

# Shodh

**MNNIT RESEARCH BULLETIN**

Vol. 2, Issue 1, 2020



**MOTILAL NEHRU NATIONAL INSTITUTE OF TECHNOLOGY ALLAHABAD**  
**PRAYAGRAJ-211004**

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## *Message from Patron*



**Prof. Rajeev Tripathi**, Director, MNNIT Allahabad

I am glad to see the Second Issue of the Research Bulletin "Shodh", being published by Research & Consultancy (R&C) Cell of the Institute.

Further, I extend my happiness that R&C is making every effort to promote research activities in the Institute and this Research Bulletin shares and publicises relevant highlights/impact of research activities of the faculty members. This on other hand introduces the strength of our research resources to outside world.

The MNNIT Allahabad has an energetic team of academics to embark on scholarly activities to continuously improve its academic performance and standard. Recently, MNNIT Allahabad has been granted two patents on the innovations carried out by the team of faculty members and students.

The Institute is committed to extend all levels of administrative support for externally funded projects and as well as small amount of financial support as "Seed money" through internal funding to young faculty members.

Looking ahead, the Institute aims to make it big in the field of scientific and technological excellence.

**Prof. Rajeev Tripathi**  
Director





प्रोफेसर गीतिका, (HAG) अधिष्ठाता (शोध एवं परामर्श)

## प्राक्कथन

उत्सुकता शोध का प्रथम चरण है। तकनीकी शोध, नवाचार, अभिकल्प एवं परामर्श, आदि मानव कल्याण, समाज उत्थान, तथा राष्ट्र प्रगति के मार्ग में मूलभूत अवयव है। निस्संदेह इस दिशा में उच्च तकनीकी शिक्षा संस्थानों की भूमिका अत्यन्त महत्वपूर्ण है। मोतीलाल नेहरू राष्ट्रीय प्रौद्योगिकी संस्थान इलाहाबाद, प्रयागराज, तकनीकी विकास एवं स्वस्थ समाज के प्रति अपने उत्तरदायित्व की ओर सजग ही नहीं सक्रिय भी है।

अधिष्ठाता शोध एवं परामर्श कार्यालय, संस्थान के समस्त संकाय सदस्यों, शोध कर्ताओं एवं छात्र-छात्राओं की शोध एवं नवाचार प्रवृत्ति को पोषित करने तथा सुचारु एवं सुव्यवस्थित रूप से संयोजित करने के लिए तत्परता से प्रस्तुत है। अत्यंत हर्ष एवं गौरव का विषय है कि गत वर्षों में संस्थान के शोध कार्यों को समुचित सम्मान एवं प्रतिष्ठा प्राप्त हुई है। संस्थान ने 20 पेटेन्ट प्रतिवेदन किए हैं जिनमें से 2 पेटेन्ट अधिकृत हो चुके हैं। अभिकल्प नवाचार केन्द्र के अंतर्गत 25 से अधिक परियोजना सफलता पूर्वक चल रही हैं। जिसमें 2 प्रोटोटाइप (Prototype) तैयार हो चुके हैं तथा 3 पेटेन्ट प्रतिवेदन किये गये हैं।

इन्हीं प्रयासों, उपलब्धियों तथा विषय विशेषज्ञता की जानकारी को साझा करने के उद्देश्य से 'शोध' पत्रिका प्रकाशित की जाती है। इसी क्रम में शोध का द्वितीय अंक प्रस्तुत है। आशा है, संस्थान की विशेषताओं से समाज, उद्योग एवं नीति निर्माता लाभान्वित होते रहेंगे।

गीतिका



## *Foreword*

It gives me immense pleasure to write this message for the Second Issue of the Research Bulletin "Shodh". In this Issue we have included major achievements from Design Innovation Centre (DIC) projects, funded to the students, being mentored by the faculty member of the Institute. Also, the Issue includes patents granted, along with major research highlights.

The faculty members of the MNNIT Allahabad are committed to quality teaching and research work.

I look forward to see more and more of our research achievements being included in the "Shodh".

**Prof. Nand Kishor**  
**Editor**



## MNNIT Allahabad - A Glance

Motilal Nehru National Institute of Technology (MNNIT) Allahabad (formerly Motilal Nehru Regional Engineering College MNREC, Allahabad) is an institute with total commitment to quality and excellence in academic pursuits, and is among one of the leading Institutes in India. It was established in the year 1961 as a joint enterprise of Central Govt. of India and State Govt. of Uttar Pradesh in accordance with the scheme of establishment of REC's. However, with effect from 26<sup>th</sup> June, 2002 the Institute became a deemed university and an Institute of national importance, now known as Motilal Nehru National Institute of Technology. The institute offers B. Tech. programmes in nine areas of technology, M. Tech. programmes in more than twenty disciplines, MCA, MBA, MSc. as well as PhD. programmes in all branches of Engineering, Science and Management.

The infrastructure of the Institute is at par with the best Institutions in the country, the Computer Centre has state-of-the-art computing facilities, departments have modern laboratories and the library houses print as well digital learning resources.

The entire campus, including hostels, executive development centre and residential area is connected with 1.25 Gbps internet connectivity.

The Institute makes all efforts to strengthen collaborative research programmes in emerging areas of Science and Technology. The Institute promotes advanced research via (i) joint thesis and research projects with industry participation, (ii) institutional assistantships to promote PG and Doctoral programmes, (iii) administrative support to faculty members to conduct consultancy and research projects funded by external agencies.

As per National Institutional Ranking Framework (NIRF), Ministry of Human Resource and Development, Government of India, the Institute stood at 42<sup>nd</sup> rank in Engineering stream in the country in 2019.



