BIOSCOPE

Volume 3/Issue 2/July 2021

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CBRHI:

Centre for Biomedical Research & Healthcare Innovations

A latest addition to the state of the art laboratory facilities.

In This Issue

Editorial Team

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Ms. Vani Sridhar, Undergraduate Student, Department of BME, SRMIST.

MESSAGE FROM THE CHAIRPERSON

Dr. M. Vairamani, Chairperson, School of Bioengineering SRM Institute of Science & Technology

Biomedical Engineering is a multidisciplinary subject of high importance to Science, Engineering, and more importantly to the Society. Its importance has come to more focus during Covid-19 pandemic all over the world. Many new biomedical devices have come to the market. The RT-PCR, a diagnostic technique, remains as the gold standard for detecting SARS-COV-2 virus even today. But now RT-PCRs which can do the analysis in 30 minutes are available. Such innovations have taken place within a year. Biomedical Engineering is more need and demand based. I am sure more and more user-friendly gadgets are likely to flood the market every year.

The Biomedical Engineering department at SRMIST is very dynamic and the research activities have become more vibrant in recent times. Infrastructure needed for doing quality research has been added and more research scholars have been recruited for using these facilities. The department has an industry sponsored laboratory, and many memorandum of understanding have been signed with industries to carryout collaborative research. Some faculty have been selected for Selective excellence projects financially supported by SRMIST also.

I am sure the faculty and the students of Biomedical Engineering will excel in their academic and research activities by utilizing the facilities not only in the Department but also available at SRMIST and come out with new devices for the benefit of the society.

I wish the faculty and the students all the success in their endeavors.

Hard work only pays!

Dr. M. Vairamani

"To succeed in your mission, you must have single-minded devotion to your goal."

- Dr. A.P.J. Abdul Kalam, Scientist

MESSAGE FROM THE HOD

Dr. Varshini Karthik
Chief Editor, BioScope
Head of the Department
Department of BME
School of Bioengineering, SRMIST

January to June has passed in a jiffy and here we have another issue of BIOSCOPE. In compliance with the slogan of Bioscope, "Keep it beating", even during the testing times of the pandemic, the students, research scholars and faculty of Biomedical Engineering department have kept up the spirit of consistent and smart work.

I would like to acknowledge our alumni who have always been our super support system. They inspire their juniors and set examples of the passionate career and future that Biomedical Engineering can offer. The hike in the in-campus placement offers from core industries like Stryker, Episource, Anabond Stedman, B-arm Medical Technologies etc. is an absolutely encouraging sign and it needs to be highlighted.

Working at the interface of Engineering and the medical domains, the expectation and the job ahead of us is ever changing and ever challenging. Having said that, come on BME! - Let's make strides and stay super committed.

To all the readers, wishing you a great semester ahead with all hopes to experience the colourful and vibrant campus with the hush and rush of students, very soon.

Warm regards

Dr. Varshini Karthik

"He who can listen to the music in the midst of noise can achieve great things."
- Dr. Vikram Sarabha, ISRO Founder

From The Editor's Desk

Dear Readers,

Welcome to the second issue of the third volume of Bioscope- the newsletter of the Department of Biomedical Engineering at the SRM Institute of Science & Technology, Kattankulathur.

Hope you are safe and sound with your families & friends. In these uncertain times, we would like to request that you pay attention to safety guidelines & adhere to them.

As we head into a new academic year, we celebrate another year of learning and accomplishments, both curricular & extracurricular. Despite the circumstances involving a global pandemic, we have endured and successfully navigated through a year of virtual learning, thanks to the industrious efforts of our faculty, staff & students.

We congratulate all the students, staff and faculty for their hard work and success. While the future seems uncertain, we can confidently say that through hard work and enthusiasm, the upcoming academic year will also be as fruitful as the last.

We would also like to heartily wish our readers all the very best and that you have a splendid year ahead of you.

Stay Safe & Best Wishes,

The Editorial Board, BioScope

FACULTY EDITOR

Dr. T. Jayanthi
Associate Professor
Department of BME

STUDENT EDITORS

Mr. SaiTejveer Santhan

Ms. Vani Sridhar

Ms. Sreelakshmi K Vijayan

"You cannot teach a man anything; you can only help him discover it in himself".
- Galileo, Astronomer

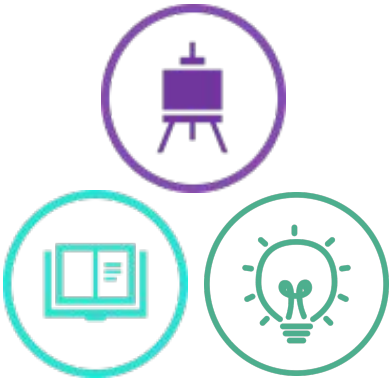
About the Department

Biomedical Engineering is the amalgamation of engineering principles and medical procedures in order to create solutions for healthcare. This essentially involves collaborating with doctors and medical researchers to develop medical equipments and devices as well as automated systems and software solutions related to the field.

Biomedical Engineering is one of the five departments in the School of Bioengineering. It was established in 2004, with active clinical partnership in association with SRM Medical College and Research Institute. The department aims to graduate responsible Biomedical engineers who can provide knowledge based, cost effective and high quality health care technology. Biomedical Engineering department offers B.Tech, M.Tech and Ph.D. programmes in Biomedical Engineering. Over the years, the department has actively been a part of diversified research and teaching, becoming one of the best institutions for the programme in the country.

Key Areas of Research

1. Medical thermal imaging in diseases, diagnosis and management
2. Technologies focusing on Point of care devices for healthcare applications
3. Human Movement analysis and assistive technologies
4. Next generation healthcare technologies for communicable and non-communicable diseases involving Bio Signal Processing, Medical Image Processing, Bio electronics and Biomechanics
5. Advanced sensor technologies involving Biosensors with Instrumentation Systems and Biomedical Nanotechnology



"Science and everyday life cannot and should not be separated."

– Rosalind Franklin, Chemist

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CBRHI: Centre for Biomedical Research & Healthcare Innovations

CBRHI has been formed with a commitment to offer world class and need of the hour research in healthcare and Biomedical Engineering fields.

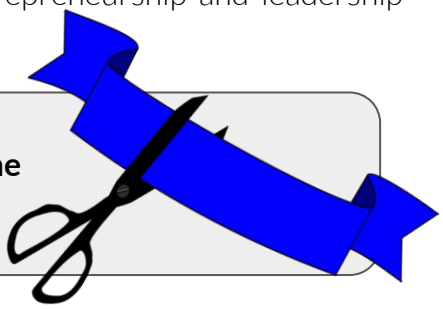
Vision: CBRHI is committed to build a world class research platform that positions our institution as a leader, in efforts to promote and transfer advances in Biomedical Engineering research into the benefits of the healthcare industry.

Mission: To develop and create interdisciplinary research environment for Biomedical research and its applications contributing to the development of diagnostic, therapeutic, assistive and augmentative technologies.

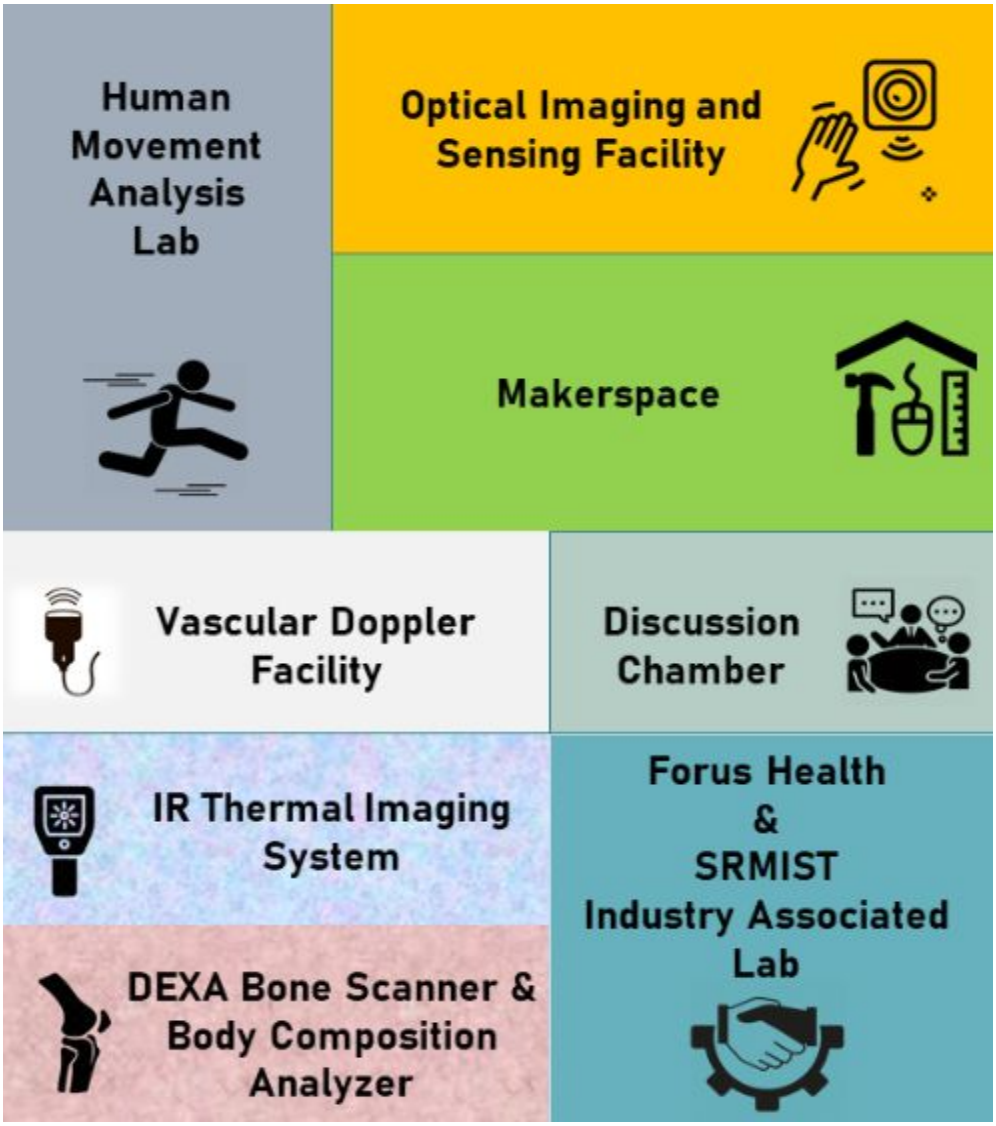
CBRHI **aims** to:

- Encourage creativity and new approaches in research.
- Work resolutely to meet biomedical challenges of the generation.
- Collaborate with industries, clinicians, and allied health professionals to provide better healthcare through research to the society.
- Enable conversion of abstract hypotheses, scientific and engineering knowledge into working systems.
- Translate the validated designs in labs to models from bench to bedside through industrial partnerships.
- Develop broad range of skills and attitudes that will contribute to entrepreneurship and leadership along with technical achievements.

The Inauguration ceremonies for the CBRHI Laboratories took place on the 9th of April, 2021.



"We are trying to prove ourselves wrong as quickly as possible, because only in that way can we find progress."— Richard P. Feynman



CBRHI encourages interdisciplinary research in:

- Non-invasive diagnosis
- Point of care devices
- Human movement analysis
- Assistive and augmentative technologies
- Biosignal and medical image processing
- Optical imaging and sensing

Research facilities at CBRHI include:

- Industry associated lab - Forus Health Pvt. Ltd. and SRMIST
- 3nethra Aberro refractometer
- 3nethra Fundus camera
- Infrared thermography system
- DEXA bone densitometer
- Foetal ultrasound Doppler monitor
- Body composition analyser
- Power Lab physiological DAQ system
- Movement and Gait analysis setup
- Vascular Doppler ABI measurement system
- NI ELVIS MyDAQ, MyRIO, Mechatronic, Embedded kit
- 3D image based engineering software- Mimics, Abaqus
- 3D Printer (Made by BME students)

GALLERY

For more images on the inauguration ceremony, visit the gallery pages. (Page number 65)

"In questions of science, the authority of a thousand is not worth the humble reasoning of a single individual." — Galileo Galilei

CORONA TALKIES

COVID - Related Research & Project Works:

1. **Annasamy Gowri, Ashwin Kumar N, Suresh Anand, BS,** "Recent Advances in Nanomaterials based Biosensors for Point of Care (PoC) Diagnosis of Covid-19-A Minireview", (Feb 2021), Trends in Analytical Chemistry (TrAC), 137, 116205, Impact factor: 9.801 - SCI indexed.

2. **Bhargavi G, Sowmiya S, Shivani Bukka, Snekhalatha U, Rajalakhsmi T** won the best paper award for the paper entitled "Automated segmentation of Covid-19 regions from lung CT images using watershed algorithm and classification using machine learning classifiers" in the National Conference on Rehabilitation Engineering and Assist Devices (NCREAT –2021), from 11 to 12 March 2021 Virtually organized by the department of Biomedical Engineering, SRM Institute of Science and Technology, Kattankulathur, Chennai, Tamil Nadu, India.

