<sub>2.5</sub> will be divided into two parts. One half will be cut into small pieces and will be taken into 125 ml conical flask. 25 ml E-pure and sterile water will be poured into flask and samples will be kept on an electrical shaker for 3 hours followed by on ultrasonic bath for 10 minutes. The sample will be filtered through filter paper, and aqueous extract will be used for biological characteristics of aerosol. Culture techniques estimated the presence of bacteria and fungi.

### **Preparation of culture media**

Fungi and bacteria will be cultured using Sabouraud Dextrose Agar (SDA) media and Nutrient Agar Media (NAM), respectively.

### **Fungal culture**

The Sabouraud Dextrose Agar (SDA) will be prepared with the following compositions: Peptone 10 g, dextrose 40 g, Agar 20 g, distilled water 1000 ml, and pH 5.6. To assess the ability of fast growth of aero-fungi, fungi will be incubated at 27°C in the SDA media. The fungal spores will be identified morphologically under a light microscope (Motic BA-310 digital Microscope) using oil immersion at a magnification of 40×. The concentration of fungal spores in the air will be expressed as the number of spores per cubic meter of air (spore m<sup>-3</sup>). Fungi will be purified by sub-culturing of desirable colonies appearing on SDA plate till pure form is obtained.

### **Bacterial culture**

Bacteria will be isolated using Waksman's dilution technique, and different concentration will be cultured on nutrient Agar medium (beef extract- 1g, yeast extract- 2 g, peptone- 5g, NaCl- 5g, distilled water 1000 ml) and LB media. The incubated plates will be kept at 35° ± 2°C for one day. As the colony appears on the medium, it will be re-cultured until pure cultures will be obtained. The bacterial spores will be identified morphologically under a light microscope (Motic BA-310 digital) using oil immersion at a magnification of 100×. The concentration of bacterial spores in the air is expressed as the number of spores per cubic meter of air (spores m<sup>-3</sup>).

$$\text{Concentration (cfu m}^{-3}\text{)} = \text{No. of colonies} \times \text{dilution Factor} / \text{Total air volume (m}^3\text{)}$$

They will be further identified based on their biochemical characteristics features by Bergey's Manual of Systematic Bacteriology (Claus and Berkely, 1986).

### **Purification and identification of fungi**

Fungi will be purified by sub-culturing of desirable colonies appearing on SDA plate, till pure form will be obtained. For fungal identification, a small portion of fungus colony will be taken on to a slide containing 4% of NaCl. A drop of cotton blue stain will be added over it immediately and will be left for about 1-2 min. The area will be then covered by a cover slip and will be used for the microscopic examination.

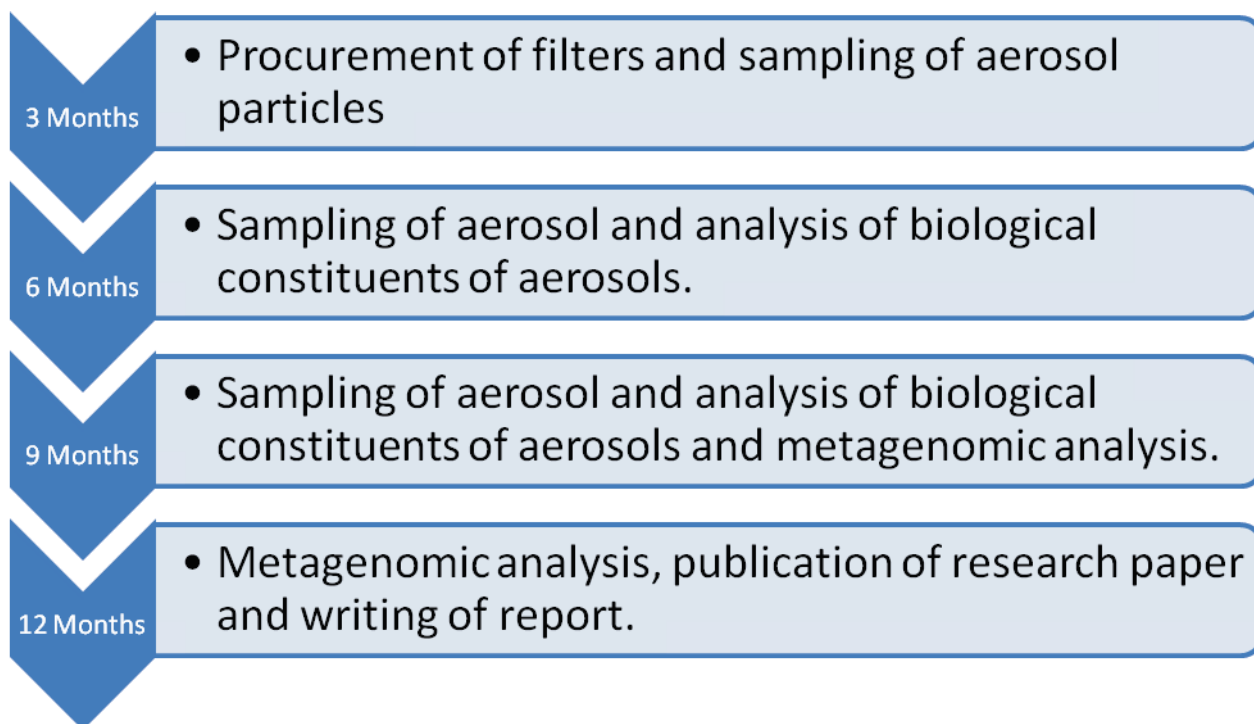
### Metagenomic analysis:

Bioaerosol DNA extraction from air filters will be performed by using power soil DNA isolation kit (MO BIOTM soil DNA isolation kit) and processed according to the protocols mentioned in the kit. The extracted DNA will be stored at -20°C until further analysis. DNA samples will be outsourced for IlluminaMi-Seq (2x300 bp) sequencing to Research and Testing Laboratory (RTL) LLC (Lubbock, TX, USA). The raw sequence reads obtained after Illumina paired end sequencing will be processed using MOTHUR software (Schloss 2009). The two sets of data from each sample will be joined to form contigs and further processed to reduce the sequencing and PCR errors. Sequences shorter than 350 nucleotides with homopolymers longer than 8 nucleotides and all reads containing ambiguous base calls or incorrect primer sequences will be removed (Kozich et al. 2013). The improved sequences will be further processed to remove redundant sequences. Next, the processed sequences will be aligned against SILVA v132 database, (Pruesse et al. 2007) available at [http://www.mothur.org/wiki/Alignment\\_database](http://www.mothur.org/wiki/Alignment_database). Putative chimeric sequences will be detected and removed via Chimera Uchime, which is an integrated algorithm in MOTHUR. All taxonomic classification will be performed using Bayesian classifier (Qiong et al. 2007), using a Greengenes dataset (gg\_13\_8\_99) available at [https://www.mothur.org/wiki/Greengenes-formatted\\_databases](https://www.mothur.org/wiki/Greengenes-formatted_databases). Data will be normalized to obtain seven taxonomic levels for each sequence at 80% Naïve Bayesian bootstrap cut-off with 1000 iterations. Operational taxonomic units (OTUs; at 97% and 98% sequence similarity) will be calculated using the Mothur platform. The undesirable sequences belonging to Mitochondria, Chloroplast, Archaea and Eukaryota will be removed. The constructed OTU table will be corrected to comply with current official nomenclature (List of Prokaryotic names with Standing in Nomenclature: LPSN-[www.bacterio.net](http://www.bacterio.net)). The rarefaction analysis will be carried out using rarefaction single function of Mothur and alpha diversity will be estimated by calculating the diversity indices like Inverse Simpson, Shannon diversity (H) and Observed richness by sub sampling. The statistical analysis will be carried out using PAST v3.18 (Hammer et al. 2001). The statistical tests like ANOVA and Tukey post-hoc tests will be used to detect remarkable differences in diversity indices between Bioaerosol samples. To further examine the community relationship among all the bioaerosol samples non-metric multi-dimensional scaling (NMDS) by using Bay-Curtis distance. The number of shared OTUs among all the samples will be calculated and represented using a Venn diagram (subsamped OTU table) by Mothur. The distribution of potential pathogenic bacteria/fungi will be deduced from metagenome.