## Major Research Fields in the Departments

Name of the Department	Research fields
Applied Mechanics	Computational Solid Mechanics, Composite Structures, Finite Element Analysis, Advanced Structural Systems, Kinematic and Dynamic analysis of musculoskeletal system, Damage mechanics, Sound, noise and vibration, Thermo-Fluids Engineering, Solid mechanics, Characterization of smart materials, Bone Adaptation.
Biotechnology	Agricultural Biotechnology, Bioinformatics, Bioprocess Development, Bio-energy, Environmental Biotechnology, Genetics & Genetic Engineering, Immunology, Medical Biotechnology, Microbiology, Nanoparticle based diagnostic.
Chemical Engineering	Membrane and Reactive Separation, Convective heat transfer, Chemical reaction engineering, Process Modeling and Simulation, CFD, Environmental science & engineering, Industrial hazard, Process Safety & Hazards Management, Advanced Distillation Technology, Food Technology and Bio-processing.
Chemistry	Inorganic nano-chemistry, Sensor analyte, Metal organic frameworks, Nano-biotechnology, Polymers
Civil Engineering	Structural Engineering, Geotechnical Engineering, Environmental Engineering, Transportation Engineering, GIS and Remote Sensing, Environmental Geo-technology, Water Resources Engineering, Construction Engineering and Management.
Computer Science & Engineering	Software Engineering, Mobile Computing, Knowledge Based System, Real Time System, Distributed Computing, Soft Computing and Machine Learning, Image Processing, Biometrics, Pattern Recognition, Data mining, Network Security
Electrical Engineering	Power electronics, Electrical drives, Power system operation, control and protection, Smart grid challenges, Renewable energy systems, Non-linear control theories and its applications.
Electronics and Communication Engineering	Data Communication and Networking, Optical Communication, Digital Signal Processing, Image Processing, Pattern Recognition, Biometrics, Mobile and ATM Network, Wireless Sensor Network, Analog and Digital Circuits, VLSI Design, Characterization of semiconductor devices
GIS Cell	GIS applications; GNSS and InSAR technology (core and application), Natural Hazard monitoring, Machine Learning applications in Geoinformatics, WebGIS, LiDAR technology, Satellite Image Processing.
Humanities and Social Sciences	English Psychology Human Resource Management, Accounting & Finance.
Mathematics	Commutative algebra, Basic hypergeometric functions, Numerical analysis, Operation research, Soft computing, Cryptography, Fluid dynamics, Heat & Mass transfer, Bio-fluid mechanics, General topology, Nearness-like structures & Near set theory.
Mechanical Engineering	CAD/CAM, Manufacturing processes, Chain management, Composite materialsits characterization, Fracture and fatigue, Multi-scale machining processes, Mechanical system design, Nanocomposites characterization, Refrigeration, Cyrogenics, Heat transfer, CFD, Air-conditioning, Passive Cooling.
Physics	Experimental condensed matter physics, Theoretical physics, Nano structured thin films, Functional oxide nano-materials, Synthesis and optical, magnetic and electric properties, of 2D systems.
School of Management Studies	International finance, Marketing Management, Financial management, Human Resource management, Management information systems, Entrepreneurship, Strategic Management.



## Recently Awarded & Sanctioned Major Research Projects

**Research Project Topic:** *To develop a test bed based on Magnetic Induction (MI) communications for agricultural soil condition monitoring (water concentration, minerals, and toxic chemicals)*

**Funding agency:** Ministry of Electronics and Information Technology

**Name of Faculty Members:** Dr. Vinay Kumar, Dr. Joydeep Sengupta and Prof. Rajeev Tripathi

**Name of the Department:** Electronics and Communication Engineering

**Email ID:** rt@mnnit.ac.in

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**Title:** **GIS-based mapping of microbial diversity across the Ganges for ecosystem services**

**Funding Agency:** National Mission for Clean Ganga, Ministry of Jal Shakti

**Name of PI:** Prof. Shivesh Sharma

**Department :** Biotechnology

**Email ID :** shiveshs@mnnit.ac.in

## Patents Granted

**Title of Invention:** ***A process for bioremediation of industrial grease waste using a bacterial consortium***

**Application Status:** Patent Granted, Waiting for publication under Section 43(2), Patent Number: 330765. Date of Certificate Issue: 30/01/2020

**Name of Inventors:** (i) Dr. Sangeeta Negi, (ii) Mr. Sunil Kumar, Department of Biotechnology

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**Title of Invention:** ***Shape and configuration of the "gel Imaging device"***

**Name of Inventor:** Dr. Seema Nara, Mr. Pramir Tripathi, Department of Biotechnology

**Certificate:** Certificate of Registration of Design

**Design No., Date of issue:** 294796, 28/01/2019

## Awards

**Name of Faculty Member:** Prof. Anjana Pandey

**Name of Award:** INGSA Science Advice Promotion Award 2019 on the theme "Science advice on nutrition and health", 2019

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**Name of Faculty Member:** Prof. Tanuj Nandan