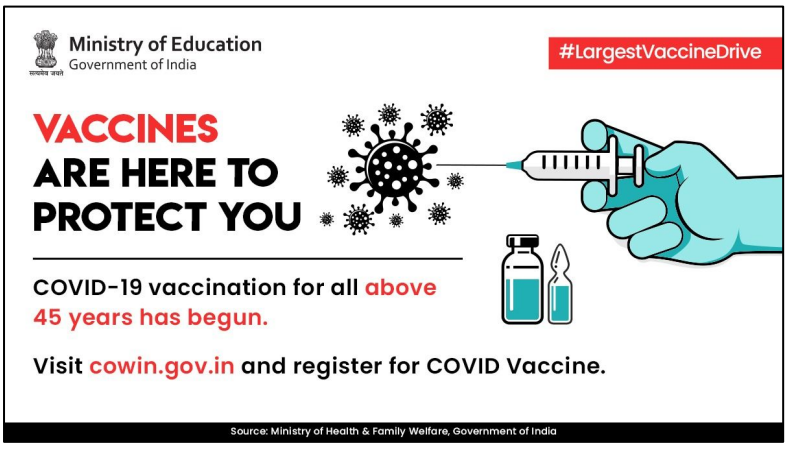
3. **Dr. T. Jayanthi** Proposal submitted as Principal Investigator in SERB-Special call on Oxygen Concentrators, in collaboration with Dr. Mohammed Rabik, Assistant Professor, Dept. of Mechatronics as Co-PI. (File No: CVD/2021/000045)

4. **Bhargavee Guhan**, **Sowmiya S**, **U.Snekhalatha**, **T.Rajalakshmi**, Automated Segmentation of COVID-19 Regions from Lung CT Images using Watershed Algorithm and Classification using Machine Learning Classifiers. Under review BEABC J May 2021. SNIP: 0.374

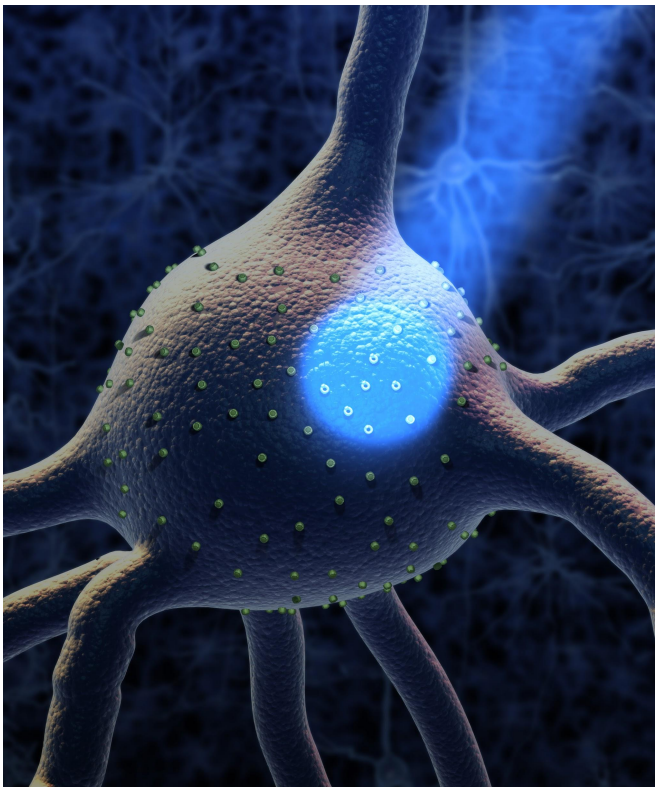
5. **Bhargavee Guhan**, **Sowmiya S**, **U.Snekhalatha**, **T.Rajalakshmi** (2021). Automated System for classification of COVID-19 Infection from Lung CT Images based on Deep Learning Techniques Submitted to JEIOM May 2021

TAKE CARE & STAY SAFE!!

Kindly follow take the necessary safety precautions and help save lives.



"By 'life,' we mean a thing that can nourish itself and grow and decay."
— Aristotle, Scientist & Philosopher



Optogenetics

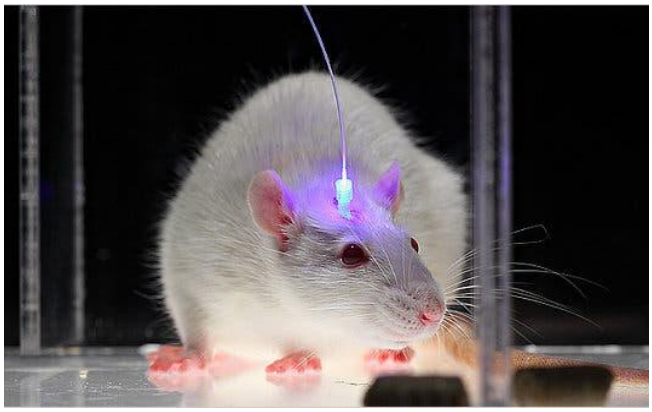
LIGHTING UP THE BRAIN!!

The human brain is the most complex organ in the human body and is made up of billions of neurons. Neurons conduct electrical impulses and establish the communication link between the brain, body (motor commands to muscles) and outside world (sensory inputs). A person's ability to understand and perceive the surroundings, recognize, remember, communicate and move around are all dependent on these neurons.

The progressive degeneration of neurons leads to various neurodegenerative diseases affecting movement, learning, metabolism, hunger, thirst, respiration, motivation, fear and sensory processing. Each of the activity is controlled by a small network of neurons in the brain and when the network is disturbed the activity is out of control. The identification and control of the neurons in each of the networks can lead to restoring normal activity. One such attempt is the field of Optogenetics. It is a combination of optics and genetics which is used to excite or inhibit neurons in order to enable well-defined events in the human body.

Optogenetics basically uses targeted single genes known as opsins to genetically modify the neurons and makes them sensitive to light. Opsins produce protein that function as light sensitive/activated ion channels or pumps which activate or inhibit the neurons. When these ion channels are illuminated, they open and allow ions to enter the cells and cause them to fire once a threshold is reached.

In 2010, optogenetics was chosen as the "Method of the Year" across all fields of Science & Engineering.



"There are only two ways to live your life. One is as though nothing is a miracle. The other is as though everything is a miracle.

— Albert Einstein

Targeted approach enables specific modulation of cells within the complex neuron structures without affecting other activities. Optogenetics is used to study as well as treat neurodegenerative disorders by lighting up specific neurons and understands its role in the activity.

The important goal accomplished here is the electrical control of a single neuron without affecting the surrounding neurons. This technique has high temporal and spatial resolution. The controlled pulses of laser light allow for high temporal resolution and the targeting binding of opsins contributes to the spatial resolution. The technique is mutation independent and circuit specific restoration of neuronal function. Different types of opsins are used to target different regions of the brain and is illuminated with a specific wavelength to provide the neuronal stimulation. A few of them are activators i.e. open cation channel and the inhibitors open the chloride channel. A few of the opsins are ChR2 (activator, 400-500 nm), NpHR (inhibitor, 550-620 nm), ReaChR (activator, 590-630 nm), Crimson (activator, 600 nm), SFO (activator, 450-590 nm), VChR1 (activator, 500-550 nm) and iCIC2 (inhibitor, 450-500 nm). The light is delivered through implanted optical fibers or 2D/3D multichannel waveguides [2].

One important breakthrough in the field of optogenetics is the partial restoration of vision. Retinitis pigmentosa (RP) is a neurodegenerative eye disease. It is a progressive, inherited and blinding disease. This disease destroys the photoreceptors which are responsible in sensing light in the retina thereby causing blindness. A recent research article in Nature Medicine [3] reported the partial recovery of vision in a RP patient through optogenetic therapy. The treatment included the injection of adeno-associated viral vector encoding the optogenetic sensor ChrimsonR (targeted ganglion cells in retina) in one eye of the 58-year-old male RP patient. The light stimulation was provided with the help of an engineering goggle. The injection caused the formation of an artificial photosensitive layer in the retina.

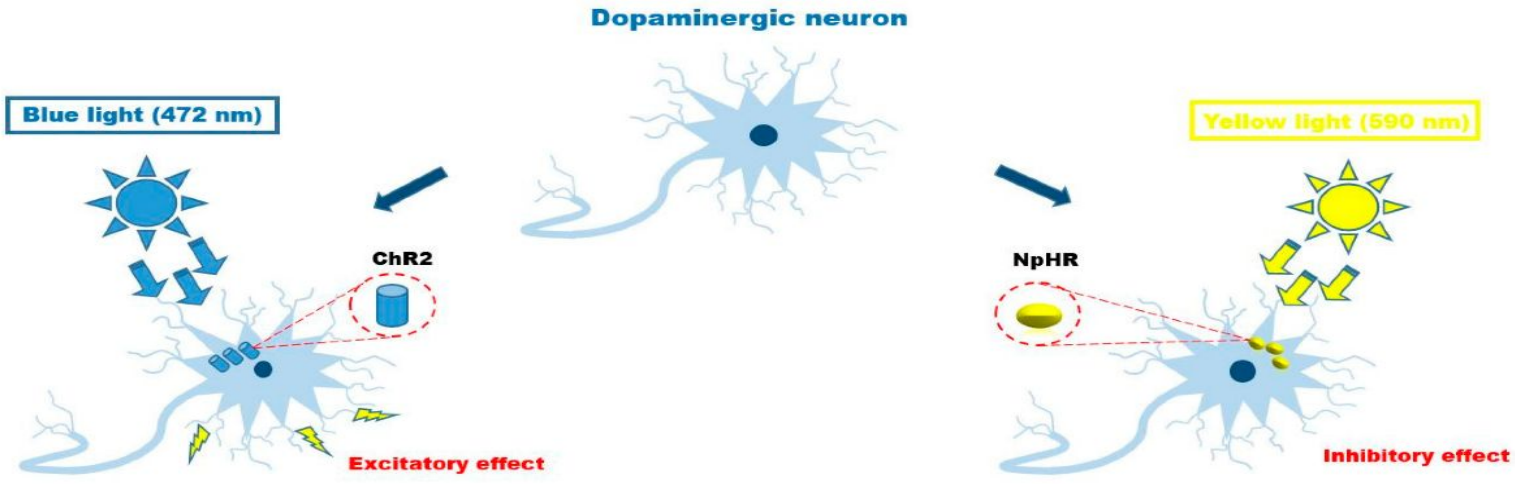


Figure 1: Neuromodulation with Optogenetic technique: blue light activates ChR2 with an excitatory effect, while yellow light activates NpHR with an inhibitory effect.[1]

"A physicist is an atom's way of knowing about atoms.".

- George Wald, Neurobiologist

The goggle activate captured the outside visual world and converted them into light pulses which were projected on the retina. These light pulses would activate the modified cells. The study results showed visual perception in the patient. The patient could orient himself towards the object and perform visuomotor task of reaching the object. The EEG of the patient was also studied to verify the visual stimulation reaching the occipital lobe and the generation of alpha rhythm.

The other applications of optogenetics is to correct heart rate abnormalities by introducing rhodopsin in the sinus node. The opsins can also be injected in the cardiomyocytes present in the heart muscle thereby controlling the heart rate directly.

Thus, the field of Optogenetics looks promising in understanding and studying individual neurons in networks responsible for physiological and behavioral activities and restoring these functions.

- Dr. Vani D

About the author

Dr. Vani Damodaran

Currently working as an Assistant Professor in the Department of Biomedical Engineering at SRM Institute of Science and Technology, Kattankulathur campus. She received her Doctoral degree in Biomedical Optics from Indian Institute of Technology Madras (IITM), India. Her PhD research work was on development of optical coherence tomography (OCT) system for dental imaging to identify early caries and has filed a patent on a novel high speed electro-optical scanner for OCT systems. She is currently working on developing a handheld OCT Angiography system for ophthalmic imaging which is funded by the SERB Startup grant. Her research interests are optical imaging and sensing, biomedical image and signal processing, electro-optics and deep learning.

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1. Spagnuolo G, Genovese F, Fortunato L, Simeone M, Rengo C, Tatullo M. The Impact of Optogenetics on Regenerative Medicine. Applied Sciences. 2020; 10(1):173. https://doi.org/10.3390/app10010173
2. Mahmoudi P, Veladi H, Pakdel FG. Optogenetics, Tools and Applications in Neurobiology. J Med Signals Sens. 2017;7(2):71-79.
3. Sahel J, Boulanger-Scemama E, Pagot C et al. Partial recovery of visual function in a blind patient after optogenetic therapy. Nat Med. 2021. doi:10.1038/s41591-021-01351-4

"Time is a drug. Too much of it kills you."

— Terry Pratchett, Small Gods

EVOLUTION IN BIOMEDICAL ENGINEERING (BME)

"A look at the evolutionary change across the healthcare industry due to the pandemic."

Evolutionary change for Biomedical Engineers

It has been a year and eight months India is fighting the pandemic. The world of health and healthcare have proved their stake in society. The vaccine makers are having competition in dosage and efficacy.

Despite this pandemic there is notable research going in healthcare industries in other parts of it. Researchers have turned over the conventional use of 3D printing. Instead of producing bioscaffolds directly, the team has 3D printed molds with complex-patterns, ,the voids are filled with biocompatible materials, before suspending the molds away.

Technology has gone with nature, which has the ability to heal itself. This forthcoming field of tissue engineering aims to bind to our body effortlessly and has the ability to cure itself, to regrow bone and muscle loss due to diseases or accidents. The central piece for clinical engineers has been the strategies and in developing these scaffolds which are being implanted in the body which helps support cell regeneration. This latest biofabrication method is economical and easily mountable as it relies on widely current expertise. A common problem that was faced by the doctors is accessible technological experimental solutions for the problems the biomedical engineers lead the path and execute it.

Making the impossible, Possible

Can a paralyzed patient walk, communicate freely? Can a paralyzed person lead a new normal life? rehabilitative

Yes, Brain-computer interfaces (BCIs) are new growing rehabilitative technology that enables paralytic patients to manipulate programmed prostheses by reflecting about their own body movements.

This evolution of these neuroprosthetic technologies help the patients suffering from motor disabilities by enriching their ability to interact and communicate better in the environment.

It's the first in the world that BrainGate clinical trial participants with tetraplegia have demonstrated use of a wireless BCI with an external wireless transmitter. This system has the capacity of transmitting brain signals at single-neuron resolution and without physically tethering the user

"What you learn from a life in science is the vastness of our ignorance".

– David Eagleman, Neuroscientist

to a decoding system.

The usual wire has been replaced by a small transmitter which is about 2 inches in its largest dimension. The signals recorded and transmitted can be done both via wired and wirelessly mode.

One a similar note many companies have set up the same lines BCI field, and with wonderful outcomes have demonstrated the use of lower-bandwidth wireless systems.

This technology is crucial and a stepping stone to the generation of neuroprosthetic technologies which may lay significant improvement in the patients with motor disabilities and enhance communication with their colleagues and their loved ones.