### References:

- Schloss PD (2009) A high-throughput DNA sequence aligner for microbial ecology studies. *PLoS One* 4:e8230.
- Qiong W, George MG, James MT and James RC (2007) Naive Bayesian Classifier for Rapid Assignment of rRNA Sequences into the New Bacterial Taxonomy. *Appl Environ Microbiol* 73:5261-5267.
- Hammer O, Harper DAT, Ryan PD (2001) PAST: Paleontological statistics software package for education and data analysis. *Palaeontologia Electronica* 1:9.
- Kozich JJ, Westcott SL, Baxter NT, Highlander SK, Schloss PD (2013) Development of a dual-index sequencing strategy and curation pipeline for analyzing amplicon sequence data on the MiSeqIllumina sequencing platform. *Appl Environ Microbiol* 17:5112-5120
- Pruesse E, Quast C, Knittel K, Fuchs BM, Ludwig WG, Peplies J, Glöckner FO (2007) SILVA: a comprehensive online resource for quality checked and aligned ribosomal RNA sequence data compatible with ARB. *Nucl Acids Res* 35:7188-7196.

### 3.2 Time Schedule of activities giving milestones through BAR diagram.



### 3.3 Suggested Plan of action for utilization of research outcome expected from the project.

The proposed study will provide detail information about the mass concentration of PM10 and Pm2.5 along with biological components. This study will be first of its kind in which the concentration of culturable and non culturable bacteria and fungi in the aerosol particle would be obtained. Health risk assessment of bioaerosol will give information on the role of bioaerosol in hospital admission and will help in taking control measures. Data obtained can be used for regional health model as well as a regional climate model because bioaerosols are organic in nature.

### 3.4 Environmental impact assessment and risk analysis.

Health risk assessment analysis will be performed by establishing the relationship between the concentration of bacteria and fungi and hospital admissions. The information on hospital admission will be obtained from OPD of prominent hospital in Agra.

## 4. Expertise:

### 4.1 Expertise available with the investigators in executing the project:

**Dr. Ranjit Kumar** has 16 years of research experience in the area of atmospheric science. His main research area is trace gas and aerosol measurements and characterization; wet deposition and dry deposition chemistry and modeling; black carbon radiative forcing;



bioaerosol, climate change, and public health. He has published more than 39 research papers in National and International journal of repute including one in World 1st ranked Journal in the field of Environmental Engineering and contributed papers in more than 70 seminars/conferences in India and abroad. He has completed and involved in many research projects funded by CSIR, DST (2), ISRO-GBP (2), UGC (2), MHRD (1) as a PI and Co-PI. Dr. Kumar was Visiting Faculty in the Department of Energy, Environment and Chemical Engineering at Washington University in St. Louis, USA. He has visited Germany, Nepal, and the USA. His research has wide recognition as he has received many National and International awards like ISCA Young Scientist Award 2002, NESI Young Scientist Award 2004, AGU START Young Scientist Award 2004, Fast Track Young Scientist Project Award 2004, DST Award for 55th Meeting of Nobel Laureates and Young Scientist at Lindau, 2005, Berkner Fellowship by American Geophysical Union, USA, 2008; UGC Raman Fellowship 2013 etc. He is Fellow of Society of Earth Scientists, Lucknow and Indian Council of Chemists, Agra. He is elected Member of National Academy of Science, India and Member, Core Committee, INYAS, INSA, New Delhi. He is also a member of many scientific societies viz., NESI, New Delhi; IASTA, Mumbai; IAAPC, Baroda, SSI, Trivandrum; ISCA, Kolkata; COSPAR (Committee on Space Research), USA; Affiliate Member, IUPAC; USA, etc. Recently he has been bestowed with Member, INYAS (Indian National Young Academy of Sciences), INSA, New Delhi in 2017. He was member Core Committee of INYAS.

**Dr. Ashok Yadav** is Associate Professor in the Department of Mechanical Engineering, Faculty of Engineering, Dayalbagh Educational Institute (Deemed University), Dayalbagh, Agra. He has wide experience of teaching and research in the field of environmental sustainability.

**Prof. Ch. Sasikala** received an M.Sc. degree in Applied Microbiology from the Bharatiar University, Coimbatore and (1986) and a Ph.D. in Microbiology from Osmania university, Hyderabad (1990). After a post-doctoral period at the same University, she joined JNT University Hyderabad in 1996, where she started her own lab. She is currently a professor of Environmental science and technology at the Centre for Environment, IST, JNT University Hyderabad, India. She is also presently the Chairperson of Board of studies. Dr. Sasikala's research interests are in the area of bacterial diversity, metabolomics and bioprospecting for environmental management and in biotechnology, specifically with respect to anaerobic bacteria. Genetic diversity studies through metagenome analysis have enabled guest mates of bacterial diversity while cultured diversity studies have resulted in the valid description (i.e., publication in International Journal of Systematic and Evolutionary Microbiology) of over 130 new species, 14 new genera, 1 new family and 1 new order in addition to several reclassifications. She is elected as a member of "International Committee on systematic of prokaryotes: Subcommittee on the taxonomy of phototrophic bacteria". She is recipient of State award for Meritorious teachers-2016 by Government of Telangana and Prof. B.N. Johri award for microbial diversity of Association of Microbiologists of India in 2016.

**4.2 Summary of roles/responsibilities for all Investigators:**

S.No.	Name of the Investigators	Roles/Responsibilities
1.	Dr. Ranjit Kumar (DEI)	Co-Principal Investigator (Will be involved in analysis of biological constituents of aerosols and interpretation of results)
2.	Dr. Ashok Yadav (DEI)	Principal Investigator (Will look after sampling and logistics)
2.	Dr. Ch. Sasikala (JNTUH)	Principal Investigator (Will be involved in metagenomic analysis of aerosols and interpretation of findings)

**4.3 Key publications published by the Investigators pertaining to the theme of the proposal during the last 5 years****Publication of PI**

- **Ranjit Kumar** and K. Maharaj Kumari. Measurement of near ultrafine S aerosol at a semiarid region in India. National Academy Science Letter 35(3), 177–180, 2012.
- **Ranjit Kumar**, S.S. Srivastava and K. Maharaj Kumari. Experimental and parameterization method for evaluation of dry deposition of acidifying S compounds to natural surfaces (*Cassiasiamaea*). Atmospheric and Climate Sciences 2 (4), 492-500, 2012.
- **Ranjit Kumar**, J.N. Srivastava, G.P. Satsangi, Mamta and K. Maharaj Kumari. Bioaerosol: A new research perspective in Climate change. Earth Science India, 2013 (Accepted).
- Nupur Raghav, J.N. Srivastava, G.P. Satsangi and **Ranjit Kumar**. Investigation on abundance of microbial communities in ambient air over urban site in semi-arid region. Journal of Energy Research and Environmental Technology 2 (5), 375-378, 2015.
- **Ranjit Kumar**, Sudhir Kumar Verma and K. Maharaj Kumari. Chemical characterization of depositing materials onto building surfaces. Proceedings of National Conference on Recent Advances in Chemical and Materials Sciences, 124- 128, 2015.
- Mamta, J.N. Srivastava, G.P. Satsangi and **Ranjit Kumar**. Assessment of bioaerosol pollution over Indo-Gangetic plain. Environmental Science and Pollution Research 22 (8), 6004-6009, 2015.
- **Ranjit Kumar** and K. Maharaj Kumari. Characterization of aerosols and trace gases in Indo- Gangetic plain. Urban Climate 12, 11-20, 2015.