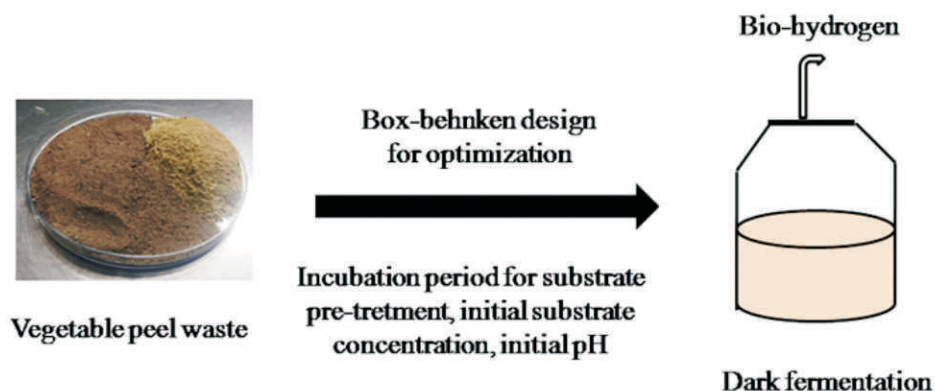
**Name of Award:** Bharat Vikas Award, 2019

## Highlights of Major Research Output

<i>Research Project Title:</i>	<b>Augmentation of fermentative biohydrogen production by using nanoparticles and immobilization techniques for mitigating biowastes</b>
<i>Funding Agency:</i>	DST Women Scientist Scheme A
<i>Woman Scientist:</i>	Ms. Priya Rai, Research Scholar
<i>Name of Mentor:</i>	Prof. Anjana Pandey, Department of Biotechnology
<i>Name of Department:</i>	Biotechnology
<i>Email ID:</i>	anjanap@mnnit.ac.in

### **Abstract of research with result:**

Optimization of bio-wastes i.e. vegetable peel waste, fruit peel waste, agricultural waste, and leaf waste was done with single factor optimization to find out the best bio-waste for bio-hydrogen production. Vegetable waste was selected as the best substrate in comparison to other bio-wastes for bio-hydrogen production by *Bacillus licheniformis*-AP1. Three factor based Box-behnken design was used to optimize the three factors like incubation time for pre-treatment of vegetable waste, initial substrate concentration, and initial pH for augmentation of bio-hydrogen production. Observed highest cumulative hydrogen production (1675 ml / L medium) was produced by using optimized incubation period 30 min for vegetable substrate pretreatment, 50 gram/l initial substrate concentration, and 6.5 initial pH by Box-behnken design at  $38^{\circ}\text{C} \pm 2^{\circ}\text{C}$ .



### **Impact of research works:**

This research project is awarded under DST women scientist scheme A. The aim of the project is to minimize the solid biowaste for renewable energy production (biohydrogen) on a large scale. Our environment would be benefitted with such type of research owing to reduction in large organic waste load on the earth and conversion of these bio-wastes into zero carbon gaseous fuel.

### **Outcome of the project:**

Pilot plant of capacity 2 litres will be fabricated for harnessing biohydrogen utilizing wastes along with the mineral supplements and useful thermotolerant bacterial strains for waste to biohydrogen production.

*Research Project Topic:* **Evaluation of time consumption in the movement of crowd of pilgrims from a particular place to another**

*Funding Agency:* North Central Railway (NCR), Prayagraj

*Name of Faculty member:* Dr. Mayank Pandey

*Name of the Department:* Computer Science & Engineering

*Email ID:* mayankpandey@mnnit.ac.in

***Abstract of research with results :***

Large gatherings in the religious event like Kumbh Mela require rigorous monitoring and attention. Successful accomplishment of such event involves authoritative persons from different departments such as Police department, department of Traffic management, Roadways, Eecurity, Health department and many others. Railway department is one among them which plays a major role in the management of rail traffic and passenger transportation. In the Kumbh Mela held at Prayagraj from 15 January 2019 to 4 March 2019, we were associated with the Allahabad division of North Central Railway (NCR), India under project. The railway authorities have an important role in the management of crowd of pilgrims at the railway station during this KumbhMela festival. They predefine the crowd management plans, movement strategies and boarding procedures. The project was intended to design an effective way, to analyze and evaluate the time consumed in the movement of crowd of pilgrims from a particular place to the assigned platform and board. This analysis was needed for adjusting the frequency of Mela special trains at various platforms and accordingly customizing their plans. We have utilized the Agent Based Modelling and Simulation technique to model the virtual environment of Allahabad Junction railway station. The model simulates various actions and behaviour of synthetic agents (passengers and trains) according to the real scenarios.

***Impact of research works:***

The simulation results of time consumption in different movement and boarding scenarios is approximately similar to empirically evaluated values. The empirical values are shared by the railway authorities with us. In addition, some modified boarding procedures are incorporated to compare the efficiency of the actual plan executed by them. Their boarding strategies for two platforms (1 and 7) were observed to be less efficient with respect to time consumption. The verified and validated simulation results establish the applicability of this model and our approach.

***Outcome of the project:***

The model helped the authoritative personnel in testing their strategies for realistic assessments of crowd movement.

**Research Project Topic:** Intelligent detection and mitigation of DDoS attack in SDN  
**Funding Agency:** Department of Science & Technology (DST)  
**Name of Faculty Member:** Dr. Shashank Srivastava  
**Name of the Department:** Computer Science and Engineering  
**Email ID:** shashank12@mnnit.ac.in

**Abstract of research with results:**

Distributed Denial of Service (DDoS) attacks are becoming more sophisticated day by day, fiercely threatening the underlying network which restricts instantaneous identification and mitigation of such attacks before they could harm the network users. Due to inflexible traditional switches used in the network administrators are unable to detect these attacks, so if DDoS attacks could be detected at initial stages and appropriate countermeasures are taken to handle these attacks, it may save a lot of revenue and legitimate users will be able to get the services without any disruption. Software Defined Networks (SDN) is a promising solution to this security issue as it has the potential to mitigate DDoS attacks.