Cross cutting technologies

Can I pursue passion and interest in the same field? Yes, why not. Current trends of research are not limited within one field but also integrate two disciplines which is very essential in today's world.

The need for radical fiber biomaterials and medical devices have seen a rapid up rise up rise.Textile biomedical engineering (TBE) is being outline as an blended approach of designing and engineering job of creating a superior fiber materials which is used in devising textile structures and devices to achieve various its needs viz. tissue engineering and artificial implants.

Recently researchers in Massachusetts Institute of Technology (MIT) have innovated a digital sense, retain, analyze and infer activity, and can be sewn into clothing to help monitor physiological functions. It is the world's first electronic fabric that can record the digital data just like any other device.

This scalable preform-to-fibre approach is used to produce flexible fibre containing hundreds of interspersed, digital temperature sensors and memory devices. This digital fibre, is being incorporated in our clothes, and collects and stores body temperature data for multiple days, and enables real-time inference of wearer activity with an accuracy of 96% via a skilled neural network with about 1650 neuronal networks collected within the fibre. The stored information is then converted in digital memory of the fibre to determine if the wires are still connected to it.

In one of the interviews Preethi Gopinath, Associate Professor and Founding Director of the Textiles MFA programme at Parsons, The New School in New York mentioned that she has collaborated with engineers and techies are in the verge of renovating a medical device involving smart textiles that helps to monitor our blood oxygen levels. This shall lay a significant change in many other fields crosscutting many disciplines with the healthcare industry.

A big boon to India in Health care

Early in 2021, IIT Madras has released a white paper on Biomedical Engineering Education. This whitepaper involves a lot of biomedical scholars from several IITs and other main institutes from the education field. The Biomedical Engineering education system is the backbone of healthcare innovation in India.

"Imagination is more important than knowledge".

- Albert Einstein, Theoretical Physicist

Medical Technology provides us with immense opportunity for both the educational sectors and industry to work together. This paper encourages the teaching firm significance of patents, and promotes in maintaining a good value system and technology transfer which is very essential in this era.

This paper is an eye opening for all the sectors such as education Institutes, industries, designers, entrepreneurs in the field of Healthcare for our nation.

- Mr. G.Prithvi Shankar

About the author

G. Prithvi Shankar

As a bachelor's student at SRM IST, Prithvi has been a part of various activities in the Department of Biomedical Engineering, also has been a core member in BioCom Community in Biomedical domain at SRM IST. His team has published a paper on low cost wearable devices. He has also organized webinars which went live stream in Youtube for the channel Kalams and Krishnans and gave presentations in school in the field of Health and Healthcare.

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https://www.advancedsciencenews.com/new-technique-breaks-the-mold-for-3d-printing-medical-implants/
https://www.medicaldevice-network.com/news/digital-fibre-mit/
https://yourstory.com/2021/06/designup-2021-preethi-gopinath/amp
https://www.republicworld.com/india-news/education/iit-madras-other-top-institutions-release-whitepaper-on-biomedical-engineering-education.html

"I'm sure the universe is full of intelligent life. It's just been too intelligent to come here."
— Arthur C. Clarke

Research Publications

- **A. Udaya Kumar, R. Raghavi, R. Reshma, S. P. Angeline Kirubha,** "Non-invasive assessment of fractional flow reserve using computational fluid dynamics modelling from coronary angiography images", (Jan 2021), International Journal of Medical Engineering and Informatics, Vol. 13, No. 1, 2021, [SNIP:0.338] – (Scopus Indexed), DOI: 10.1504/IJMEI.2021.111863

- **Tuhin Sengupta, Ashokkumar Devaraj, Varshini Karthik, Huda Altaf and Mansi Gupta**, "TRACE: Tracking Relational Axes And Comparative Evaluation", Biomedical Engineering: Applications, Basis and Communications, Vol. 33, No. 2 (Feb 2021), SNIP: 0.374 –Scopus Indexed, DOI: 10.4015/S1016237221500083.

- **Anitha Govindan, Subhiksha Venkat, B. Vigneshvaran,** "Effect of ageing on different swallowing pattern using electromyography", Materials Today: Proceedings, (Feb 2021) Elsevier Ltd. SNIP:.576 - Scopus Indexed. https://doi.org/10.1016/j.matpr.2021.01.494 2214-7853/2021

- **Lakshmi Prabha P. Jayanthy A.K. Kumar, C.P. and Ramraj B,** "Prediction of cardiovascular risk by measuring carotid intima media thickness from an ultrasound image for type II diabetic mellitus subjects using machine learning and transfer learning techniques", (March 2021), The Journal of Supercomputing, pp.1-18,2021, Impact factor: 2.46 - SCI indexed, DOI: https://doi.org/10.1007/s11227-021-03676-w

- **Qaysar Mohi-Ud-Din, A.K. Jayanthy,** "EEG feature extraction using wavelet transform for classifying autism spectrum disorder" Materials Today: Proceedings, (March 2021), DOI: https://doi.org/10.1016/j.matpr.2021.01.803

- **Anitha Govindhan, A. Bhargavi Haripriya, Vaishnavi Umalkar,** "Design of low-cost device to acquire lung signals", Materials Today: Proceedings (March 2021), SNIP: .576 - Scopus indexed. https://doi.org/10.1016/j.matpr.2021.01.805.

"Science is the acceptance of what works and the rejection of what does not. That needs more courage than we might think."

– Jacob Bronowski, Mathematician

- **Richa Rashmi, U. Snekhalatha, Palani Thanaraj Krishnan** (2021)**,** "Thermal Imaging method to evaluate childhood obesity based on machine learning techniques" Imaging Systems and Technology, published online 20th March 2021(IF 1.925) SCI and Scopus indexed, https://doi.org/10.1002/ima.22572

- **Tarunika kumaraguru, P. Abirami, K.M. Darshan, S.P. Angeline Kirubha, S. Latha, P. Muthu** , "Smart access development for classifying lung disease with chest x-ray images using deep learning, Materials Today: Proceedings", April 2021, SNIP - 0.51, Scopus Indexed, https://doi.org/10.1016/j.matpr.2021.03.650.

- **R Archana, T Rajalakshmi, P Vijay Sai,** "Design of Low cost Data Acquisition Circuit with Feature Extraction", IOP Conf. Series: Materials Science and Engineering, April 2021, SNIP – 0.531, Scopus Indexed, doi:10.1088/1757-899X/1130/1/012079.

- **Ameenudeen Mohammed, Varshini Karthik, Oinam Robita Chanu,** "Point of care detection of potassium in saliva using colorimetric optical Absorption", Materials Today: Proceedings, May 2021, SNIP - 0.576 (Scopus Indexed and SCI), https://doi.org/10.1016/j.matpr.2021.05.315.

- **Dheepitha Babu, Vandhana Karunakaran, Swathi Gopinath, S.P. Angeline Kirubha, S. Latha, P. Muthu**, "GUI based prediction of heart stroke using artificial intelligence" Materials Today: Proceedings. May 2021, SNIP - 0.56 (Scopus Indexed)

- **Bhargavee Guhan. Sowmiya S, U.Snekhalatha, T.Rajalakshmi,** "Automated segmentation of Heel Fissure based on Thermal Imaging Processing and classification using machine learning algorithms", Biomedical Engineering Application Basis Communication Journal online May 2021, https://doi.org/10.401/S1016237221500320, SNIP - 0.374, (Scopus Indexed)

- **U. Snekhalatha, Palani Thanaraj Krishnan,** "Automated detection of Orofacial Pain from Thermograms using Machine Learning and Deep Learning Approaches", Expert systems Online 8th June 2021, IF-1.546 (SCI and Scopus Indexed)

- **Kavya, U. Snekhalatha Palani Thanaraj Krishnan**, "Deep learning techniques for Automated classification of Autism using Thermal imaging", JEIOM Online 9th June 2021 https://doi.org/10.1177%2F09544119211024778, IF-1.28 (SCI and Scopus Indexed)

- **Vijaysai, T.Rajalakshmi, U.Snekhalatha,** "A Non invasive Thyroid detection based on Electroglottogram signal using machine learning classifiers", JEIOM Online 27th June 2021 DOI: 10.1177/09544119211028070, IF-1.28 (SCI and Scopus indexed)

- **Ashwin Kumar N, Swathi Lakshmi B, Ganapathy Krishnamurthi,** "Influence of europium (Eu) doped tantalum oxide nanoparticles (TaOx NPs)", A potential contrast agent, June 2021, IF – 3.2 (SCI)

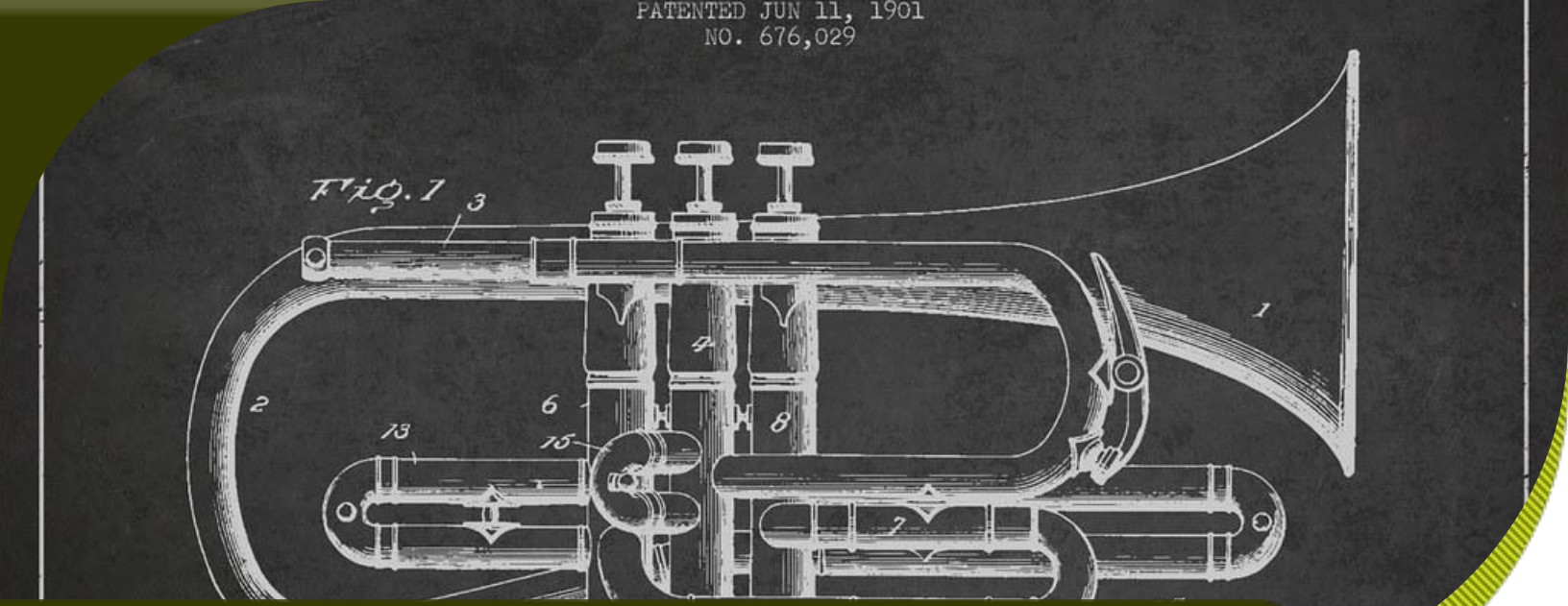
"Every great advance in science has issued from a new audacity of imagination."
– John Dewey, Philosopher

Internships & Student Training

- **Mr. Rudransh Tiwari** (Reg. No. RA1811034010033), **Mr. Rohit Dey** (Reg.No. RA1811034010036) ECE-BME III year, successfully executed their student Internship work titled "Developing of software for Raspberry pi HQ camera" at Forus Health Pvt. Ltd., Bangalore during 13th October 2020 to 13th January 2021.
- **Mr. Jaineet Arora** (Reg. No. RA1711013010077), B.Tech-BME IV year, doing Internship in the Department of Biomedical Engineering, Sir Ganga Ram Hospital, New Delhi, India from 8th March 2021 to 7th September 2021.
- **Ms. Anupama Chaudhary** (Reg. No. 1912015010007), M.Tech-BME II year internship at B-Arm medical technology during March 2021.
- **Ms. Mayuri** (Reg. No. RA1811034010032), B.Tech ECE-BME III year internship training on industrial based embedded system development with IOT at National Small Industries Corporation Limited, Technical services Centre, Chennai, Tamil Nadu, India from 15th March 2021 to 29th March 2021.
- **Ms. Mayuri** (Reg. No. RA1811034010032), B.Tech ECE-BME III year internship training on VI solutions, Bangalore from 15th March 2021 to 21st April 2021.
- **Ms. Sisna Remitta** (RA1911034010021), B.Tech ECE-BME II year internship training on Design and Development of Sellable Automatic Dispenser: Sanitizer, Water and Liquid, at NRIT, Maharashtra from 23rd March 2021 to 4th April 2021.
- **Mohammed Ameenudeen Anwar** (RA1912015010003), M.Tech-BME II Year, attending an "Advanced training in Biomedical applications" in Harvey biomedical, Bangalore, 28th June to 6th August 2021.
- **Samarth Patel** (RA1811034010057), ECE-BM III Year, attended the 4 week "Project Management Training Program" at TaakZone Business Management & Consulting.

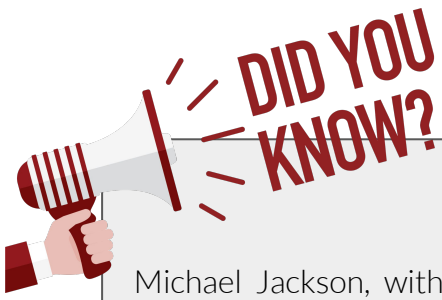
"Science is organized knowledge. Wisdom is organized life."