- **Ranjit Kumar** and K. Maharaj Kumari. Evaluation of dry deposition of acidifying N compounds to vegetation. *Environmental Science and Pollution Research* 22(23), 18437-18445, 2015.
- P. Gupta, S. P., Singh, A. Jangid and **Ranjit Kumar**. Estimation of physical and optical properties over Indo-Gangetic basin in India. Session. *Proceeding of IASTA Bulletin* 22(1 & 2), 495-497, 2016, ISSN 09714510.
- Mamta., P. Gupta, G.P. Satsangi and **Ranjit Kumar**. Atmospheric bioaerosols: characterization and deposition. *Proceeding of IASTA Bulletin* 22(1 & 2), 288-290, 2016, ISSN 09714510.
- Mamta, J.N. Srivastava, G.P. Satsangi and **Ranjit Kumar**. Biogenic constituents of respirable aerosol over semiarid region. *Journal of Chemical Biological and Physical Sciences* 6 (4), 123-132, 2016.
- Pratima Gupta, Ashok Jangid and **Ranjit Kumar**. A study on monitoring of air quality and modeling of pollution control. *IEEE Region 10 Humanitarian Technology Conference (R10-HTC)* DOI: 10.1109/R10-HTC.2016.7906800 2016.
- Pratima Gupta, Shalendra Pratap Singh, Ashok Jangid and **Ranjit Kumar**. Measurements and characterization of black carbon in ambient air of city of Taj over Indo-Gangetic: seasonal variation and meteorological influence. *Advances in Atmospheric Sciences* 34, 1082-1094, 2017.
- Rohini Singh, Pratima Gupta, Ashok Jangid, Anshumala Sharma, Ranjit Kumar, 2018. A one year study on assessment of fractionated aerosol at a semiarid region over Indo-Gangetic basin. *Clean, Soil, Air and Water*. doi.org/10.1002/clea.201800040.
- Pratima Gupta, Ashok Jangid and **Ranjit Kumar**, 2018. Measurement of PM<sub>10</sub>, PM<sub>2.5</sub> and Black Carbon and assessment of their health effects in Agra, a semiarid region of India. *Proceeding of the Indian National Science Academy*. (Accepted).
- Pratima Gupta, Ashok Jangid, Sahab Das and **Ranjit Kumar**. Speciation of carbon soot particle and source interpretation. *Journal of Geophysical Research*, 2018 (Under review).

### Chapter in book

- Ranjit Kumar and Pratima Gupta. A chapter on “Air Pollution control policies and regulations” in a book entitled “Air Pollution and Plant Health: Climate Change Perspectives” (Editors: Prof. UC Kulshrestha and Dr. Pallavi Saxena), Chapter 12, Springer, page no. 133-149, 2016.
- Ranjit Kumar, Vineeta Deewakar, J.N. Srivastava and K. Maharaj Kumari. Biochemical characteristics of aerosol at a sub urban site. “Chemistry of Phytopotentials: Health Energy and Environmental Perspectives” (editors - M.M. Srivastava, L.D. Khemani and S. Srivastava). DOI: 10.1007/978-3-642-23394-4\_79, Springer-Verlag Berlin Heidelberg, page 373-375, 2011.

**Publication of Ch. Sasikala in the last 5 years (78)**

**Important publications in the proposed research area are given below.**

- Kumar Gaurav; Dhanesh kumar; Jagadeeshwari Uppadda; **Sasikala Ch**; Ramana Ch, V.(2019) Metagenomic insights into the not-yet-cultivated diversity of Planctomycetes of Chilika lagoon and descriptions of exospore producing *Roseiconus lacunae* gen. nov. sp. nov., *Pararoseiconus nitratreducens* gen. nov. sp. nov. Systematic and applied microbiology (communicated)
- Kumar Gaurav; Radha Vaddavalli; Jagadeeshwari Uppada; **Sasikala Ch**; Ramana Ch, V. (2019) Sponge-associated Planctomycetes" Brazilian Journal of Microbiology (Communicated)
- G Suresh; Dhanesh Kumar; Krishna A; **Sasikala Ch**; Ramana Ch.V., Ph.D (2019) *Rhodobacter sediminicola* sp. nov., isolated from a fresh water pond of Gujarat Int. J. Syst. Evol. Microbiol. (Accepted Ms No. IJSEM-D-19-00586)
- Suresh, Tushar, **Sasikala, Ch** and Ramana, Ch. V. (2019) Taxogenomics resolved the conflict of the genus *Rhodobacter*: A two and half decades pending thought to reclassify the genus *Rhodobacter*. Frontiers in Science Research Integrity (accepted)
- Suresh, Dhanesh Kumar, Jagadeeshwari Uppada, **Sasikala Ch**, Ch V Ramana (2019) *Rhodomicrobium lacus* sp. nov., an alkalitolerent bacterium isolated from Umiam lake, Shillong, India Int. J. Syst. Evol. Microbiol (Accepted Ms. No. IJSEM-D-19-00001R1)
- Anusha Rai, Indu, N. Smita, G. Deepshikha, K. Gaurav, K. Dhanesh, G. Suresh, Ch. **Sasikala**, and Ch. V. Ramana (2019) Emerging Concepts in Bacterial Taxonomy Microbial Diversity in Ecosystem Sustainability and Biotechnological Applications Book Subtitle Volume 1. Microbial Diversity in Normal & Extreme Environments ISBN:978-981-13-8314-4 (**Chapter in book**)
- T. S. Sasi Jyothsna; K. Rahul; Saikat Dutta; **Ch. Sasikala** and Ch.V. Ramana (2019) Phylogenetic Diversity of Sulfate Reducing Bacteria of Sediments of Chilika Lake, India, determined through analysis of the Dissimilatory Sulfite Reductase (dsr AB) genes 3Biotech 9:134- 139

**5. List of Projects submitted/implemented by the Investigators:****5.1 Details of Projects submitted to various funding agencies: NA**

S. No	Title	Cost in Lakh	Month of submission	Role as PI/Co-PI	Agency	Status



**5.2 Details of Projects under implementation**

S. No	Title	Cost in Lakh	Duration	Role as PI/Co-PI	Agency
<b>Dr. Ranjit Kumar</b>					
1.	Characterization of physical and optical properties of aerosol at Agra in Indo-Gangetic plain	71.0	2013-18	PI	ISRO-GBP
<b>Dr. Ch Sasikala</b>					
2.	Biodegradation of Pharmaceuticals and Personal Care Products (PPCPs): PPCP degrading bacterial diversity and their potential application in the wastewater treatment	10.0	2018- 2020	PI	UGC (midcareer award grant)
3.	Anoxygenic phototrophic bacterial diversity of marine habitats of India	2.0	2018-2019	PI	TEQIP
4.	Carbon sequestration using anoxygenic photo autotrophic bacteria: Potential exploitation for Climate Change Mitigation	10.0	2019-2021	PI	AICTE (Research Promotion Scheme)
5.	Studies on Microbial ecology, diversity and their Bioprospecting for Environmental Management	10.0	2019-2021	PI	AICTE (MODRO BS)