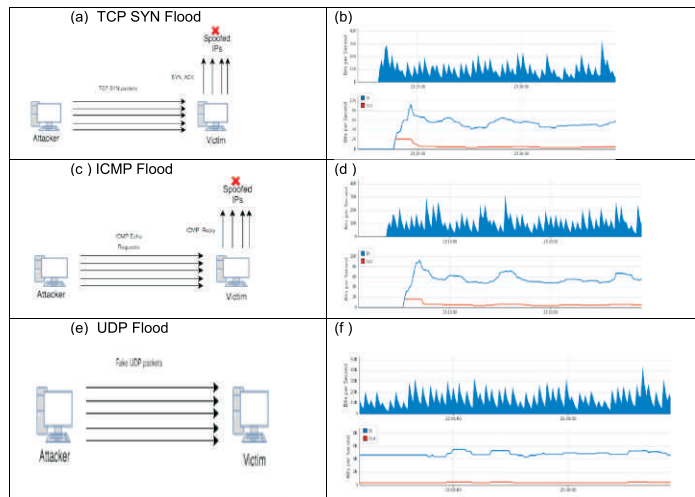
**Impact of research works :**

Following attacks using Flow-RT have been analyzed:

- TCP SYN Flood Attack
- ICMP Flood
- UDP Flood

**Outcome of the project:**

An attack model of DDoS attacks has been built. We have setup an emulation based testbed in our lab for mimicking different attack scenarios. During attack, we tried to find out the behavior/pattern of traffic based on different parameters.



Figs. (a),(c),(e) describes the three attacks. Fig. (b),(d),(f) are the graphical representation of these attacks by sFlow-RT which shows the incoming traffic is significantly higher than the outgoing traffic which represents that attack has taken place due to spoofed IP addresses.

## Design Innovation Centre (DIC)

Design Innovation Centre (DIC) is a joint project of the Indian Institute of Technology - IIT (BHU) and Banaras Hindu University (BHU) funded by Department of Higher Education, Ministry of Human Resource Development, Government of India.

It works on HUB and SPOKE model and following institutions are involved:

- Banaras Hindu University (HUB)
- Indian Institute of Technology BHU (HUB)
- Motilal Nehru National Institute of Technology Allahabad (SPOKE)
- Indian Institute of Information Technology Allahabad (SPOKE)
- University of Allahabad (SPOKE)

### Innovative Projects Completed under DIC

**Title:** Voice Recognition and touch screen control based wheel chair for handicapped person

**Area/ Department:** Biomedical Engineering (Department of Applied Mechanics)

**Researchers:** Student: Mr. Shivam Gupta, Mentor: Dr. R.P. Tewari

#### **Description/Objectives:**

**Need for study:** Quadriplegics and Multiple sclerosis patients with severe disabilities and are not capable of driving joystick operated wheelchairs

**Objective:** Development of a voice recognition and touch screen control based wheel chair for handicapped persons.

#### **Deliverables:**

Voice recognition and touch screen based wheel chair.



Complete circuit of the wheel chair



Prototype of the wheel chair

**Title:** Development of low cost system for real-time ECG data acquisition and wireless remote monitoring

**Area/ Department:** Electronics and Communication Engineering

**Researchers:** Student : Mr. Shubham Jain, Mentor: Dr. Basant Kumar

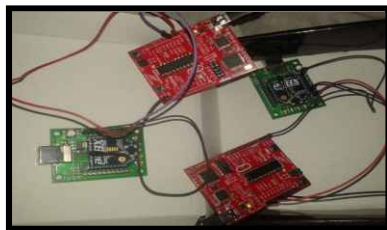
**Description/Objectives:**

**Need for study:** Heart disease is one of the causes of death in India. According to WHO, number of patients with heart diseases is increasing continuously. It is required to have technology that helps in increasing the reach of medical expertise and reduces cost.

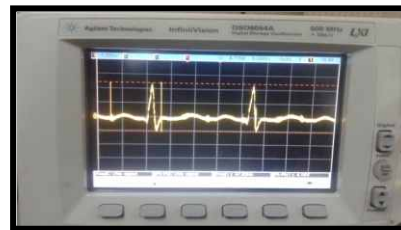
**Objectives:** Development of wireless ECG system, Classification of received ECG signal in real time into normal and abnormal and further transmission of signals to experts for second opinion.

**Deliverables:**

A complete prototype of the product for real time, low cost, wireless ECG monitoring of heart patients.



Experimental apparatus for wireless transmission and recreation of analog signals



Received ECG signal sourced from simulator displayed on a DSO



**Title:** Design of ankle foot rehabilitation robotic assistive device

**Area/ Department:** Biomedical Engineering (Department of Applied Mechanics)

**Researchers:** Student: Mr. Akash Srivastava, Mentor: Dr. R. P. Tewari

**Description/Objectives:**

**Need for study:** Deformities and muscle weakness in ankle joints influence the stability of the joints, hence requiring compensatory adaptations. To assist people in treatment, this type of robotic assistive device is required.

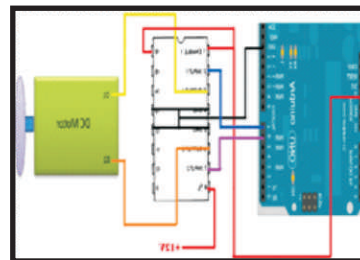
**Objectives:** Design of a simple robot which can be used for ankle injury treatment.

**Deliverables:**

Ankle assistive device which will be reconfigurable and can used with various type of injuries and patients.