– Immanuel Kant, Philosopher



Patents Under Process (Intellectual Property Rights)

- **P. Lakshmi Prabha, R. Kayalvizhi, Kuntal Konika, Banerjee Indrajit** "A system and method for controlling a wheelchair" Application No.202041057241, Date of filing of Application : 30/12/2020.
- **J. Glory Precious, S. P. Angeline Kirubha, Keren Evangeline. I** "Diagnosis of brain tumor using novel deep learning BT-GPM convolutional net from magnetic resonance images" Application for patent Applied Dated: 04/01/2021
- **Ameenudeen Mohammed, Varshini Karthik, Oinam Robita Chanu,** Point of care detection of potassium in saliva using colorimetric optical absorption – May 2021, Application submitted
- **Shivani S, Dhyaneshwar G, Varshini Karthik, Ashok D, Ganapathy U Gaze** Rehabilitation for Autistic Juveniles – May 2021, Application submitted



FUN FACT

Michael Jackson, with two other inventors, had invented a device that enabled him to perform that on stage – patent numbered US5255452A and titled "Method and means for creating anti-gravity illusion".

"Everything is theoretically impossible, until it is done."

– Robert A. Heinlein, Author

Doctorate Degrees Awarded

Congratulations to the hardworking and industrious student & faculty researchers of our department on completing their doctorate programmes successfully!!!

We wish you success in their careers, academic or industrial, as well as their personal lives.

- **Mrs. T. Usha Rani** Full time candidate under the guidance of **Dr. U. Snekhalatha**, Associate Professor, Biomedical Engineering defended her Thesis in Ph.d Viva voce titled "Facial and tongue infrared thermography: a non-invasive prognostic tool for pre-screening the type II diabetes mellitus" held on 22nd February 2021 and graduated as Doctoral degree holder.
- **Mr. P. Muthu** (Reg. No: 7631310002) Part time Research scholar – under the supervision of **Dr. S. P. Angeline Kirubha** defended his thesis titled "Investigations on the Influence of Additional Phase on the Prepared Biocomposites and Computational Analysis of Microscopic Images" in public Viva-Voce Oral Examination on 8th April 2021 and graduated as Doctoral degree holder.

"The art and science of asking questions is the source of all knowledge."
– Thomas Berger, Novelist

Student & Faculty Participation in Conferences

Students & faculty members from our department have taken part in a variety of events held by various institutions ranging from conferences and workshops to webinars and hackathons.

Given below are a few mentions where our faculty & student members have presented their ideas at a public forum.

- **Richa Rashmi, U. Snekhalatha**, presented a paper titled "Thermal imaging analysis in detection of childhood obesity in cervical region using machine learning classifiers" in International e-Conference on intelligent system and signal processing (e-ISSP2020) organized by Electronics & Communication Engineering Department of G H Patel College of Engineering & Technology from 28th to 30th December 2020.
- **Meghna Sampath, Nelufer, Sakshi Srivastava, U. Snekhalatha,** presented a paper titled "Automated segmentation and classification of Psoriasis hand thermal images using machine learning algorithm" in International e-Conference on intelligent system and signal processing (e-ISSP2020) organized by Electronics & Communication Engineering Department of G H Patel College of Engineering & Technology from 28th to 30th December 2020.

"The whole of science is nothing more than a refinement of everyday thinking."
– Albert Einstein, Theoretical Physicist

- **Oinam Robita Chanu, p**articipated and presented a paper entitled "Non-enzymatic electrochemical sensor based on NiO/Ag film for the detection of the nitrite for profiling kidney diseases" in the International Conference on Nanoscience and Nanotechnology (ICONN 2021) from 1st to 3rd February 2021 organized by Physics and Nanotechnology, SRM Institute Of Science And Technology, Kattankulathur, Chennai, Tamil Nadu, India

- **Ashwin Kumar N,** participated and presented a paper entitled "Feasibility study of doped nanomaterials as contrast agents for X-Ray Excited optical imaging" in the 6th International Conference on Nanoscience and Nanotechnology (ICONN 2021), from 1st to 3rd February 2021 organized by Department of Physics and Nanotechnology, SRM Institute of Science and Technology, Kattankulathur, Chennai, Tamil Nadu, India.

- **Kathirvelu D,** participated in second International Conference on Instrumentation, MEMS and Biosensing Technology (ICIMBT-2021), organized by the department of Electronics and Instrumentation Engineering, SRM Institute of Science and Technology, Kattankulathur, Chennai, Tamil Nadu, India on 18th to 20th February 2021.

- **Varshini Karthik**, participated in the 5th International Conference on "Recent Advances in Material Chemistry (ICRAMC-2021) Virtual Mode", from 18th to 20th February 2021 organized by the Department of Chemistry, SRM Institute of Science and Technology, association with alternative Energies and Atomic Energy commission (CEA) & Universite Gustave Eiffel, France.

- **Oinam Robita Chanu,** participated in the 5th International Conference on "Recent advances in Material Chemistry (ICRAMC-2021) Virtual Mode", from 18th to 20th February 2021 organized by the Department of Chemistry, SRM Institute of Science and Technology, association with alternative Energies and Atomic Energy commission (CEA) & Universite Gustave Eiffel, France.

- **Niryukta**, **U.Snekhalatha**, **T.Rajalakshmi** (2021) presented a paper titled " Audiometer Based on Bone Conduction For Accessing the Hearing Deficiency. Second International Conference on Instrumentation, MEMS and Bio-sensing Technology (Virtual) - ICIMBT2021 virtually conducted by Department of Electronics and Instrumentation, SRM IST, Chennai, Tamilnadu, India during February 18-20, 2021"

- **Saahithyaa Vijayaraghavan, Rishab Kumar, Sibi D P, Ashok kumar D, Varshini Karthik** won the best paper award for the paper entitled, "FSR Sensor based Embedded System to detect imbalance in Autistic children" in the National Conference on Rehabilitation Engineering and Assist Devices (NCREAT –2021), from 11 to 12 March 2021 Virtually organized by the department of Biomedical Engineering, SRM Institute of Science and Technology, Kattankulathur, Chennai, Tamil Nadu, India.

- **A Bhargavi Haripriya,** participated in the International Conference on Recent Advancements in Biomedical Engineering (ICRABE'21), from 17th to 19th March 2021 organized by Bharath Institute of Science and Technology, Chennai, Tamil Nadu, India.

"Science is the knowledge of consequences, and dependence of one fact upon another."
– Thomas Hobbes, Philosopher

- **Dhyaneshwar G, Shivani S, Varshini Karthik, Ashokkumar D, U Ganapathy Sankar** presented a paper entitled "Eye Tracking to Study Eye Gaze in Juveniles with Autism" in the National Conference on Rehabilitation Engineering and Assist Devices (NCREAT –2021), from 11 to 12 March 2021 Virtually organized by the department of Biomedical Engineering, SRM Institute of Science and Technology, Kattankulathur, Chennai, Tamil Nadu, India.

- **Jerin Thomas, Sourav P R, Harikrishnan C Prakash, A Bhargavi Haripriya** presented a paper entitled "A Wearable Performance Analysis System for Monitoring Various Lower Extremity Parameter of an Athlete" in the National Conference on Rehabilitation Engineering and Assist Devices (NCREAT –2021), from 11 to 12 March 2021 Virtually organized by the department of Biomedical Engineering, SRM Institute of Science and Technology, Kattankulathur, Chennai, Tamil Nadu, India.

- **Tuhin Sengupta, Huda Altaf, Mansi Gupta, Ashokkumar D, Varshini Karthik** presented a paper entitled "Microgravity and Radiation Effects on Musculoskeletal Atrophy Detection System" in the National Conference on Rehabilitation Engineering and Assist Devices (NCREAT –2021), from 11 to 12 March 2021 Virtually organized by the department of Biomedical Engineering, SRM Institute of Science and Technology, Kattankulathur, Chennai, Tamil Nadu, India.

- **Ipsitha Bodhak, Mayuri, Panchami S S, A Bhargavi Haripriya** presented a paper entitled "Design and Development of a Self-Diagnostic Smartphone Application Based on Hair and Scalp Analysis" in the National Conference on Rehabilitation Engineering and Assist Devices (NCREAT –2021), from 11 to 12 March 2021 Virtually organized by the department of Biomedical Engineering, SRM Institute of Science and Technology, Kattankulathur, Chennai, Tamil Nadu, India.

- **Rajalakshmi S, A R Reshma Ruth Pauline, S Mohnish, Rajalakshmi T, Snekhalatha U** presented a paper entitled "A Novel lung tumor detection technique using fast greedy snake's algorithm" in the National Conference on Rehabilitation Engineering and Assist Devices (NCREAT –2021), from 11 to 12 March 2021 Virtually organized by the department of Biomedical Engineering, SRM Institute of Science and Technology, Kattankulathur, Chennai, Tamil Nadu, India.

- **Dheepitha babu, Vandhana Karunakaran, Swathi Gopinath, Mr. P. Muthu,** presented a paper entitled "GUI based prediction of heart stroke using artificial intelligence" in the International Conference on Recent Advancement in Biomedical Engineering (ICRABE'21), from 17th to 19th March 2021 organized by the department of Biomedical Engineering, Bharath Institute of Science and Technology, Chennai, Tamil Nadu, India.

- **Shweta Ashok, Ashwin Kumar N**, selected as a best paper titled "Low cost microfluidic syringe pump" in the International Conference on Recent Advancements in Biomedical Engineering (ICRABE'21), from 17th to 19th March 2021 organized by Bharath Institute of Science and Technology, Chennai, Tamil Nadu, India.

"Science is a way of thinking much more than it is a body of knowledge."

– Carl Sagan, Astronomer

- **Anupam Jyoti, Ashokkumar D, Varshini Karthik, Raja D, Nilkanth Gupta** presented a paper entitled "Study the loading effect of shoulder joint using Finite Element Analysis", in the National Conference on Rehabilitation Engineering and Assist Technologies" (NCREAT –2021), from 11 to 12 March 2021 Virtually organized by the department of Biomedical Engineering, SRM Institute of Science and Technology, Kattankulathur, Chennai, Tamil Nadu, India.

- **Tarunika kumaraguru, P. Abirami, Darshan KM, Mr. P. Muthu,** presented a paper entitled "Smart access development for classifying lung disease with chest X-Ray images using Deep Learning" in the International Conference on Recent Advancement in Biomedical Engineering (ICRABE'21), from 17th to 19th March 2021 organized by the department of Biomedical Engineering, Bharath Institute of Science and Technology, Chennai, Tamil Nadu, India.

- **Pallavi P, S. P. Angeline Kirubha, Anish Kumar Patra, Junaid Zahoor Dar,** presented paper titled "Automatic Segmentation of Kidney stones Using Active Contour Method using Machine Learning" in the International Conference on Recent Advancement in Biomedical Engineering (ICRABE'21), from 17th to 19th March 2021 organized by the department of Biomedical Engineering, Bharath Institute of Science and Technology, Chennai, Tamil Nadu, India.

- **B.Nitish harihar, Shinaz Naziha, Jerome Jorge, P. Muthu, S. P. Angeline Kirubha,** presented paper titled "Portable Spectroscopic analysis device of human saliva sample by Micro Spectroscopy for detection of Diabetes Mellitus", in the International Conference on Recent Advancement in Biomedical Engineering (ICRABE'21), from 17th to 19th March 2021 organized by the department of Biomedical Engineering, Bharath Institute of Science and Technology, Chennai, Tamil Nadu, India.

- **Mr. Yasar Arafath and A. K. Jayanthy,** presented a paper entitled "Non-invasive monitoring of glucose and oxygen level in blood" in the International Conference on Recent Advancements in Biomedical Engineering (ICRABE'21), from 17th to 19th March 2021 organized by Department of Biomedical Engineering, Bharath Institute of Science and Technology, Chennai, Tamil Nadu, India

- **R Jaireethikha**, participated in International Conference on Recent Advancements in Biomedical Engineering (ICRABE'21) from 17th to 19th March 2021 organized by Department of Biomedical Engineering, Bharath Institute of Science and Technology, Chennai, Tamil Nadu, India

- **Qaysar Mohi-ud-Din and A.K. Jayanthy,** presented a paper entitled "Detection of Autism spectrum disorder from EEG signals using pre-trained deep convolution neural networks" in the seventh International Conference on Biosignals, Images and Instrumentation, from 25th to 27th March 2021 organized by the Department of Biomedical Engineering, SSN Engineering College, Chennai, Tamil Nadu, India.

"Science and religion are not at odds. Science is simply too young to understand."
— Dan Brown, Angels & Demons

- **Niryukta M and U. Snekhalatha,** presented a paper titled "Automated audiometer for home based health care using Mobile App" in the Virtual International Conference on Recent Advances in Manufacturing Engineering Research (ICRAMER 2021) from 15th to 16th April 2021 organized by Department of Mechanical Engineering, SRM Institute of Science and Technology, Kattankulathur, Chennai, Tamil Nadu, India.