**5.3 Details of Projects completed during the last 5years**

S. No	Title	Cost in Lakh	Duration	Role as PI/Co-PI	Agency
<b>Dr. Ranjit Kumar</b>					
1.	A study on bioaerosols in TSPM, PM <sub>10</sub> and PM <sub>2.5</sub> at a suburban site	20.50	2012-15	PI	DST
2.	A study on biochemical characteristics of aerosols at an urban site of Indo-Gangetic plain	11.45	2012-15	PI	UGC
<b>Dr. Ch Sasikala</b>					
3.	Marine anaerobic bacteria diversity for the production of antimicrobials	40.00	2013-2017	PI	MoES
4.	Bacterial hopanoids as chemotaxonomic markers: A study on the genus <i>Rhodovulum</i>	2.0	2015-2017	PI	TEQIP
5.	Petroleum hydrocarbon (PTH) degrading bacterial diversity and their potential application in bioremediation of petroleum contaminated sites	2.0	2015-2017	PI	TEQIP
6.	Ecology of Halo-Anoxygenic phototrophic bacteria of marine habitats of Gujarat	47.05	2014-2018	PI	MoES

**6. List of facilities being extended by parent institution(s) for the project implementation.**

**a. Infrastructural Facilities**

<b>Sr. No.</b>	<b>Infrastructural Facility</b>	<b>Yes/No/ Not required Full or sharing basis</b>
1.	Workshop Facility	Yes
2.	Water & Electricity	Yes
3.	Laboratory Space/ Furniture	Yes
4.	Power Generator	Yes
5.	AC Room or AC	Yes
6.	Telecommunication including e-mail & fax	Yes
7.	Transportation	Yes
8.	Administrative/ Secretarial support	Yes
9.	Information facilities like Internet/Library	Yes
10.	Computational facilities	Yes
11.	Animal/Glass House	Not Required
12.	Any other special facility being provided	-

**b. Equipment available with the Institute/ Group/ Department/Other Institutes for the project:**

<b>Equipment available with</b>	<b>Generic Name of Equipment</b>	<b>Model, Make &amp; year of purchase</b>	<b>Remarks including accessories available and current usage of equipment</b>
<b>PI &amp; his group (DEI)</b>	1. PM <sub>10</sub> Sampler 2. PM <sub>2.5</sub> Sampler 3. PM <sub>1</sub> Sampler 4. Trace gas measurements unit 5. CO <sub>2</sub> Analyzer 6. Spectrophotometer 7. Aethalometer 8. Multi-wavelength Radiometer 9. Pyranometer 10. Automatic AWS10.0 (Rave Innovations) Weather Station 11. Microscope 12. Ultrasonic bath 13. Laminar flow 14. BOD Incubator	Envirotech/Polltech Polltech Instruments Envirotech Envirotech Rave Innovations Systronics M&G Analyzer SPL Delta Ohm Rave Innovations Motic Sarthak Scientific Zenith Zenith	

	15. Autoclave 16. Microwave oven	Zenith LG	
<b>PI's Department</b>	17. E-pure Deioniser 18. Ion Chromatograph	Barnstead/Thermolyne  Dionex Dx-500 anion columns (AS11A) Self regenerating.	
<b>Principal Investigator (IST- JNTUH)</b>	PCR PCR GC DGGE Spectrofluorimeter Microplate reader Gel Documentation Micropipette Bacteriological incubator Incubator shaker Laminar Air Flow Chambers UV Spectrophotometer Phase contrast microscope Phase Contrast microscope FT IR HPLC	BIO-RAD Eppendorf Shimadzu 14B Bio-rad Perkin Elmer (LS45) Epoch Biotech Bio-Rad (Gel Doc EZ) Pipetteman Cintex Heidolph  Shimadzu UV-1800 Olympus BX 40  Leica  Perkin Elmer Shimadzu Shimadzu LC-20AD	All the instruments are in good working condition and under use.

7. **Name and address of experts/ institution interested in the subject / outcome of the project.** Central Pollution Control Board, State pollution control Board, Ministry of Environment, Forest and Climate change. Researchers in the area of air pollution research, doctors, pulmonologists and epidemiologists.

**PROGRAM BUDGET**

	Particulars	Amount		Total
		DEI	JNTUH	
<b>Travel</b>	Transportation charges Students/Researcher/Teacher (@ 12,000.00 per person per visit for teacher (two visits) @ 10,000.00 per person per visit for student (two visits))	50,000.00	Nil	88,000.00
	Lodging, meals and incidental expenses for <b>Collaborator</b> Students/Researcher/Teacher	15,000.00 (for 3 days @ each visit)	Nil	18,000.00
<b>Consumables</b>	Consumables/Chemicals/Filters etc	1,35,000.00	20,000.00	1,24,000.00
<b>Outsourcing</b>	Outsourcing for metagenome sequencing (for 40 samples, either for 16 S r RNA amplicon sequencing or shotgun sequencing or metagenome assembled genome sequencing through metagenome binning)	0.00	1,80,000.00	1,80,000.00
<b>Total</b>		<b>2,00,000.00</b>	<b>2,00,000.00</b>	<b>4,00,000.00</b>

**PARTICIPANT STATISTICS****Proposal for a Partnership between: Dayalbagh Educational Institute, Agra & J.N.T.U,  
Hyderabad under twinning activities of TEQIP****Anticipated Number of D.E.I. Participants in Exchange Visit:**Males: **02**Females: **02**Participants' Occupations: **Teaching**Teachers/Faculty: **02**Researchers: **01**Graduate Students: **01**

Other (please specify):