Ankle foot rehabilitation robotic assistive device



Interfacing circuit for driving motors

**Title:** *Human health risk assessment based on total concentration and bio-availability of contaminants in urban dust/soil (Sustainable Risk Management Tool)*

**Area/ Department:** Civil Engineering

**Researchers:** Students: Mr. Vishal Kumar Soni, Mr. Sumeet Kumar Sinha, Mr. Suman Kumar, Mr. Sumit Gupta, Mentor: Dr. V.P. Singh

**Description/Objectives:**

Need for study: Soil contamination has adverse health risks from headache to cancer hence studies about health risk assessment due to soil and road dust contaminants are very much needed.

**Objectives:**

- To prepare a conceptual site model for site investigation for collection and handling of samples, and to collect the data regarding exposure assessment.
- Analyze the sample to evaluate contaminant characteristics, concentration and their pollution index.
- Assessment of human health risk based on total concentration and bioavailability of contaminant.
- To suggest a sustainable and green remediation method if required on basis of MCDA.
- To provide a model that can be adopted and implemented for other urban area to help both residents and the government agencies to take protective measures.

**Deliverables:**

A model of solution to prevent or reduce the exposure of contaminants to human health by green and sustainable approach on the basis of MCDA.

**Title:** *eHealth and Medical Record Digitalization*

**Area/ Department:** Computer Science and Engineering

**Researchers:** Students: Mr. Aditya Kumar Ghosh, Mr. Verma Rahul Omprakash  
Mentors: Dr. Divya Kumar and Dr. Ranvijay

**Description/Objectives:**

Need for study: Digital health empowers individuals to better track, administer and improve their health. Digitalization helps in reducing the cost of patient record keeping, increase quality. Digital health is still in immature stage in India.

**Objectives:** Improve care coordination, care quality, safety efficiency and automated clinical decision support and Faster diagnostic decisions of patients' disease through digitalization.

**Deliverables:**

A website which would also be mobile optimized to dynamically adjust to the viewport being used to view it, allowing it also to be used as an app on mobile browsers.

**Title:** *Gauging stress, anxiety and depression levels in students*

**Area/ Department:** Computer Science and Engineering

**Researchers:** Students: Mr. Rishabh Saxena, Mr. Verma Rahul Omprakash  
Mentors: Dr. Divya Kumar and Dr. Ranvijay

**Description/Objectives:**

Need for study: Some of college students suffer from mental illness. Suicide is one of the causes of death among college students. Hence most of the institutes worldwide have centers and counsellors to help students come out of chronic and dangerous mental illness.

**Objective:** To develop an institute wide online service to help students in maintaining positive mental health.

**Deliverables:**

An Online Portal developed in PHP platform to be hosted on an apache server. And an Android application to provide all the basic functionality of the online portal for mobile users.

**Title:** *Development of hexacopter for medical relief management*  
**Area/ Department:** Mechanical Engineering  
**Researchers:** *Students: Ms. Dhvani Khenwar, Ms. Akansha Sahu, Ms. Sweety Dutta,*  
*Mentor: Prof. Rajeev Srivastava*

**Description/Objectives:**

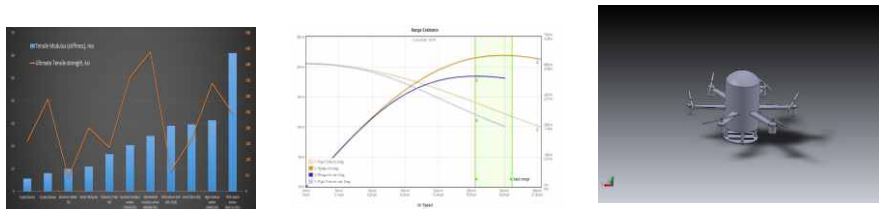
Need for study: According to census 2011, 68.4 % of Indian population lives in rural areas whereas only 3 % of doctors are practicing there. As India's masses increase in affluence and awareness, they are demanding access to better health care. But the supply of conventionally-delivered health care services cannot hope to keep up with the ever-increasing demand.

**Objective:**

- 1) To make a remotely piloted hexacopter which can perform the following functions:
  - Balancing itself on its own in a 3-D space.
  - Traverses through remote locations to reach its destination in the shortest time possible

**Deliverables:**

Prototype of a hexacopter capable of delivering first aid and medication to remote areas.



**Title:** *Design of food products for diabetic and hyperuricemia patients using enzymatic and chemical modification*

**Area/ Department:** Chemical Engineering  
**Researchers:** *Student: Mr. Vivek Kumar Jaiswal, Mentor: Dr. Harinder Singh*

**Description/Objectives:**

Need for study: The proposal is aimed at production of resistant starches using a combination of enzymatic and chemical modifications and study of feasible strategies to reduce foods with high levels of purines for hyperuricemia patients. The proposal envisages production of such food products containing resistant starch or production of resistant flour and starch.

**Objectives:**

- 1) To prepare resistant starches using different strategies with enzymatic and chemical modification routes.
- 2) To analyze resistant starches prepared for physicochemical, structural properties and their digestibility.
- 3) To study the feasibility of the methods and strategies to reduce purine levels of food products like legumes, meat, liver etc.

**Deliverables:**

Processes food materials for consumption by diabetic people.