- **Smera Sudheer Pandaran, Liya Vinod, Bhanu Sai Prakash Beldi, Varshini Karthik and Ashokkumar Devaraj** presented a paper titled "Pressure Assessment at the Sacral Region for different sitting Posture and Body Mass Index" in the 11th International Conference on Science and Innovation Engineering on 2nd May 2021 organized by Jawahar Engineering College, Chennai, Tamil Nadu, India

- **Haritha Nair, Nehaa Prvin, Adwaith Sreedher and Lakshmi Prabha P** presented a paper titled "Smart Health Monitoring System for the Elderly" in the 11th International Conference on Science and Innovation Engineering on 2nd May 2021 organized by Jawahar Engineering College, Chennai, Tamil Nadu, India

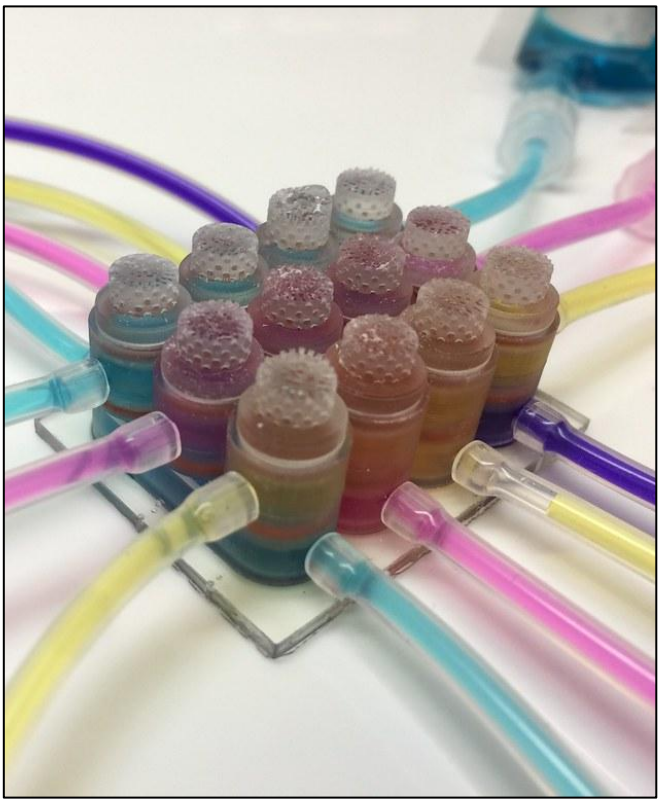
- **Deepaloke Pramanik, Jaineet Arora, Rushali Bhattacharjee, T Jayanthi,** presented paper title "Evaluation of Hypertension from Fundus Images" in International Conferences on Advances in Mechanical Engineering Design in the International Conference on Advances in Medical Engineering Design ICAMED 2021 from 3rd to 4th May 2021 organized by the Department of Mechanical Engineering Design Division.

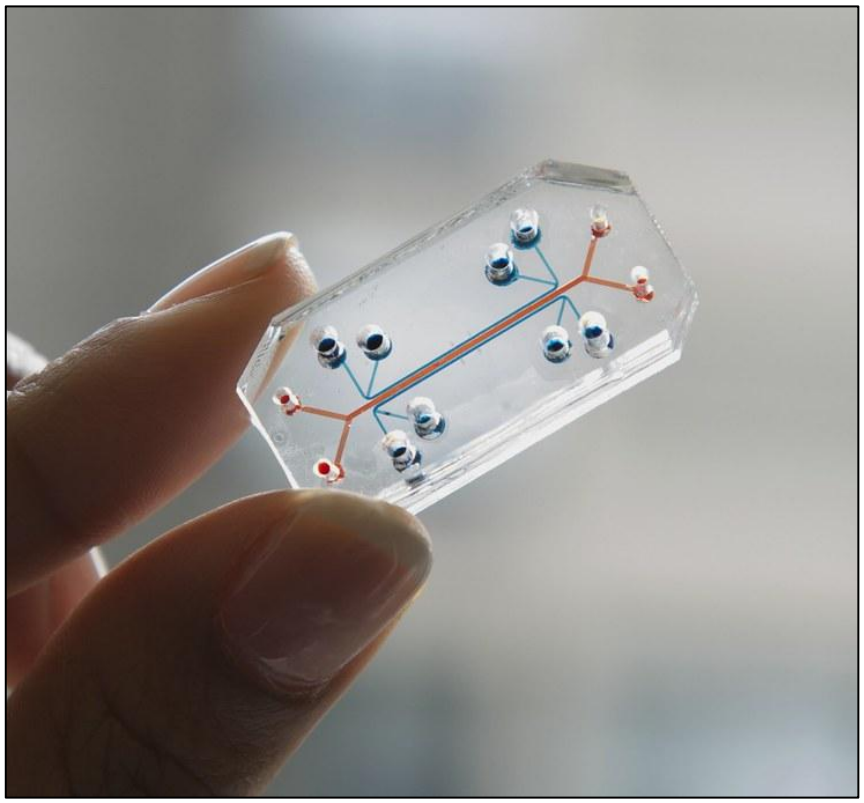
- **Disha R. Jain, Diya Samanta and A. K. Jayanthy**, Won Best Paper Award and presented a paper titled "Automatic Detection And Staging Of Diabetic Retinopathy Using Deep Learning Techniques" in IEEE Photonics, Robotics and Automation, Engineering in Medicine, Computer society Sponsored Two day International Conference on "Biomedical Smart Structures and Systems" from 7th to 8th May 2021 organized by the department of ECE Medical Electronics & BME, Saveetha Engineering college, Chennai, Tamil Nadu, India

- **Souvik Kumar Purkayastha, Hafsah M Kureshi, Aakash C and A. K. Jayanthy**, Won Best Paper Award and presented a paper titled "Identification and classification of malignant skin lesions of anterior torso using CNN" in IEEE Photonics, Robotics and Automation, Engineering in Medicine, Computer society Sponsored Two day International Conference on "Biomedical Smart Structures and Systems" from 7th to 8th May 2021 organized by the department of ECE Medical Electronics & BME, Saveetha Engineering college, Chennai, Tamil Nadu, India.

- All our **Research Scholars**, presented a poster in Dr. Paarivendhar Research Colloquium (DPRC 2021), from 3rd to 5th March 2021 organized by the Directorate of Research, SRM Institute of Science and Technology, Kattankulathur, Chennai, Tamil Nadu, India.

"That which can be asserted without evidence, can be dismissed without evidence."
— Christopher Hitchens





Organ-on-a-Chip

THE LATEST TREND IN DRUG DISCOVERY!

India is a developing nation and there's a dire need to spread awareness about organ donations and replacement which might save countless lives and enhance the living conditions of many people. It is also of great importance to eliminate the myths and fears surrounding organ transplants & donations. Organ replacement surgeries have been practised since ancient times. We can find numerous shreds of evidence of organ replacement in human history. Modern-day research dives into the replacement of organs with an electronic chip rather than tissues, cells, and membranes. This can help save lives and can bring an enormous revolution within the history of medical sciences bringing possible alternative to traditional animal testing.

Animal testing in some cases is long, costly, and fails to demonstrate the proficiency of treatment on people. Numerous drugs pass the animal testing stage but are later proven to be possibly harmful or poisonous for human consumption. As a solution to this setting came the technology of organs on-chip(OOC). Cell cultures are regularly used on OOACs which also utilize microfluidics to mimic the way a tissue or organ works. Organ-on-a-chip investigation as of now has allowed the creation of numerous microfluidic chips which in part mimic an organ: liver,

"The good thing about science is that it's true whether or not you believe in it."
— Neil deGrasse Tyson

lungs, intestine, and even tumors. The latter proves exceptionally valuable when testing modern cancer medications, particularly when associated with other organs. Multi-organs on the chip seem to permit us to witness the side impacts of certain drugs on distinctive organs, not restricted to those targeted by the treatment. The objective is to connect the major organ systems to breed a human-on-a-chip.

An organ transplant is a surgical process wherein the organ from a donor is transplanted into the recipient's body. Renal transplants, solid organ transplants and vascularizations are complex procedures that are practiced commonly in modern day medicine. The credit goes to Dr. Joseph Murray, a surgeon at Harvard School of Medicine who performed the world's first successful surgical procedure. On one hand organ transplant has proven to be a lifesaver whereas on the opposite hand there are many possible risks involved. Finding the correct donor may be a herculean task as there's a serious shortage of donors. Also, at the time of surgeries unavoidable medical issues are faced like infections, antibody reaction towards the replaced organ remains critical and the patient is often at constant vigilance and medicine.

The world has seen many revolutions which have brought affirmation and altered the course of civilization. Similarly, organ-on-a-chip may be a revolution and an enhancement within personal healthcare improving the patient's safety. OOAC could be a burgeoning technology developed by C.Zhang et al, with the potential to enhance disease modelling, drug discovery, and toxicology research by strengthening the relevance of culture-based models while reducing costly animal studies. Through a blend of cell biology, building, and biomaterial innovation, the microenvironment of the chip recreates the organ in terms of tissue interfacing and mechanical incitement. This reflects the auxiliary and useful characteristics of human tissue and might foresee reaction to a cluster of boosts counting medicate reactions and natural impacts.

An OOAC has broad applications in precision medicine and defence strategies. An OOAC may be a microfluidic, cell culture chip that allows or stimulates the mechanical, physiological activities of the organ and the system, can also be called an artificial organ. It's highly converged from the Lab-on-chip concept and has legalized the study of human physiology. The research was done mainly by biomedical engineers, specialised in Bio-MEME. It's an in-vitro multicellular artificially developed chip, building substantial artificial organs requires not as it were a positive cellular control but a near understanding of the human body's essential complex reaction to any occasion. The body might be a multifaceted network of physiological forms, making it challenging to recreate one organ. Microfabrication, microelectronics, and microfluidics offer the prospect of displaying modern in vitro physiological reactions beneath precisely mimicked conditions. The point of microfluidics in organs-on-chips helps the strong transport and conveyance of supplements and other solvent signals all through the practical 3D tissue development. Organs-on-a-chips are brought up since another wave of 3D cell-culture models that mirror entirety living organs' biological activities, energetic mechanical properties, and biochemical functionalities that will offer assistance in controlling outside parameters and accurately recreate physiological situations.

"Heard melodies are sweet, but those unheard, are sweeter"

— John Keats

Fluid shear force activates the dynamic environment during which cells are located is more resembling in vivo conditions than static culture. In addition, fluid shear stress induces organ polarity. Imperatively OOAC applies vital physical weight on the routine natural capacities of endothelial cells by actuating cell surface molecules and related signalling cascades. The concentration gradient, energetic mechanical stretch, cell designing, surface adjustment, and 3D printing is the foremost significant portion for fabricating an OOAC effectively. Essentially, the consolidation of liquid into the OOAC device grants biological appraisals at the one organ level.

The organ chip is implied to precisely reproduce the common physiology and mechanical powers that cells encounter inside the natural structure. The chips are lined with living human cells and their modest fluidic channels replicate blood and/or airflow even as inside the physical makeup. Their adaptability permits the chips to reproduce breathing movements or experience muscle withdrawals. Each chip is that the size of an AA battery. The chip's design permits researchers to decide the organ's usefulness, conduct, and reaction, at the cellular and atomic level.

Instrumentation inside which the organ chips are put into an interest framework sort of a computer. The instrument is meant to reproduce the human body's living environment – counting blood stream and breathing movements. the measured rebelliousness to present drugs, chemicals, and other poisons to the chip's environment to check the organ's reaction and conduct. The measured nature of the framework permits researchers to observe and dissect the cells inside the organ chips utilizing a sort of research tools and instrumentation.

Software app amid this process, researchers can extract information that can be collected and dissected with the assistance of cutting-edge computer program, such as an app you'd download on a phone/tablet. The computer program is outlined to supply exact control of the organ system's living microenvironment. The computer program offers the capacity to arrange cell engineering, tissue-to-tissue interfacing, mechanical forces, and biochemical environment.

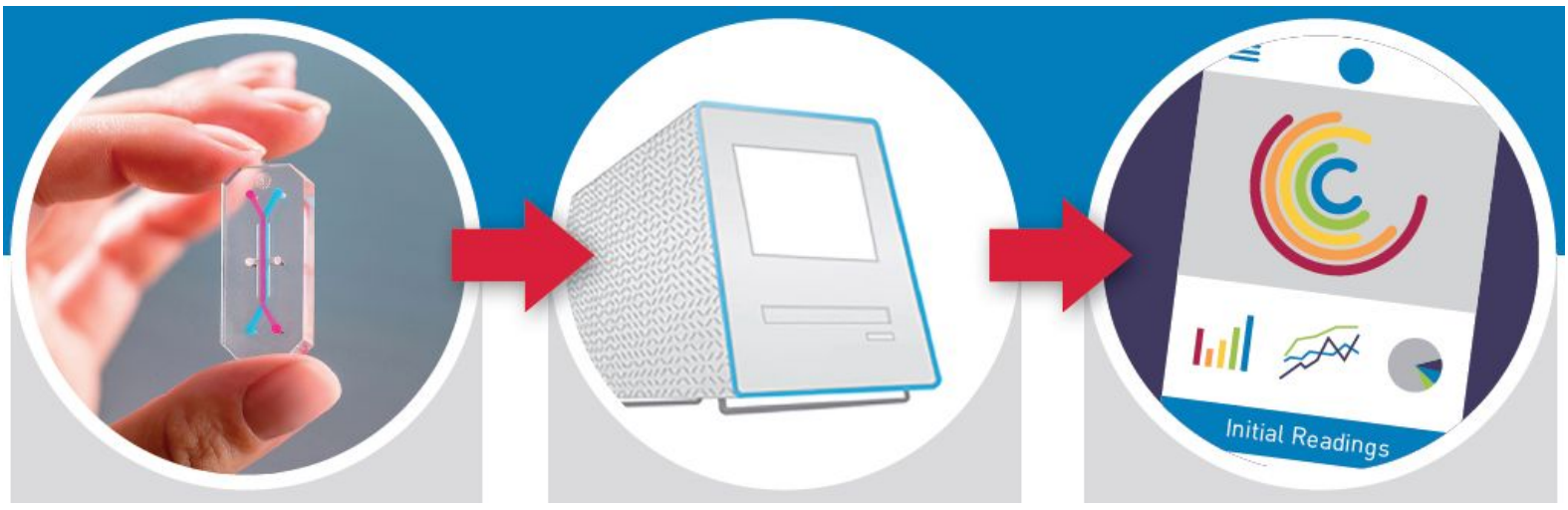


Figure 1: Components of Organ-on-a-chip (OOAC) Technology.

"If I have seen further it is by standing on the shoulders of Giants."
— Isaac Newton, The Correspondence Of Isaac Newton

Case Study: Lung-on-a-chip

The exchange of gas within the lungs is controlled by alveoli which are hard to mimic. Microfluidics can set up external lung models and lung pathologies by directly using liquid fluids and stored gas exchanges. The current study focuses on airway weight regulation, blood-blood barrier (BBB), and the effects of shear reduction on pathophysiological forms. A lung-on-a-chip presentation was made using weak lithography to separate the chip into regions separated by a layer of 10 μm PDMS by an external membrane.. The upper regions of PDMS had alveolar epithelial cells, while the lower regions had aspiratory microvascular endothelial cells, which is why they mimicked alveolar-capillary inhibition.