**Anticipated Number of J.N.T.U.H. Participants in Exchange Visits:**Males: **Nil**



Females: **02**

Participants' Occupations: **Teaching and Research**

Teachers/Faculty: **01**

Researchers: **01**

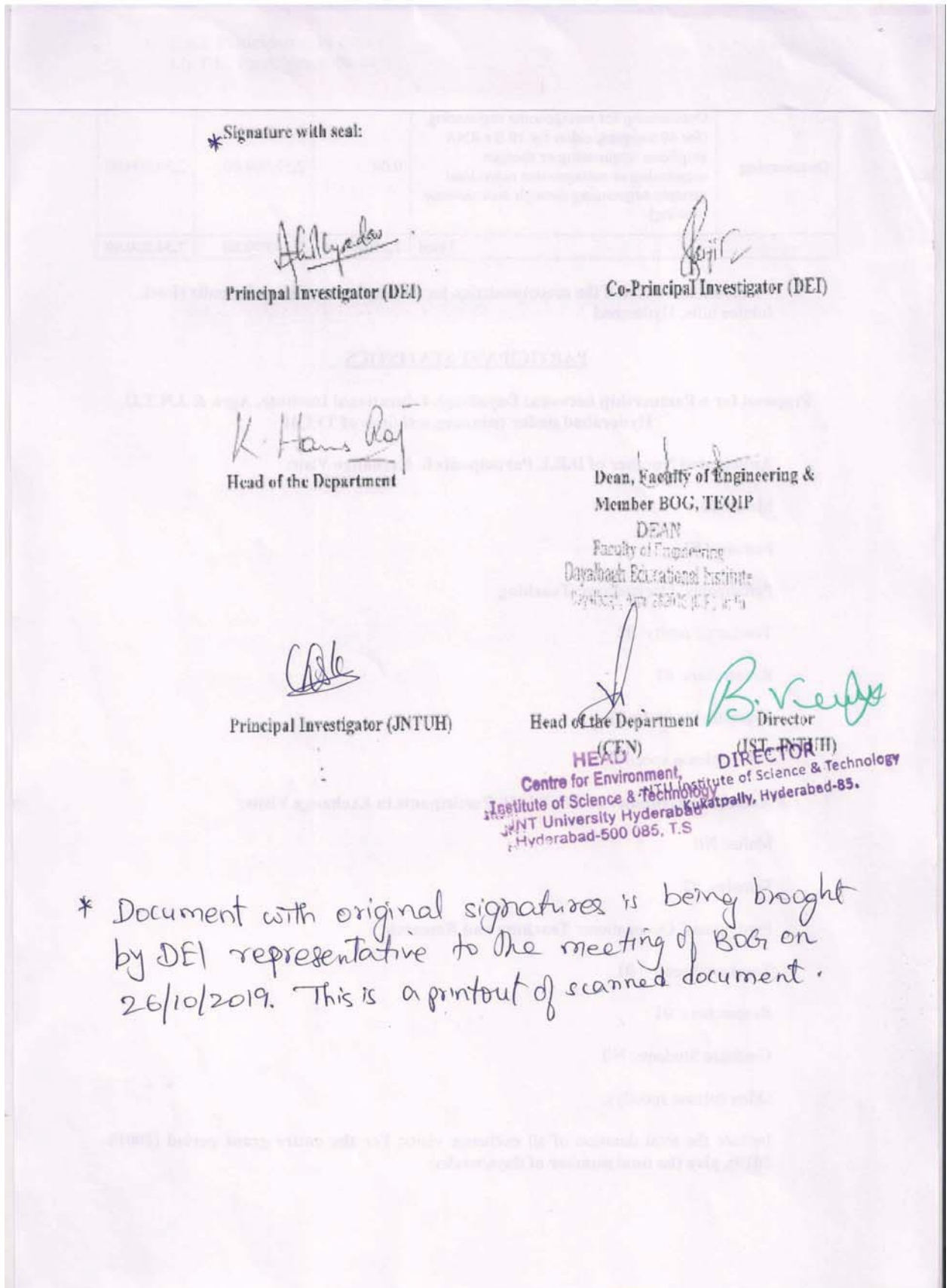
Graduate Students: Nil

Other (please specify):

Include the total duration of all exchange visits: **For the entire grant period (2018-2019), give the total number of days/weeks:**

D.E.I. Participants: **10** days

J.N.T.U. Participants: **06** days



**The following twinning proposal had been considered in the BoG Meeting on 30.11.2019, but was deferred with a request for resubmission in the proper format. The resubmitted twinning proposal may be considered for funding with a matching grant of Rs. 2 lakhs**

**TEQIP-III project proposal**

**1) Project title:** LPG Gas sensing Hybrid Nano Structures (Graphene/ Oxide Nano material / Bacterial Protein).

**2) Name of the PI: Name:** Dr. K.Venkateswara Rao

**Designation:** Professor of Nano technology

**Institute:** Institute of science and technology (IST), JNTUH.

**Telephone & Mobile No. :** 040-23050876 & 09440858664

**E-mail:** kalagadda2003@gmail.com, [kalagadda2003@jntuh.ac.in](mailto:kalagadda2003@jntuh.ac.in)

**3) Name of the Co PI: Name:** Dr. Rahul Swarup Sharma

**Designation:** Professor of Engineering

**Institute:** Department of Mechanical Engineering. Dayalbagh Educational Institute (Deemed University)

**Telephone & Mobile No. :** 0562-6548399 &

**E-mail:** [rahulswarup@dei.ac.in](mailto:rahulswarup@dei.ac.in), [rahulswarup.sharma@gmail.com](mailto:rahulswarup.sharma@gmail.com)

**4) Amount of Rs in lakhs (2,00,000/-+2,00,000/-)= 4,00,000/-**

**5) Name of the centre:** Centre for nano science and technology (CNST), Institute of science and technology (IST), JNTUH, Hyderabad-500085.

**6) Brief literature review on the Topic :**

The fabrication of different novel sensors with high response detection or a lower limit of detection (LOD) for gas sensing application using graphene has become a popular research field owing to its unique electrical properties, high surface-to-volume ratio, high electron transfer rate, high mechanical properties and outstanding flexibility compare to other carbon materials. Even though the gas sensing response of reduced graphene oxide (graphene) is large and more rapid but they get strongly affected by relative humidity at RT, slow recovery, poor selectivity, detection limit and repeatability which limits their practical application. A further incident that has attracted a great deal of interest towards this material is the advent of decorating rGO with various metal oxide NPs. By altering, the degree of loading the resulting hybrid nanomaterials properties can be fine-tuned, as well as the NPs decorated on the rGO sheets.

LPG (liquefied petroleum gas) a colorless, slight irritant and easily explosive gas, also referred as simply mixture of hydrocarbons such as propane ( $C_3H_8$ ) and butane ( $C_4H_{10}$ ) as well as ethyl mercaptan (ethane thiol) and similar sulfuric compounds in small amounts for odorization, which is mostly used in cooking, Rural heating, autogas , refrigeration . However, LPG gas has a flash point of  $-104\text{ }^\circ\text{C}$  and an explosion limit of  $1.8 \sim 8.8\%$ . This means that it is explosive, and has a threat to the property and life safety of people and LPG can cause cold burns if in contact with the skin, or act as an asphyxiant (meaning you won't be able to breathe) if present in high concentrations . In addition, the toxic and noxious gases of carbon monoxide and carbon dioxide produced from LPG combustion are a hidden danger to human body health. Hence, the detection of the LPG is necessary.



Graphene, a unique two-dimensional material with a hexagonal lattice, has drawn a wide attention due to its idiosyncrasy properties such as zero band gap, large surface area, high stability, and distinct electron transport behaviour. A graphene merging with evenly distributed nanoparticles/Metal-Metal oxide on the surface could lead to a well-defined novel graphene with an exceptional surface area. In addition, the Metal-Metal oxide nano structures could act as a stabilizing agents against the agglomeration of individual graphene sheets, which is principally caused by a strong Vander Waals interconnection between graphene layers. The comprisal of such nanostructures on the graphene surface is vastly convetable for tuning band gap, surface morphology, and electronic properties in glucose sensing.

Nano structured metal oxides have attracted considerable interest in the past decade because of their unique properties as well as their potential industrial applications. Semiconductor nanomaterials have attracted remarkable attention in recent years due to novel optical, electrical and mechanical properties. Nano structured metal oxides have so many applications such as chemical sensors, humidity sensors, optical sensors, pressure sensors, lithium ion batteries, electrochemical performance for energy storage, dye-sensitized solar cells, catalytic and photocatalytic, environmental remediation, field emission non-volatile memory and tunneling devices, bio-ceramic coating applications, Nano generators etc., 13-19. The earliest commercial gas sensor comprised of a hot platinum wire (Arai et al., 1986). Basically, the platinum filament is maintained at several hundred degrees centigrade and via catalysis it will detect any

combustible gas in air. Such a phenomenon will cause a rise in temperature in the platinum wire and a measurable increase in resistance. For example, 1000 ppm of isobutene will show an output signal of a few millivolts via a resistance bridge circuit. The sensor was improved by introducing a catalyst such as palladium as done by Baker (1959). The output signal increased to a magnitude of 15 –20 mV. However, the setback was that the catalyst deteriorated with time but modern versions of the sensor known as pellistors and is still being used in coal mines until today (Ihokura and Watson, 1994).