**Title:** *Transport hybrid vehicle*  
**Area/ Department:** Mechanical Engineering  
**Researchers:** *Students:* Mr. Vikas Bahuguna, Mr. Shivam Samadhiya, Mr. Saurav Pathak, Mr. Vinay Chandra Joshi, Mr. Vikas Mahato, Mr. Shishir Sinha, Mr. Sahil Verma, Mr. Zaid Ahmed Ansari, Mr. Divyaj Sahai, Mr. Devendra Kumar Sharma, *Mentors:* Dr. Samir Saraswati and Dr. K. N. Pandey

**Description/Objectives:**

Need for study: Conventional fuels will not last for long hence it is necessary to develop mobility vehicle which runs on non-conventional energy. The hybrid vehicle is capable of providing small distance transport with zero emissions.

**Objectives:**

- 1) To develop a hybrid vehicle capable of seating two people and used for small distance transport.
- 2) To develop an efficient system of synchronization and power accumulation of pedaling and electric system for comfortable riding experience.

**Deliverables:** Unique hybrid drive train capable of running by pedals with the ability of using electric power.



**Title:** *To study the potential of herbal extract for their anti-dysentery potential*  
**Area/ Department:** Biotechnology  
**Researchers:** *Students:* Mr. Devendra Singh, Mr. Ankit Kushwaha, *Mentor:* Dr. Vishnu Agarwal

**Description/Objectives:**

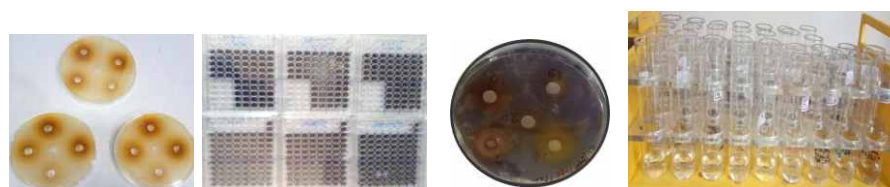
Need for study: Increased use of antibiotics paralleled by increasing occurrence of multidrug-resistant bacteria is leaving traditional antimicrobial treatments ineffective Present study will be helpful to explore the new effective herbal extracts against the dysentery along with exploration of the new inhibitors of quorum sensing and biofilm that will be more effective in dealing with drug resistance problem.

**Objectives:**

- 1) To screen the herbal extract for their as anti-dysentery activity.
- 2) To perform as anti-biofilm and anti-QS activity of screened herbal extracts.
- 3) To perform the Cytotoxic analysis.

**Deliverables:**

The study will significantly improve our knowledge about efficacy of our herbal constituents with currently existing market drugs. The screened natural herbal that can be consumed as anti-dysentery drug alternatives will have no or least side effects.



**Title:** *Design an optical sensor using graphene/MoS2 for biomedical application*  
**Area/ Department:** Electronics and Communication Engineering  
**Researchers:** Student: Mr. Jitendra Bahadur Maurya, Mentor: Dr. Yogendra K. Prajapati

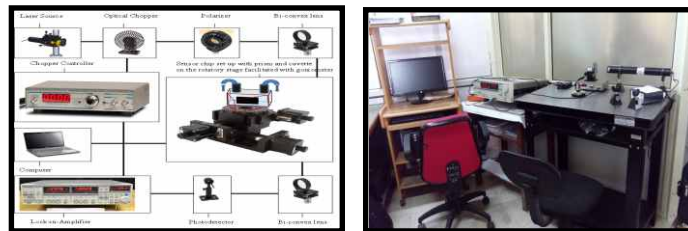
**Description/Objectives:**

Need for study: Infectious diseases are a major cause of deaths worldwide. Detection of the infection on the early stage is the main problem because in maximum cases the detection of infection is observed after the severity of the diseases.

**Objectives:**

- 1) To fabricate sensor chip along with graphene/MoS2 layers operated at tetrahertz/visible range for sensing application.
- 2) To grow an additional biomolecular recognition element (BRE) for increased attachment of ssDNA virus or Pseudomonas like bacteria on chip.
- 3) To develop a test-bed of a biosensor using the fabricated chip.

**Deliverables:** A rapid optical biosensor using graphene/MoS2 for detection of human pathogens.



**Title:** *Design and fabrication of a low cost fused deposition modelling machine*  
**Area/ Department:** Mechanical Engineering  
**Researchers:** Students: Mr. Faiyaz Ahmad, Mr. Mangesh Lokhnde, Mr. Saurabh Purty, Mr. Shwetank Verma, Mentors: Prof. Vinod Yadava and Dr. Venkateswara Rao Komma

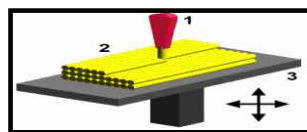
**Description/Objectives:**

Need for study: 3D printing is a new and emerging technology that offers multiple future prospects. 3D printer can be used to produce complex geometries with high resolution. It is very much useful to produce custom one-off parts such as prosthetics.

**Objectives:**

- 1) To design and fabricate a low cost 3D printer based on fused deposition modeling technique.
- 2) The machine should be simple enough for further improvements and upgrades for miniature products.