- Vaishnavi Umalkar

About the author

Ms. Vaishnavi Umalkar

is a Graduate in Biomedical Engineering, SRM Institute of Science and Technology, Chennai. She is inclined towards research in healthcare and her interests include Instrumentation, Medical image processing, Rehabilitation And Assistive device.

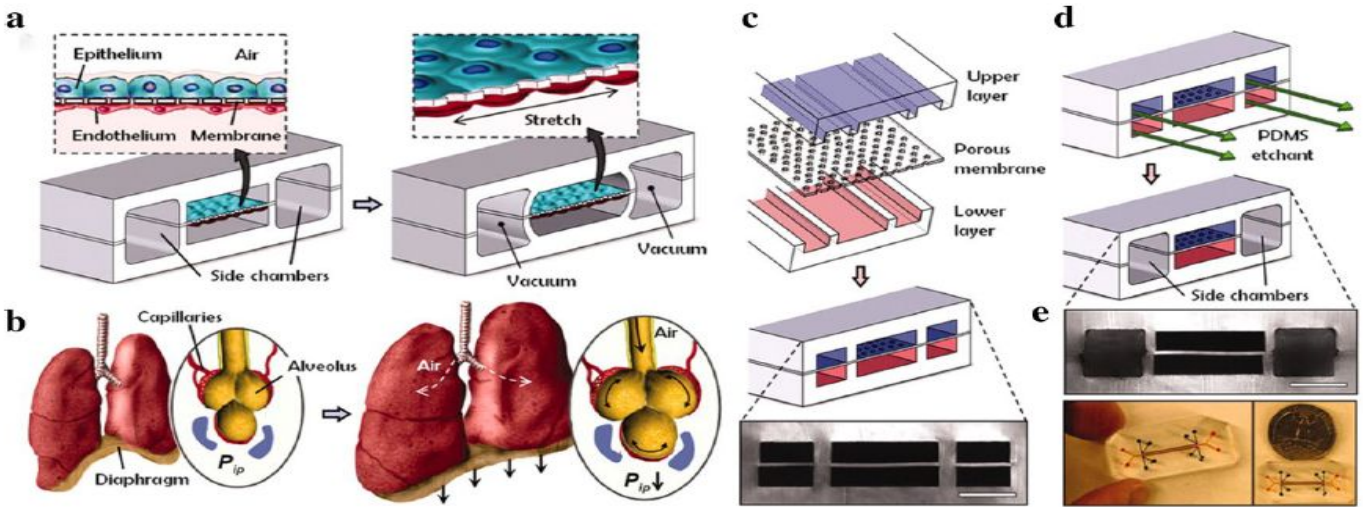


Figure 2: Lung-on-a-chip technology

References:

1. Wu, Q., Liu, J., Wang, X. et al. Organ-on-a-chip: recent breakthroughs and prospects. BioMed Eng OnLine 19, 9 (2020). https://doi.org/10.1186/s12938-020-0752-0.
2. Melinda Wenner Moyer, "Organs-on-a-Chip for Faster Drug Development", Scientific American 25 February 2011.
3. A.Wnorowski, et al., Progress, obstacles, and limitations in the use of stem cells in organ-on-a-chip models, Adv. Drug Deliv. Rev. (2018), https://doi.org/10.1016/j.addr.2018.06.001.

"If you wish to make an apple pie from scratch, you must first invent the universe."
— Carl Sagan, Cosmos

Faculty Development & Training Programmes

Name	Event	Details
Dr. U. Snekhalatha	Faculty Development Programme	Data Science and Analytics, 4th to 8th January 2021
Dr. Kathirvelu D	FDP	3D Printing & Design, 4th to 8th January 2021
Dr. Vani D	FDP	3D Printing & Design, 4th to 8th January 2021
Dr. P. Vinupritha	FDP	3D Printing & Design, 4th to 8th January 2021
Mrs. Oinam Robita Chanu	Faculty Development Programme	Recent trends in Biomedical Engineering, 7th to 12th January 2021
Dr. P. Muthu	Pre-Event	Types of Patents in India, 16th January 2021
Dr. D. Kathirvelu	Short Term Training Programme	Empowering the Moral Values, Ethics and Behavioral Attitude in Teaching Skills among Teachers (Phase-II)", 18th to 23rd January 2021.
Dr. P. Vinupritha	Short Term Training Programme	Empowering the Moral Values, Ethics and Behavioral Attitude in Teaching Skills among Teachers (Phase-II), 18th to 23rd January 2021.
Dr. A. K. Jayanthy	Innovation	Turnip Innovation Festival, 22nd to 23rd January 2021

"Your assumptions are your windows on the world. Scrub them off every once in a while, or the light won't come in."— Isaac Asimov

Name	Event	Details
Mr. SaiTejVeer Santhan	webinar	1st International Symposium on PCOS, 22nd to 23rd January 2021
Mr. SaiTejVeer Santhan	Bootcamp	Machine Learning using Python, 9th to 13th January 2021
Ms. Mayuri	FDP	Artificial Intelligence & Ambient Intelligence, 25th Jan to 6th Feb 2021
Dr. S. Gnanavel	Faculty Development Programme	Recent trends in Biomedical Engineering, 7th to 12th January 2021
Mrs. G. Anitha	Workshop	Medical Devices Entrepreneurship, Intellectual Property Rights and Patents, 18th to 19th February 2021
Dr. A. K. Jayanthy	PATENT SCHOOL Workshop	Idea generation and Patentability Aspect Analysis, 3rd February 2021
Ms. Mayuri	webinar	How to build a Carrier in artificial intelligence, 3rd February 2021
Dr. U. Snekhalatha	FDP	Artificial intelligence and machine learning and deep learning, 1st to 5th February 2021
Mrs. Bhargavi Haripriya	webinar	Clean Code Software Development and ML, 1st to 5th February 2021
Dr. A. K. Jayanthy	Workshop	Recent Trends in 3D Printing and Scanning, 15th February 2021
Mrs. G. Anitha	FDP	Wearable Devices,15th to 19th February 2021
Ms. S. Vineetha	Workshop	Medical Devices Entrepreneurship, Intellectual Property Rights and Patents, 18th to 19th February 2021
Mrs. A. Bhargavi Haripriya	Workshop	Medical Devices Entrepreneurship, Intellectual Property Rights and Patents, 18th to 19th February 2021
Dr. Vani D	Workshop	Medical Devices Entrepreneurship, Intellectual Property Rights and Patents, 18th to 19th February 2021
Dr. A. K. Jayanthy	Faculty Development Program	Recent Trends in Medical Image Processing, 24th February 2021 to 2nd March 2021
Dr. A. K. Jayanthy	webinar	Simulation of machine learning using open-source tools, 13th March 2021
Mrs. Lakshmi Prabha	e-Training Program	Child Centred Disaster Risk Reduction, 17th to 19th March 2021
Dr. S. P. Angeline Kirubha	Webinar	Artificial Intelligence for Biodesign Innovation, 25 to 27 March 2021
Mrs. A Bhargavi Haripriya	Webinar	Clinical AI for Biodesign Innovation, 25th to 27th March 2021
Dr. N. Ashwin Kumar	Faculty Development Program	HTIC MedTech Incubator virtually

"Science is not only compatible with spirituality; it is a profound source of spirituality."
— Carl Sagan

Name	Event	Details
Mrs. G. Anitha	Virtual International Workshop	Energy Storage Technologies for E-Mobility" (IWESTE-2021), 25th to 27th March 2021
Dr. P. Muthu	Webinar	Clinical Artificial Intelligence for Biodesign Innovation, 25th to 27th March 2021
Mrs. Oinam Robita Chanu	Basic Training Program	Nano Science and Technology, 10th to 12th May 2021
Mr. Avradeep Bala. B.Tech-BME II year	Webinar	Triumph Talk Series, 28th May, 2021
Mr. Adarsh Pramod Nair B.Tech-BME II year	Webinar	Machine Learning in Healthcare Applications, on 7th May 2021
Mrs. Oinam Robita Chanu	Webinar	Clinical Artificial Intelligence for Biodesign Innovation, from 25th to 27th March 2021
Mrs. P. Lakshmi Prabha	Webinar	Clinical Artificial Intelligence for Biodesign Innovation, from 25th to 27th March 2021
Dr. S. P. Angeline Kirubha	Webinar	Clinical Artificial Intelligence for Biodesign Innovation, 25th to 27th March 2021
Mrs. A. Bhargavi Haripriya	Webinar	Clinical Artificial Intelligence for Biodesign Innovation, 25th to 27th March 2021
Dr. A. K. Jayanthy	Webinar	Clinical Artificial Intelligence for Biodesign Innovation, 25th to 27th March 2021
Ms. Mayuri	webinar	Autonomous Systems, 30th March 2021
Dr. A.K. Jayanthy	FDP	Advances in Signal Processing, on 5th April, 2021
Mrs. P. Lakshmi Prabha	Patent School Workshop	Effective patent drafting strategies & patent commercialization plans,16th April 2021
Dr. Snehalatha Umapathy	Webinar	An Introduction to Engineering Applications of Artificial Intelligence (EAAI) and the IFAC Family of Journals: a Webinar for Authors and Editors of the Future, 18th May 2021
Mrs. A. Bhargavi Haripriya	Webinar	Image Dehazing, 27th to 28th May 2021
Dr. U. Snekhalatha	webinar	Recent research and developments in deep learning architectures, 15th and 16th April 2021
Ms. Mayuri	Webinar	Database Security: From a Pen Tester's Perspective, 15th April 2021
Dr. A. K. Jayanthy	Webinar	Recent Research and Developments in Deep Learning Architectures, 15th to 16th April 2021
Mr.Adarsh Pramod Nair B.Tech-BME II year	Webinar	Understanding the role of Management Systems Standards in Business for Students, 29th April 2021

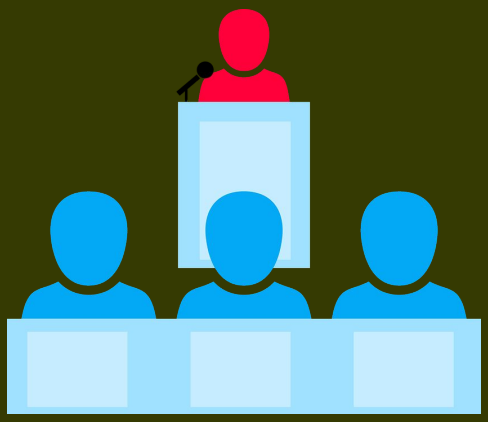
"Science is the great antidote to the poison of enthusiasm and superstition."

– Adam Smith, Economist

Name	Event	Details
Dr. U. Snekhalatha	Webinar	Machine learning in health care applications, May 7th 2021.
Mrs. Oinam Robita Chanu	Webinar	Machine learning in health care Application, 7th May 2021
Dr.T. Jayanthi	Pre Conference workshop	Artificial Intelligence in Healthcare, 23rd to 24th March 2021
Dr.T. Jayanthi	FDP	Participated in FDP on "Recent Trends In Photonics" organized by department of ECE, Oxford College of Engineering, Bangalore on 14th to 19th June 2021.
Mr.Qaysar Mohi-ud-Din	Pre Conference workshop	Artificial Intelligence in Healthcare, 23rd to 24th March 2021
Dr. U. Snekhalatha	FDP	"Master class on machine learning" (5 days) at Pantech Prolabs India Pvt Ltd., From 31st May 2020 to June 2021
Dr. U. Snekhalatha	FDP	"Deep learning master class" (5 days) at Pantech Prolabs India Pvt Ltd., From 7th June 2021 to 11th June 2021.
Dr. Vani D	FDP	Participated in two day FDP on "Photonics and fiber optics technologies", Conducted by IETE Chennai Centre and IEEE Photonics society Madras chapter, Chennai, Tamil Nadu, India on 21st and 22nd June 2021.
Ms.Devaki	FDP	Participated in FDP on "Recent Trends In Photonics" organized by department of Electronics and Communication Engineering, The Oxford College of Engineering, Bangalore on 14th to 19th June 2021.
Dr. N. Ashwin Kumar	FDP	Participated in FDP "Photonics and fiber optics technologies,conducted by IETE Chennai Centre and IEEE Photonics society Madras chapter, Chennai, Tamil Nadu, India on 21st and 22nd June 2021

"Nothing in life is to be feared, it is only to be understood. Now is the time to understand more, so that we may fear less"

— Marie Curie, Physicist



FACULTY IN PROFESSIONAL ACTIVITIES

Faculty Name	Details
Dr. A. K. Jayanthy	• BOS Member at Easwari Engineering College, Chennai, Tamil Nadu, India on 22nd January 2021 • Reviewer Taylor and Francis • Faculty interview member at Sastha Engineering College 4th March 2021 • DC member in BOS meeting at Manakula Engineering college, Chennai, Tamil Nadu, India on 31st March 2021. • Guest Speaker in Webinar on "Emerging fields in Biomedical Engineering Research" on 11th February 2021 organized by Department of Biomedical Engineering, Sri Shakthi Institute of Engineering and Technology, Chennai, Tamil Nadu, India. • Contributed as a reviewer in the seventh International Conference on "Biosignals, Images and Instrumentation" from 25th to 27th March 2021 organized by the department of Biomedical Engineering, SSN Engineering college, Chennai, Tamil Nadu, India • Participated in A National Level Three Day Online Workshop on "Modern Ideas & Its Applications – Artificial Intelligence and Machine Learning" organized by Department of Electronics and Communication Engineering, St. Martin's Engineering College, Dhulapally, Secunderabad, T.S, India. from 10th to 12th June 2021.
Mrs. A. Bhargavi Haripriya	• Review in two journals - International journal for diabetes in developing countries (JDDC), BMC Research Notes, February 2021

"The only person you are destined to become is the person you decide to be."