### **Review of status of Research and Development in the subject**

- kalagadda venkateswara rao et al [2017] fabricated ZnFe<sub>2</sub>O<sub>4</sub>/B. subtilis hybrid nanostructures working at low temperatures where the crystallinity and protein concentration in the sample was evaluated by the XRD and Bradford method . The aim of the experiment concluded that proteins enhance the sensitivity of sensors at low temperature compared to sensors without proteins. The fabricated hybrid sensor showed excellent stability for 30 days with a constant temperature at 400 ppm of LPG, and further showed an excellent sensitivity at low temperatures. These fabricated sensors can be implemented as gas leakage detectors in various industries, gas cars, domestic areas, hotels, and factories.
- kalagadda venkateswara rao et al [2017] for the first time reported the comparison of ZnO nanomaterials by chemical and green methods. The morphology, crystalline size, sensitivity and particle size vary towards LPG with respect to the preparation method. The relationship between synthesis and

sensitivity in these devices is precisely investigated. The final conclusion informed that the biosynthesized ZnO exhibits alike properties of ZnO prepared by chemical method. The sensing responses towards LPG were also nearly approximate. For detecting trace-level gases, these eco-friendly and economical green synthesized nanomaterials are suggested.

- kalagadda venkateswara rao et al [2017] this paper describes thin films preparation by mSILAR. Properties like temperature sensitivity, photo sensitivity, and gas sensitivity of ZnO and ZnO/PANI is investigated. These designed eco-friendly and non-toxic sensors structural and electrical properties variations are compared before and after coating with PANI. PANI improved the porosity and surface activities and enhanced the photocurrent and photoconductivity. Comparison of sample properties with and without electron beam irradiation showed that the ZnO/PANI is more sensitive when irradiated. ZnO/PANI sensor shows excellent LPG gas sensitivity, stability and high selectivity compared with other analyte gases. The ZnO/PANI can be well advised as a good composite for temperature, gas, and photo sensing with fast recovery and response time, with the ability to tune the sensing by electron beam irradiation.

- Subramanian et al [2007][12] Prepared P-type porous silicon structure with Pore diameter 25  $\mu\text{m}$  by anodic electrochemical etching process, developed Pd: SnO<sub>2</sub>/PS/p-Si heterojunction with top gold ohmic contact and studied Sensing properties of the device towards liquefied petroleum gas (LPG) and NO<sub>2</sub> gas. They estimated maximum sensitivity and optimum operating

temperature of the device towards LPG and NO<sub>2</sub> gas as 69% at 180 °C and 52% at 220 °C, respectively. They also calculated response time of 25 and 57 s for sensing LPG and NO<sub>2</sub> gases, respectively.

- Salunkhe et al [2008][13] fabricated Liquefied petroleum gas (LPG) sensors using cadmium oxide nanorods obtained by a chemical bath deposition (CBD) method. The response of the CdO nanorod network to LPG was improved significantly after palladium (Pd) sensitization by a dip and dry method. The LPG sensing properties of the unsensitized and Pd-sensitized CdO were investigated at different operating temperatures and LPG concentrations. The unsensitized CdO exhibited the maximum response of 14% at 698K upon exposure to 0.1 vol% of LPG that was improved up to 35% at an optimum operating temperature of 548K after the Pd sensitization. The Pd-sensitized CdO film showed more selectivity towards LPG as compared to CO<sub>2</sub>.
- Anil et al [2007] [14] fabricated Nano-SnO<sub>2</sub>-based thick-film resistors using screen printing technology. They studied the effect of firing temperature in the range 425–850°C. The Sensors fired at 750°C showed the highest sensitivity and selectivity for H<sub>2</sub>, CO, and LPG at 140°C, 210°C, and 180°C, respectively, with a response and recovery time of 12 and 22 s.
- R. Y. Borse and A. S. Garde [2008] [15] et al, deposited thick films of tin-oxide (SnO<sub>2</sub>) on alumina substrates employing screen-printing technique by The films were dried and fired at 680°C for 30 minutes. The variation of D.C. resistance of thick films was measured in air as well as in H<sub>2</sub>S gas atmosphere



as a function of temperature. The SnO<sub>2</sub> thick films studied were also showing decrease in resistance with increase of concentration of H<sub>2</sub>S gas.

- Qingrui Zhao et al [2006] [16] et al, prepared Tin oxide (SnO<sub>2</sub>) hollow nanospheres from mixed ethanol and water systems containing the surfactants sodium dodecyl benzenesulfonate (SDBS) and terephthalic acid. by In the present work, the assynthesized SnO<sub>2</sub> hollow nanospheres exhibit excellent room-temperature ethanol sensitivity and potential catalytic ability towards the electrooxidation of ethanol, and thus are expected to be economical alternative catalysts and useful in industrial applications such as room-temperature gas sensors.
- Yadav et al [2008] [17] developed Fluorine doped tin oxide (F: SnO<sub>2</sub>) films prepared onto the amorphous glass substrates by spray pyrolysis and Gas sensing properties have been checked against combustible gases. The direct optical band gap energy for the F: SnO<sub>2</sub> films were found to be 4.15 eV. The H<sub>2</sub> sensitivity of the F-doped SnO<sub>2</sub> sensor was found to be increased which is discussed in terms of increased resistivity and reduced permeation of gaseous oxygen into the underlying sensing layer due to the surface modification of the sensor.
- Lars riis damgaard et al[2001] [18] measured a high spatial and temporal resolution using microscale biosensor for methane. The homogenised biofilm was able to maintain 50% of the methanogenic activity in the absence of external electron donor. Oxygen had only a minor effect on the methane production, but aerobic respiration consumed a substantial part of the produced

ethane and was thus an important control on methane export from the biofilm. A concentration of 2mmol-1 nitrate was shown to inhibit methanogenesis only in the upper layer of the biofilm, whereas a further addition of 2mmol-1 sulphate inhibited methanogenesis in the entire biofilm. The study demonstrated the power of the methane microsensors in the study of microhabitats with concurrent production and consumption of methane.

- Andréa dos Santos Rodrigues et al [2009] [19] observed that the microbial oxidation of methane in the atmosphere is performed by methanotrophic bacteria that use methane as a unique source of carbon and energy. The objective of this work consisted of the investigation of the best conditions of methane biodegradation by methanotrophic bacteria *Methylosinus trichosporium* OB3b that oxidize it to carbon dioxide, and the use of these microorganisms in monitoring methods for methane.
- Sonali L. Darshane et al [2008] [20] have prepared Zinc ferrite ( $ZnFe_2O_4$ ) nanoparticles using sodium chloride as a growth inhibitor. Single-phase formation of spinel zinc ferrite having crystallite size in the range of 15–20 nm was observed by XRD and confirmed by TEM. In this work, the gas-sensing properties of these zinc ferrite nanoparticles towards ethanol, LPG,  $H_2$ ,  $NO_x$ ,  $SO_x$ , and  $H_2S$  have been studied. It has been found that they exhibit excellent selective sensitivity toward 200 ppm of  $H_2S$  at the operating temperature of 250°C, and thus this nanosized ferrites are expected to be useful in an industrial application as a potential  $H_2S$  gas sensor.