**Deliverables:** A 3D printer based on fused deposition modelling machine with maximum build volume 30cmX30cmX30cm.



Fused Deposition Modelling



3D printer based on fused deposition modelling machine

Title: **Design of voice and thought controlled wheel chair for disabled people**

Area/ Department: Applied Mechanics

Researchers: Student: Mr. Sajal Kumar Babu Degala, Mentor: Prof. R. P. Tewari

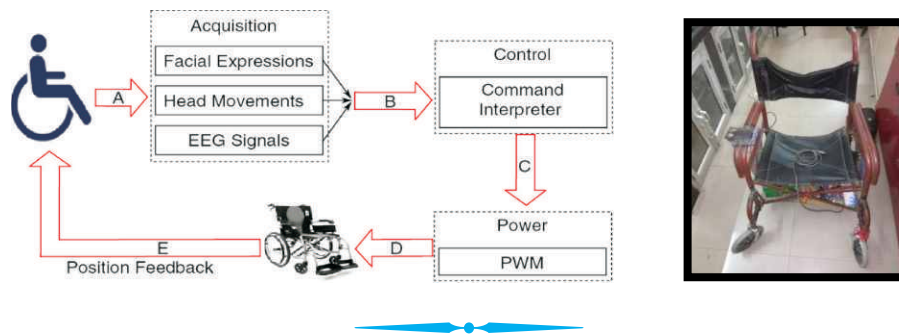
**Description/Objectives:**

Need for study: Normal walking is an easily learnt and applied activity but it is difficult for physically challenged persons suffering from neuro-muscular disorders like polio, paralysis etc., and accidents. Mobility of the handicapped and elderly persons needs a personalized approach by providing rehabilitation devices. The assessment and assistive device should be safe, simple, rugged, low cost with minimum maintenance.

**Objective:**

To design an electric wheelchair from a common wheelchair and the develop a Brain Computer Interface (BCI) between the electric wheelchair and the human brain and also to control it with the help of voice commands.

**Deliverables:** Prototype of voice and thought controlled wheel chair for disabled persons.



Title: **Development of multiplex methylight assay based on DAPK1 and SOX1 methylation as a non invasive diagnostic marker in serum samples of epithelial ovarian cancer patients**

Area/ Department: Biotechnology

Researchers: Students: Ms. Alka Singh, Mr. Vivek Kumar, Mentor: Dr. Manisha Sachan

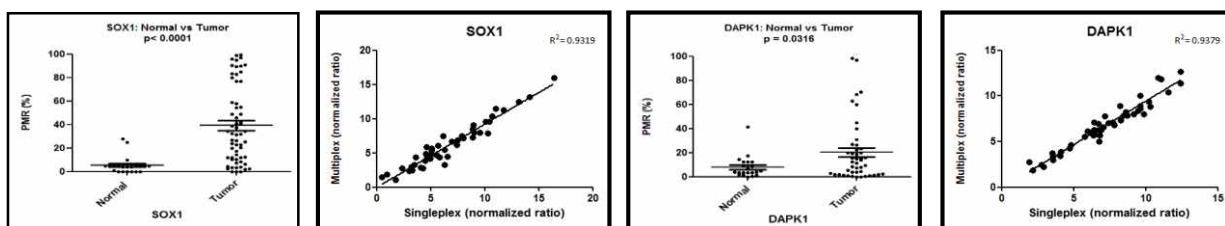
**Description/Objectives:**

Need for study: At present, no single epigenetic biomarker is able to accurately detect early ovarian cancer in either tissue or body fluid. Analysis of the methylation status of multiple genes simultaneously in a blood based assay may provide a more sensitive and specific method for the molecular classification and diagnosis of ovarian cancer.

**Objectives:**

- 1) Developing a multiplex MethyLight assay to quantify methylation level of DAPK1 and SOX1 for ovarian cancer (epithelial origin) diagnosis.
- 2) Validation of Q-PCR based multiplex MethyLight assay in serum/plasma samples of epithelial ovarian cancer patients for their diagnostic significance at early stage.

**Deliverables:** A proof of concept has been developed for non-invasive detection of ovarian cancer at an early stage using serum cell-free DNA based on evaluation of the promoter methylation level of DAPK1 and SOX1 in a multiplex MethyLight assay.



Title: **Design and control of an actuator for lower extremity prosthesis**  
Area/ Department: Applied Mechanics  
Researchers: Student: Mr. Surender Yadav, Mentor: Prof. R. P. Tewari

**Description/Objectives:**

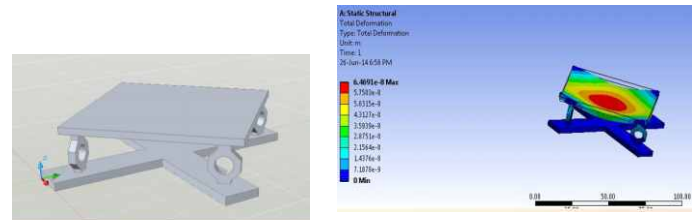
Need for study: Normal walking is an easily learnt and applied activity but it is difficult for physically challenged persons suffering from neuro-muscular disorders like polio, paralysis etc. and accidents. Around 15 per cent of the world's population, or estimated 1 billion people, live with disabilities. They are the world's largest minority (WHO). Each year tens of thousands of people in India alone suffer from neuro-muscular disorders i.e. paralysis, polio etc.

Objectives:

- 1) To eliminate the limitation of current available adaptive wearable ankle foot orthotic device.
- 2) To develop such a system that is cost effective, low weight, optimum power consumption.
- 3) Easy to use re-configurable, requires less of physiotherapist' s interaction.

**Deliverables:**

- Prototype of Technology
- Soft tools for assessment of GRF data



Title: **Nanostructure based detection of ovarian cancer antigen (CA125)**  
Area/ Department: Biotechnology  
Researchers: Student: Mr. Pranav Tripathi, Mentor: Dr. Seema Nara

**Description/Objectives:**

Need for study: The use of aptamers and nanostructures in developing a detection assay for ovarian cancer has not been reported yet. Whether aptamers and nanostructures can be used in establishing a proof of concept of an assay taking CA125 as a marker.