- Ralph Waldo Emerson, Essayist

Faculty Name	Details
Dr. D. Ashok Kumar	• Expert Member-Second Board of Studies Meeting, Kongunadu College of Engineering and Technology, Tiruchirapalli, Tamil Nadu, India on 10th March 2021 • Contributed as a reviewer in the seventh International Conference on Biosignals, Images and Instrumentation from 25th to 27th March 2021 organized by the department of Biomedical Engineering, SSN Engineering college, Chennai, Tamil Nadu, India
Dr. U. Snekhalatha	• DC member in the first doctoral committee meeting for the research scholar Ms.Abimala, at St.Joseph college of Engineering, Anna University, Chennai, Tamil Nadu, India on 27th January 2020 • DC member in the first doctoral committee meeting held for the research scholar Mr. Satish Kumar, at St. Joseph college of Engineering, Anna University, Chennai, Tamil Nadu, India on 3rd February 2021 • DC member in the first doctoral committee meeting held for the research scholar Mrs. Neelambary, St. Joseph college of Engineering, Anna University, Chennai, Tamil Nadu, India on 3rd February 2021 • Served as a panel member for faculty recruitment in Biomedical Engineering department at Sri Sastha Institute of science and technology, Chemberambakkam on 5th May 2021.
Dr. T. Jayanthi	• Reviewer for 7th International Conference on Electronics, Computing and Communication Technologies, IEEE CONECCT organized by IEEE, Bangalore section, India on 9th to 11th June 2021.
Dr. S. P. Angeline Kirubha	• Resource person in AICTE sponsored 2 weeks Faculty Development Programme on "Machine Learning Techniques for Imaging and Healthcare with PYTHON", on 29th January 2021 Session: "Feature Extraction Techniques in Machine Learning" organized by Sri Sai Ram Engineering College, Chennai, Tamil Nadu, India • Subject Expert for second Board of Studies meeting in Department of Biomedical Engineering, Dhanalakshmi Srinivasan Engineering College, Perambalur, Chennai, Tamil Nadu, India on 28.04.2021 (Wednesday)

"It is strange that only extraordinary men make the discoveries, which later appear so easy and simple".

- Georg C. Lichtenberg, Physicist

Faculty Name	Details
Dr. S. P. Angeline Kirubha	• .Reviewed 1 article for the Journal "Part H: Journal of Engineering in Medicine" March 2021. • Reviewed 1 article for the Journal "Medical & Biological Engineering and Computing (MBEC)" March 2021 • Appreciation certificate in recognition as a reviewer (2 articles) till April 2021 for Indian Journal of Science and Technology. • Won Best Paper Award- Track II- First, presented a paper titled "Stress Monitoring System using EEG Sensors" in "International Conference on Recent Emerging Science, Engineering & Advanced Research in Communication and Healthcare-2021" organized by Department of ECE & Department of BME, Aarupadai Veedu Institute of Technology (AVIT) of Vinayaka Mission's Research Foundation (VMRF), Paiyanoor, Chennai, Tamil Nadu, India. on 4th & 5th June 2021. • Reviewed a article "MBEC-D-20-00881R1, "Blood glucose concentration prediction based on VMD-KELM-Adaboost" ; Journal name: Medical & Biological Eng & Computing.

"Extinction is the rule. Survival is the exception."

— Carl Sagan,

MENTORING

Student Mentoring

1. Team of three students **Mr. SaiTejVeer Santhan**, **Ms. Shreya Daniel** and **Ms. Mayuri** under guidance of **Dr. T. Jayanthi** was shortlisted for final round in the Hackathons 2021 organized by BITS BIRAC BioNEST & CIIE BITS, pilani K K Birla Goa Campus, in collaboration with stademy (Startup Academy), Australia from 26th to 28th January 2021 for their project titled "Health access on-go"

2. A team of three students from III year ECE-BME **Ms. Sangeetha**, **Mr. Abhishek** and **Mr. Faizal** under the mentorship of **Dr. T. Jayanthi** took part in "Defence Services Hackathon 2021" and proposed solution for border infiltration from 19th to 21st March 2021.

FACT

Mentoring is not a passive endeavour

Good mentoring doesn't just happen; it requires conscious effort and commitment on the part of a program coordinator, the mentor, and the mentee.

In fact, the best mentor programs involve initial goal-setting, frequent communication, and a desire on the behalf of the mentee and mentor to learn and connect. While the frequency of communication often subsides as a single mentoring relationship tapers off over time and a new one begins, the weight and impact of each communication actually grows in importance over time.

"Equipped with his five senses, man explores the universe around him and calls the adventure Science."

– Edwin Powell Hubble, Astronomer

PEDAGOGICAL INNOVATIONS & RECOGNITIONS

Innovation in teaching/design of new lab experiments

- **Dr. N. Ashwin Kumar** - Latex Editing was performed to all the PG students using online open source platform called "OverLeaf".
- **Mrs. A. Bhargavi Haripriya** - Knowledge sharing on using Visme software for the certificate designing to non-teaching members of Department of BME 5th February 2021
- **Dr. A. K. Jayanthy** - Designed a new experiment "Hall Effect Transducer" for Biosensors lab / M.Tech

Recognitions (SRMIST awards/Regional awards/ National awards/International awards/Fellowship in reputed society)

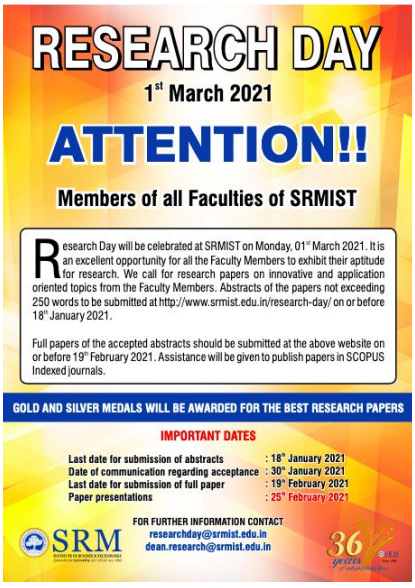
- **Dr. U. Snekhalatha**, Obtained best researcher award for publications in Nature indexed journal during Research day function held on 1st March 2021.
- **Mrs. A. Bhargavi Haripriya,** Won 2nd Prize for Speech in International Women's Day 2021 celebrations conducted by SRMIST on 8th March 2021
- **Dr. A. K. Jayanthy,** Served as a Expert member in synopsis submission meeting at Anna University, Chennai, Tamil Nadu, India on 16th June 2021.
- **Dr. A. K. Jayanthy**, Served as a BoS member in BoS Meeting at Puducherry Technological University, Puducherry.

"There is no law except the law that there is no law."

- John Archibald Wheeler, Physicist

DEPARTMENT EVENTS & ACTIVITIES

Event: Workshop
Topic/Theme: Medical Devices Entrepreneurship, Intellectual Property Rights and Patents
Date of Conduction: 18th - 19th February 2021.



Event: Research Day
Topic/Theme: Scientific Research & Innovation
Date of Conduction: 26th February 2021

"The most difficult thing is the decision to act, the rest is merely tenacity."
-- Amelia Earhart, Aviator

Event: Virtual Conference
Topic/Theme: National Conference on Rehabilitation Engineering & Assistive Technologies (NCREAT-2021)
Date of Conduction: 11th - 12th March 2021

Event: Webinar
Topic/Theme: Clinical AI for Biodesign Innovation
Date of Conduction: 25th - 27th March 2021.

Event: Inaugural Ceremony
Topic/Theme: Center for Biomedical Research and Healthcare Innovation (CBRHI)
Date of Conduction: 9th April 2021

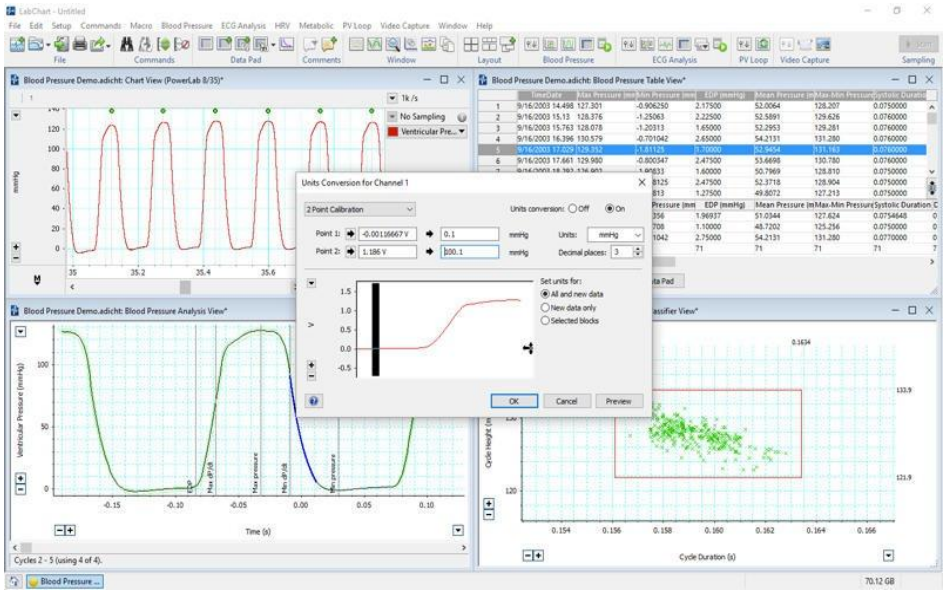
" We can easily forgive a child who is afraid of the dark; the real tragedy of life is when men are afraid of the light".

—Plato, philosopher

Laboratory Additions & Equipment

About the Equipment

Lab: Biomedical Instrumentation Lab
Equipment Category: Analog physiological data acquisition
Equipment Details: AD Instruments - Data Acquisition Hardware Device with Labchart software.
Images: (Left) Labchart Software, (Right) Data Acquisition Hardware.



"Equipped with his five senses, man explores the universe around him and calls the adventure Science."

– Edwin Powell Hubble, Astronomer

ALUMNI CONNECT

A chance to meet the our forerunners who now are spread across the globe.

Name: Mr. Vinish Yogesh, B.Tech-BME (2013-17)
Current Position: Junior Researcher, Roessing R&D
Topic/Theme: "Biomedical Engineering: The beauty and the beast"
Date of Visit: 09/02/2021 [02:45 PM -03:45 PM]

Name: Md.Furqan Zargar, B.Tech-BME (2012-16)
Current Position: Managing Director, Cure House
Topic/Theme: "Corporate Life as a Biomedical Engineer in multiple fields"
Date of Visit: 22/02/2021 [10:45 AM -11:45 AM]

Name: Mr. Shubhanvit Mishra, B Tech-BME (2015-2019)
Current Position: Graduate Student, National Tsing Hua University
Topic/Theme: "Introduction to microfluidics for biomedical application"
Date of Visit: 24/03/2021 [10AM]

"Science is vastly more stimulating to the imagination than the classics."
– J. B. S. Haldane, Scientist

Name: Mr. Kartik Rana, B Tech-BME (2016-2020)
Current Position: Associate Software Engineer, Bajaj Finserv Health
Topic/Theme: "My Projects and Journey in Engineering"
Date of Visit: 24/03/2021 [10 AM]

Name: Sourav Kumar Patnaik, B Tech-BME (2014-2018)
Current Position: Quality and Regulatory Affairs Associate, Forus Health.
Topic/Theme: "Campus to Corporate: A walk in the park or a bumpy ride?"
Date of Visit: 12/05/2021 [10AM]

DID YOU KNOW

ALUMNI CONNECT

The department conducts at least one alumni connect session every month. The purpose of these meetings is to allow current students to better understand their prospects in the industry as well as in research & academia. Keep your ears peeled for the next one!!

"A person who never made a mistake never tried anything new".
-- Albert Einstein, Theoretical Physicist

Funds, Grants & Collaborative Works

External Funding & Grants

- **Dr. Vani Damodaran** - Approved SATU Joint Research Scheme (JRS) 2021 funding in collaboration with Dr. Shu-Fen Chuang (PI), National Cheng Kung University, Taiwan on the project titled "Interfacial bonding analysis of dental composite restorations by Optical Coherence Tomography" (NCKU 16) Collaborative work with Foreign Universities -Joint Funded Project
- **Dr. U. Snekhalatha**, have been selected as one of the Co-Pi for the SATU project titled "Joint Space In Osteoarthritic Knee: A Pre-Post Hyaluronic Acid Injections Comparison Using Machine Learning To Determine Its Clinical Value" in collaboration with Dr. Siew Li Goh University of Malaya
- **Dr. U. Snekhalatha**, have been selected as one of the Co-Pi for the SATU project titled "Deep Learning Classification Of Covid-19 Computed Tomography and Radiography Images Value" in collaboration with Dr. Khin Wee Lai University of Malaya
- **Dr. N. Ashwin Kuma**r - submitted proposal "Assessment and Visualization of Angiogenesis Using Hybrid Imaging Modality" in SERB-Start up Research Grant (SRG/2021/001697/ES)
- **Dr. S. P. Angeline Kirubha** submitted proposal "Development of Smart spectacles to monitor and modify myopia related health behavior in children" in SERB-Core Research Grant Fund (File No : CRG/2021/002483)
- **Dr. U. Snekhalatha** - submitted proposal "A non invasive detection of Type-II Diabetes Mellitus based on hyperspectral imaging using deep learning techniques" in SERB-Core Research Grant Fund titled " (CRG/2021/005264)

"The science of today is the technology of tomorrow."