**7) Statement of the problem :**

One of the known current problem faced by the world today is serious burns, multiple injuries, accidents, death, caused by LPG, NO<sub>2</sub>, CO and CO<sub>2</sub> gas leakage. The blast shock waves of LPG cylinders can leak and cause severe damage to lungs and bleed or swell up due to the impact. Ears, hollow organs of the gastrointestinal tract are also severely injured. There may also be hidden brain injury and potential neurological consequences. Some people may experience post-traumatic stress disorder due to the psychological trauma. On the whole it affects a persons health and property. Globally 5 – 10 people are Dead per second as a result of gas leakage damages. science has put a barrier to minimize these human death related issues by designing many electronic devices which are there from since decades in use, but one of the recent advances was in the stream of gas sensors to detect these hazardous and flammable gases. The present market availability of the gas sensors wakens at its high price, environmental free chemicals, lack of reproducibility, durability, production at large scale.

To overcome the above problems, the proposal highlights at fabricating gas sensor by the use of environmental free bacteria at a low cost .

## **8) Project objectives :**

Significance of the expected outcome with respect to the benefit of the society:

We can expect the following benefits to society:

- By using this natural, eco-friendly, economic photosynthetic Bactria as a gas sensing material, we can reduce the hazardous chemical usages & cost of the sensor.

- Using this bacteria we can detect explosives, poisonous gases detects rapidly at fraction of seconds which is possible through photosynthetic proteins, reduces the damages and saves the human lives as a consequence.
- These photosynthetic bacteria are available abundantly in the soil surface and so it is a low cost processes, hence fabricated gas sensor can be obtained at low cost when compared to the conventional or commercial gas sensors.
- These bio-nano material based hybrid gas sensor is a flexible, foldable, wearable and it can be used in direct applications for detection of poisonous gases in coal mines and military uniforms, etc.

## 9) Methodology:

↗ **Isolation of microbial species:** For isolation of microbial species like *Bacillus Subtillus*, soil is one of the raw materials that will be used because soil is the chief source for all microorganisms including their growth . After obtaining the sample further subjected to the confirmation of *Bacillus Subtillus*. The isolated colony was showing positive results for number of biochemical tests. The confirmed colony was streaked on another nutrient agar plates for enrichment purpose by incubation.

↗ **Powder preparation of microbes:** The pellet of microbial species like *Bacillus Subtillus* was allowed to dry to get powder by several techniques like free drying and the obtained powders are directly used which act as nanoparticles. The size of *Bacillus Subtillus* is in  $\mu\text{m}$ , thus *Bacillus Subtillus* act as best nanoparticles.

↗ **Powder preparation for Ferrite  $\text{AFe}_2\text{O}_4$  (A= Mg, Zn, Co & Cu) nanoparticles:** In this study nanocrystalline Ferrite ( $\text{AB}_2\text{O}_4$ ) powders were prepared by several techniques

like solution combustion techniques, sol-gel method, Green Synthesis, thermal decomposition etc.

↗ **Characterization Techniques for Ferrite  $AFe_2O_4$  (A= Mg, Zn, Co & Cu)**

**nanoparticles:** The prepared samples are to be characterized by TG/DTA thermal analyzer, XRD diffraction analysis using  $Cu-K\alpha$  radiation, transmission electron microscope, scanning electron microscope, Particles Size Analyzer, FTIR spectroscopy, UV-Vis Spectroscopy.

**Synthesis of Graphene Oxide (GO)**

- ↗ Graphite oxide is synthesized by modified Hummer's method.
- ↗ Initially in an ice bath graphite powder is added to  $H_2SO_4$  and stirred.  $KMnO_4$  is slowly added to the above solution and stirred. ice bath is replaced by a water bath and the solution is stirred overnight.
- ↗ To the above solution a mixture of  $H_2O_2$  and water is slowly added and stirred. The solution turns to yellow colour from dark brown.
- ↗ Precipitate is obtained by filtration of solution. The filtered yellow cake (graphite oxide is washed by  $HCl$  and then washed several times by  $H_2O$  to obtain neutral pH.



↗ The synthesized graphite oxide is dispersed in water and sonicated to get GO, as shown in figure 1 (mechanism of GO).

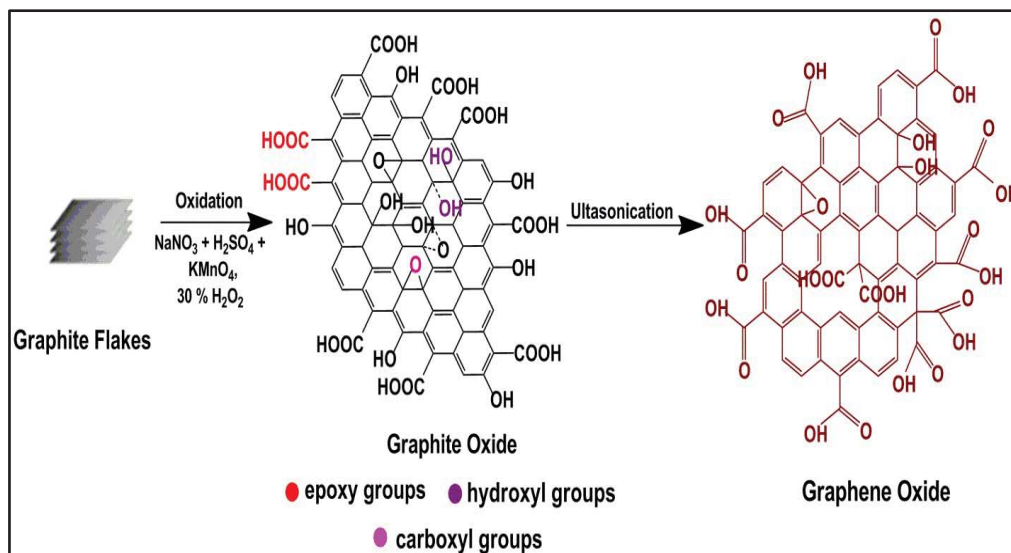


Figure 1: Mechanism of Synthesis to Graphene Oxide.

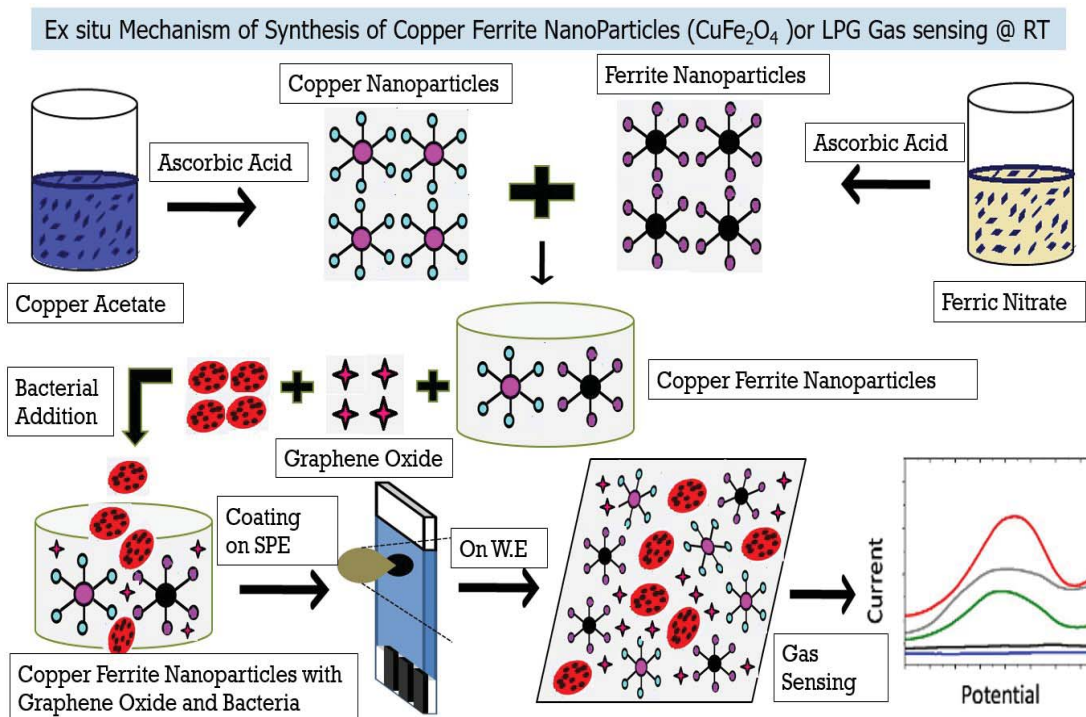
## b) Hydrothermal Synthesis of (Oxide Nanomaterials) Graphene/Reduced Graphene :