Objectives:

- 1) Synthesis and characterization of nanostructures
- 2) Surface modification of nanostructure with aptamer/CA125
- 3) Developing an aptamers based assay for ovarian cancer

**Deliverables:**

A proof-of-concept of the aptamer/CA125 based assay is developed. The change in the surface plasmon resonance is utilized to assay CA125.



**Title:** *Development of portable cataract detection system*  
**Area/ Department:** Electronics and Communication Engineering  
**Researchers:** Student: Mr. Shubham Kumar Gupta, Mentor: Dr. Basant Kumar

**Description/Objectives:**

Need for study: Currently large number of people are visually impaired world wide and suffer from blindness. As per WHO, cataract accounts for blindness. Hence, a cost-effective detection system is required.

Objective: To develop automated accurate cataract detection algorithms using digital eye images, to implement the cataract detection algorithms on hardware having processing and transmission capability and to augment telemedicine facility of obtaining second diagnostic opinion from medical experts.

**Deliverables:** Accurate algorithm for automated cataract detection, A portable prototype of cataract detection system with network communication capability.

**Title:** *Design and development of Rf sputtered Au/ ZnFe<sub>2</sub>O<sub>4</sub>/ZnO heterojunction based device for photo electrochemical water splitting*

**Area/ Department:** Physics  
**Researcher:** Dr. Naresh Kumar

**Description/Objectives:**

Need for study: Recently, solar hydrogen generation via photo catalytic water splitting has attracted tremendous attention and has been extensively studied because of its great potential for low-cost and clean hydrogen production.

Objectives:

- 1) To design and develop gold (Au)/zinc ferrite (ZnFe<sub>2</sub>O<sub>4</sub>)/zinc oxide (ZnO) triple phase nanostructures based hetero junction as a Photo anode for photo electrochemical Water Splitting
- 2) To establish a co-relation between magnetic properties of ZnFe<sub>2</sub>O<sub>4</sub> (ZFO) nanostructures used and the drastic rise in photo electrochemical efficiency of the system.

**Title:** *Development of web based tool for selection of sustainable remediation option for soil contaminated with organic contaminants*

**Area/ Department:** Civil Engineering  
**Researchers:** Student: Mr. Ashish Kumar Singh, Mentor: Dr. V.P. Singh

**Description/Objectives:**

Need for study: Accelerated industrialization and urbanization has resulted in large urban population. Intensive activities of humans have resulted in increasing quantities of contaminants into the environment. Dusts on the surface of ground have become one of the most important issues in urban environmental management.

Objectives:

- 1) To study the soil characteristics for identification of organic waste in different areas.
- 2) To develop web based tool for selection of sustainable remediation option for soil contaminated with organic contaminants.

**Deliverables:**

- Organic material concentration in surface dust in various activity areas and its comparison with background values.
- Health risks to humans associated with presence of such concentrations of heavy metals.

**Title:** *Development of antiurolithiatic compounds by phytic acid and development of OMICS based biomarkers for early detection of kidney stone in human being*

**Area/ Department:** Biotechnology

**Researchers:** Students: Ms. Preeti Sirohi, Mr. Manish Pratap Singh, Mentor: Dr. N. K. Singh

**Description/Objectives:**

Need for study: Urolithiasis is commonly referred as stone formation in any part of the urinary tract such as kidneys, ureters, urinary bladder, and urethra. Uroliths are generally composed of calcium as calcium oxalate monohydrate and calcium hydrogen phosphate dihydrate (75-90%). Phytic acid, a food inhibitor, acts as antiurolithiatic compound by inhibiting calcium oxalate and calcium phosphate crystallization in renal tissues and urine.

**Objectives:**

- 1) Inhibition and modulation of calcium oxalate monohydrate crystals into calcium oxalate dihydrate by phytic acid.
- 2) Study of loci association and detection of OMICS based marker associated with kidney disease.

**Deliverables:**

Proposed prototype (Phytic acid) will work as an antiurolithiatic compound. Analysis of genetic alteration of given SNPs will provide a new insight in the analysis of disease susceptibility of a patient towards the kidney stone formation.



**Title:** *To develop device for desalination of the rejected water from RO purification system*

**Area/ Department:** Biotechnology

**Researchers:** Students: Mr. G. Raja, Mr. Tejavath Ajith, Ms. Stuti Gupta  
Mentors: Dr. Ambak Kumar Rai, Prof. Shivesh Sharma

**Description/Objectives:**

Need for study: During the purification process, RO systems reject a significant amount of water, having very high TDS value that cannot be used for drinking, washing or planting. On passing 4 litres of water through an RO purifier, it produces only 1 litre of potable water, i.e. 3 litres of unusable waste water is rejected.

**Objectives:**

- 1) To device the methodology for desalination of rejected water by RO purifier using reduction-oxidation electrolysis.
- 2) To fabricate a prototype for desalination of rejected water by RO purification system.

**Deliverables:**

A prototype for desalination of RO rejected water will be designed. Further, the resulting water after the proposed process of purification is expected to be used for other purposes like in household activities (sweeping, washing dishes), agriculture etc.



Visit of US Embassy Delegates, as a part of Smart Cities Initiative: 05 August, 2019



Global MNNIT Alumni Convention: 08-10 November, 2019



Diamond Jubilee Celebration: 02 December, 2019



Meeting of Spoke and Hub partners with MHRD official at MNNIT Allahabad: 26 December, 2019



MoU Signed between MNNIT and NASSCOM Foundation: 11 September, 2019



Elsevier Workshop on Research Publication Analytics: 4 September, 2019



DIC meet at IIT BHU Varanasi



GIAN Course: 3-7 September, 2019



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