- ↗ Modified hummer's method is used to synthesize GO.
- ↗ In Hydrothermal process the core shell nanoparticles are dispersed in GO solution, then NaOH solution is added to the resulting dispersion solution.
- ↗ Mixture is then stirred at 95°C for 60 min and transferred to Teflon lined autoclave vessel and then completely sealed.
- ↗ The solution is finally filtered and washed thrice with distilled water and dried in hot air over at 90°C for 5 hours. All the solvents are evaporated.
- ↗ The subsequent powder is calcined at 600°C for 2 hours in a muffle furnace. As per the addition of amount of GO, Graphene is collected with different weight

percentages (graphene 1.0, 2.0 and 3.0 wt%) , (published in our earlier work satish et. al 2016).

**STEP 3: Preparation of the working electrode:**

- Preprinted interdigital gold electrodes (IDEs) were used in the gas sensing process.
- Assynthesized Graphene/Oxidenanomaterial/Bacterial Protein nanocomposite is dispersed in N-Dimethyl formamide under sonication and Spin coating technique is used for depositing hybrid nanocomposite on to the surface of flexible IDEs . The sample coated flexible IDEs are oven dried for 6 hrs. at 50 °C under vacuum condition.



**Full Summary (in Rs.)**

S. No	Item Head	1 <sup>st</sup> Year	2 <sup>nd</sup> Year	3 <sup>rd</sup> Year	Total (Rs.)
<b>A.</b>	<b>Recurring Items (General)</b>				
1.	Plant cost /Fabricated systems/ demonstration models, if any				
2.	Man Power	-	-	-	-
3.	Consumables	150,000	150000		300,000
4.	Travel Other Cost ( Outsource work etc), if any	50,000	50,000		100,000
	<b>Total cost of the project (A)</b>	-	-	-	4,00,000

↗ In addition, for comparison the mixed core shell Nano structures and pure core and shell are prepared. poly vinyl pyrrolidone is added and followed by vigorous stirring to obtain the transparent outer solutions.

**9. Budget estimates (clearly include the required consumables, field work and travel data and other related items :**

**Details of Itemized Budget :**

**A. Recurring capital items****1. Budget for Fabrication system/Tailor made items**

<b>Description of fabricated system</b>	<b>Unit Landed Price (CIF+ Custom Duty+ others charges)* (Rs in lakh)</b>	<b>Nos. of Equipment</b>	<b>Total Rupees (Rs. in lakh)</b>
-	-	-	-

**Justification for Fabrication system:** For most of the electrochemical characterization studies, Cyclic voltammeter equipment available in the department is being used. for this the quality sensing electrode is required, hence Cyclic voltammetric electrodes. (working, reference, counter) required. The minimum configuration is proposed to be procured as there is no budget provision in the department for these items.

**2. Man Power:**

	<b>Total Emoluments (in Rupees)</b>		
--	-------------------------------------	--	--

<b>Designation</b>	<b>1<sup>st</sup> Year</b>	<b>2<sup>nd</sup>Year</b>	<b>3<sup>rd</sup>Year</b>	<b>Total (1<sup>st</sup> +2<sup>nd</sup>+3<sup>rd</sup> Years)</b>	<b>No. of persons</b>	<b>(Inclusive of all Allowances )  Total Amount  (Rs.)</b>
-	-	-		-	-	
	Gross amount required for manpower budget head =					

### 3. Consumables

#### Budget for Consumable Materials

<b>Items</b>	<b>Unit Price</b>	<b>Qty Needed</b>	<b>Amount  ( Rs.)</b>
Chemicals ( Metal oxide precursors, Glucose, carbon	120000+80000+80000 +20000	6	300,000



black, Graphene) and solvents.			
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**Justification for Consumables:**

Chemicals used in the preparation of nanomaterials and sensing material (Metal precursors, Metal oxide precursors, carbon black, Silver, Silver chloride, Graphene and other materials including solvents (L.S) etc.). A minimum requirement has been projected for a large number of trials.

**4.Contingencies**

**Budget for Contingencies**

<b>Items</b>	<b>Total Amount</b>
(unforeseen expenses, patents, report preparations etc)	<b>( Rs)</b>
These include fabrications, testing,	-

patents and University overheads	
-------------------------------------	--

**Justification:** The other things include stationary, report preparation and copies etc. Here also minimum requirement has been projected.

### 5. Other Costs ,if applicable

#### Budget for Other Costs

Item	Total Amount ( Rs)
Outsource work	100,000
Other items, if any	

**Justification for Other Cost :** The other things include training, marketing, advertising, promoting, web development, consultancy, audit legal, insurance premium, repairs/ maintenance of research equipment etc. Here also minimum requirement has been projected.

### 6.Budget for Data

Characterization Instruments	Total
------------------------------	-------

	( Rs. )
XRD,FT-IR,UV-VIS,TEM,FE-SEM,AFM,LCR,RAMAN,AAS,LCR,AFM.	-

**Justification for Data :** The detailed characterization is done from various institutes.

### 7. Project out comes:

#### Expected Output and Outcome of the proposal:

- To prepare nanostructured ferrite materials with AB<sub>2</sub>O<sub>4</sub> spinel structures by several chemical methods like a. Modified chemical combustion synthesis b. Micro wave assisted room temperature ionic liquids c. Molten Salt Synthesis d. Thermal Decomposition etc.,
- Characterization of these nanomaterials by TG/DTA, AFM, UV-VIS, FTIR, particle analyzer, SEM, TEM, X-ray diffraction techniques.
- To prepare microbes bio film with obtained ferrite nanoparticles by screen printing / Inkjet printing.
- To determine the physical and micro-structural properties of the nano ferrites / bacteria powder.
- To study the gas sensing properties of the fabricated bio film.

- ↗ To construct and improve a new sensing probe in the acquisition of electrical measurements,
- ↗ To determine the optimum composition and optimum operating temperature of the LPG/Hydrogen sensing, .
- ↗ To determine the sensor resistance, conductance and sensitivity with varying operating temperatures of the gas sensor and flow rates of the gas,
- ↗ To configure a commercial version of the Microbes Bio films gas sensor.

## ANNEXURE 7.2

### DATES OF BoG MEETINGS

The dates of the next two meetings of the BoG may be fixed in May 2020 and in August 2020.