– Edward Teller, Theoretical Physicist

Internal Funding & Grants (SRM-IST)

- Source of funding: NewGen IEDC SRM Program.
- Title: Compliance enhanced brace with pressure sensor for the Treatment of scoliosis.
- Recipients of funding:
  - **SRIJA S** (RA2012015010010)
  - **SANIKA PRAKASH** (RA2012015010004)
- Mentor: **Dr. Varshini Karthik**
- Fund Amount: Rs.50,000

- Source of funding: NewGen IEDC SRM Program.
  - Title: Myopia Tracker.
  - Recipients of funding: **Malavika Kamath**
  - Mentor: **Dr. S. P. Angeline Kiruba & Dr. Dharani**

- **Dr. Ashwin Kumar N** – received Selective Excellence Research Initiative - 2021, Amount: Rs. 2,50,000, from Directorate of Research Project title : "Affordable lab on chip device for simultaneous isolation and detection of circulating tumour cells (CTSs)"
- **Dr. S. Gnanavel** - received Selective Excellence Research Initiative - 2021, Amount : 4,00,000, from Directorate of Research. Project title : "A novel biodegradable alloy for bone implant applications"

Collaborative Work

- As part of the MoU finalized with BPL Healthcare Technologies, the team of faculty member **Dr. T. Jayanthi, Dr. S P. Angeline Kirubha**, **Dr. D. Kathirvelu** and **Dr. P. Vinupritha** are involved in collaborative project in the designing of Biphasic defibrillator.
- **Dr. T. Jayanthi** - Initiated collaborative work with Forus Health Pvt Ltd., Bangalore in the following areas.
  - Diagnosis of Hypertensive Retinopathy
  - Diagnosis of cataract using refractometer images
  - Diagnosis of Dry Eye using Raspberry pi thermal camera

"The good thing about science is that it's true whether or not you believe in it."
– Neil deGrasse Tyson, Astrophysicist

MoUs, Book Chapter Publications & Industrial Relations

MoU

MoU with **BPL Healthcare Technologies** was finalized

Book Chapter Publications

Nanomaterials for Medical Imaging and In-vivo Sensing, **Ashwin Kumar N, Suresh Anand B S, Ganapathy Krishnamurthi,** Nanomaterials and their Biomedical Applications, Springer Singapore, 2021, Chapter 13, 978-981-336-252-9,DOI: 10.1007/978-981-33-6252-9_13

Industrial Relations

Dr. D. Ashok Kumar, Associate Professor, BME Department, took Initiative for placement between the Department of Biomedical Engineering, SRM Institute of Science & Technology and Peters Surgicals.

"Every brilliant experiment, like every great work of art, starts with an act of imagination."
– Jonah Lehrer, Author

THE LEARNING CURVE

Consolidated below are some of the courses, MOOCs and trainings undertaken by the student & faculty members of our department.

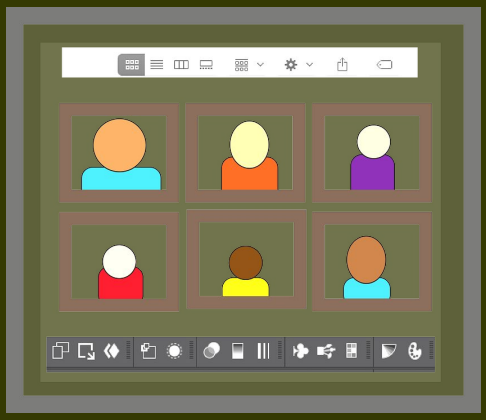
NAME	COURSE	OFFERED BY
Dr. S. P. Angeline Kirubha	Health Research Fundamentals	NPTEL
Dr. S. P. Angeline Kirubha	Digital Image Processing	NPTEL
Dr. T. Rajalakshmi	Health Research Fundamentals	NPTEL
Dr. S. Gnanavel	MATLAB Onramp	Mathworks Training services
Dr. D. Ashokkumar	Health Research Fundamentals	NPTEL
T. J. Jaya Krishnan	The joy of computing using Python	NPTEL
Neha Sharma	Java Programming	complete beginners online course
Mrs. G. Anitha	MATLAB Onramp	Mathworks Training services
Ms. Oinam Robita Chanu	BioMEMS and Microfluidics	NPTEL
Mrs. G. Anitha	Image processing Onramp	Mathworks training services
Mr. SaiTejveer Santhan	EF SET certificate	earned the English level
Ms. Gayathri R	Biomedical visualization	University of Glasgow
Ms. Gayathri R	jQuery for absolute beginners	
Riya Singh	The Arduino Platform and C Programming	University of California, Irvine and offered through Coursera
Riya Singh	C for Everyone: Programming Fundamentals	University of California, Santa Cruz and offered through Coursera
Riya Singh	Fundamentals of Network Security	Online course
Mohammed Ameenudeen Anwar	Database Management Systems	Online course
Deeksha Bharadwaj	White Hat Hacker Level 1 (CWHH 1)	Online course
Samarth Patel	UX Design: From Concept to Prototype	University of Michigan

"Perfection is not attainable, but if we chase perfection we can catch excellence".
-- Vince Lombardi, Coach

NAME	COURSE	OFFERED BY
Mayuri	The data science of health informatics	Online non-credit course authorized by Johns Hopkins University and offered through Coursera
Vineetha S	Applied optimization for wireless, machine learning, Big Data	NPTEL online certificate course
Mayuri	Python 101 for Data Science	A course on congnitiveclass.ai Powered by IBM Developer Skills Networks issued by cognitive class
SaiTejVeer Santhan	Grammar and Punctuation	Online non-credit course authorized by University of California, Irvine and offered through coursera
Mayuri	Data Analysis with Python	Cognitive Class
Neha Sharma	Short Term training program on regulatory affairs in medical devices	Department of Biomedical Engineering,SRMTST
Mayuri	Data visualization and dashboard with Excel and Cognos	Online non-credit course authorized by IBM and offered through coursera
Mayuri	Excel basics for data analysis	Online non-credit course authorized by IBM and offered through coursera
Rudransh Tiwari	Neural Networks and Deep Learning	Non-credit course authorized by Deep Learning. AI and offered through Coursera
Neha Sharma	awarded competency in Mycaptains "Java Programming Course"	Non-credit course authorized by University at Buffalo, The State University of New York and offered through Coursera
Adhyyan Kulshreshtha	Blockchain Basics	University at Buffalo, The State University of New York
Mayuri	Web Design for Everybody: Basics of Web Development & Coding	Colleen van Lent, Ph.D., Lecturer, School of Information, University of Michigan
G. Prithvi Shankar	Programming for Everybody (Getting Started with Python)	Non-credit course authorized by University of Michigan and offered through Coursera
Patel Jignesh	completed UX design: from concept to prototype	Online non-credit course authorized by University of Michigan and offered through Coursera
Kottapalli Sundar mahesh	Introductory Human Physiology	Online non-credit course authorized by Duke University and offered through Coursera
Mayuri	Web Development course	Online Course
Mayuri	SQL for Data Science	Non-credit course authorized by University of California, Davis and offered through Coursera
Mayuri	SQL for Data Science	Online non-credit professional certificate "IBM Data Analyst"

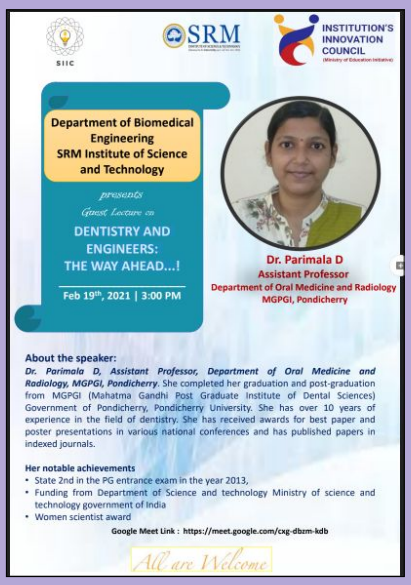
"When everything seems to be going against you, remember that the airplane takes off against the wind, not with it"

--Henry Ford, Industrialist



WEBINARS & LECTURES

A look at the various webinars hosted by the department featuring external guest speakers from academia & industry.



Speaker: Dr. Parimala D
Position: Assistant Professor
Organisation: Department of Oral Medicine and Radiology, MGPGI
Topic: "DENTISTRY AND ENGINEERS: THE WAY AHEAD...!"

Speaker: Mr. PRADEEP B
Position: Application Engineer
Organisation: INTEGRATED MICROSYSTEM
Topic: "Online demonstration of Synopsys Simpleware software"

Speaker: Ms. Ramya Thiyagarajan
Position: Clinical Data Lead
Organisation: Icon Clinical Research India Pvt Ltd..
Topic: "How vaccine trials are conducted, instruments used in labs, external data reconciliation for samples, & clinical data management in vaccines trial"

"We can't help everyone, but everyone can help someone".
-- Ronald Reagan, Former U.S, President

Speaker: Dr. J. Panthala Rajakumaran, (MBBS, MS – Orthopaedics)
Position: Orthopedist Senior Consultant
Organisation: VS Hospital, Chennai
Topic: "Osteoporosis and Bone Health"

Speaker: Dr. P. Anand Kumar
Position: Manager
Organisation: Global Application Support, Lab Systems Diagnostics
Topic: "Newborn Screening & Scope of Biomedical Engineering"

Speaker: Dr. E. Bhaskaran.
Position: Joint Director (Engineering) / General Manager
Organisation: Department of Industries and Commerce, Government of Tamil Nadu
Topic: "Accelerators / Incubation – Opportunities for Students"

We would like to congratulate and thank all the student and faculty volunteers for organising such insightful and amazing events.

"A man who dares to waste one hour of time has not discovered the value of life."
— Charles Darwin

PLACEMENTS

A sneak peek into the placement statistics for the BME department for the period from January, 2021 to June, 2021.

We are happy to announce about 74% of students who opted for placement from our department have received offers in a variety of prestigious companies with various tier salary packages. Students from both undergraduate and graduate classes were successfully placed in different positions in reputable companies listed below. We would also like to congratulate the students placed and wish them a successful career.

B-ARM

practo

cleartax

THE CLIMBER

epi EPISOURCE

Anabond Stedman Pharma Research (P) Ltd

HealthPlix

Capgemini

stryker

pickyourtrail

"Believe you can and you're halfway there."

-- Theodore Roosevelt, Former U.S. President

CAREER OPTIONS IN INDIA FOR BME GRADUATES & POSTGRADUATES

By S. Hari Prasad
BME-2011-SRM University;
MBA-2015-Xavier Institute of Business Management Studies
EPSM-2019- Indian Institute of Management Calcutta

Disclaimer:

1. All views expressed in this article are that of the author and do not represent the opinion of any entities whatsoever with which the author has been , is now or will be affiliated.
2. The intent of this article is neither to hurt individual choices nor to demean any domain or specialty. Neither to perceive any function or industry to low standards. Any distrust or difference of opinion a reader finds in the content of the article will be of his/her own thoughts.
3. Readers can have their own point of view and are free to check the facts and figures mentioned in the article.
4. This article is mainly intended for Biomedical Engineering Graduates and Post Graduates who want to kick start their career in India in the Medical Devices and Equipment Core Industry.
5. Terminologies, thoughts and opinions mentioned here are exclusive to Medical Devices and Equipment (MNCs) Core Industry present in India.

Introduction

"Scope of Biomedical Engineering now and in the next few years"

Today, I want to address few issues from the perspective of fresh graduates and students who, replies with smileys and memes when I ask about career plan and jobs after graduating BME over social media, also in reality. Please read the information mentioned below carefully, Maybe someday it may help you in getting your dream job.

Biomedical Engineering (BME) is a broad term but well-designed and organized discipline. BME discipline has many opportunities around the globe and in India. In today's world, if a conglomerate does not have a medical device or medical equipment domain, then they are lagging something seriously. Medical Device and Equipment giants like GE, Philips, Baxter, Danaher, Siemens, Stryker, Zimmer, B. Braun, Toshiba, ("List Never Stops") are in need of youngsters with great potential and brains.

Even companies like Samsung, LG, TATA sons, Kodak, Olympus, BPL, and Hitachi had entered into Medical Devices & Equipment business few years back and other giant companies like Apple,

"Science is not only a disciple of reason but also one of romance and passion."
– Stephen Hawking, Theoretical Physicist

Microsoft, Amazon, Tesla, Apollo Hospitals, Tech Mahindra, HCL, Sony, YAMAHA, Panasonic, and Bose are having plans to enter into the business. Therefore, opportunities are endless as far as scope is concerned.

Now you all will be thinking that, all these jargons we read in any other job board site or heard by any biomedical career influencer, what is special about this article, which is titled as "Career Options in India for BME Graduates and Postgraduates?" Now here me out, its "Misconceptions" which make this article different.

Misconceptions

So let us start with some major misconceptions, hoaxes and rumours related to Jobs after Biomedical Engineering and put an end to them.

1. "We don't get biomedical job as fresher's"

The above statement has two major misconceptions: "We don't Get Biomedical job (A) as Fresher (B)"

A) Biomedical Engineering is a field, which is developing tremendously in India, But Students who study this course of Biomedical Engineering in India are not happy with this course, the only reason being is stated as: "We don't Get Biomedical job as Fresher" First of all, let's stop calling it as Biomedical Job or job in biomedical industry in case if you aren't looking for a Jr. BME role at some hospital.

Biomedical Engineering is an academic qualification but it can mislead someone if you call biomedical as an industry in India. Biomedical is a very broad term, my advice would be to have a clear goal when you are targeting any specific industry. In figure 1, are the industries Indicated in Red and its sectors indicated in White under Biomedical Engineering

B) "There are no jobs for freshers" is a Hoax. There are many opportunities for BME freshers. There are many functions in an MNC where biomedical engineers with added qualifications like MBA / professional certifications are considered.

For example the three domains namely Sales Management (Most demanding & highly paid), Applications/Clinical management, Service Engineering where freshers are considered right after B. Tech for entry-level roles. Candidates are considered for Testing & Validation, Quality Control & Assurance, Regulatory Affairs Domain with additional professional certifications.

To conclude this, you need to search and apply to opportunities in a strategic and meaningful way. Continue reading the article for more details.

2. "Don't join sales, it's a cheap job"

"Don't join sales, it's a cheap job" is another popular hoax. The data from relevant sources says 93 % of the CEOs and Global leaders come from Sales. Yes, if you are not targeting such positions or do not have skills nor interested in developing skills required for sales, it might be an exception for you. Here are a few references:

URL: 3 Reasons Why Sales People Make The Best CEOs

URL: 5 Reasons Salespeople Make Great Leaders

3. "You will get only marketing jobs in India "

You will only get marketing jobs in India. It is a Hoax. You will not get a job in marketing directly as it is a national level role. To be a marketing manager in a medical devices or equipment MNC you need to be a MBA / PGDM /EMBA graduate from tier one B

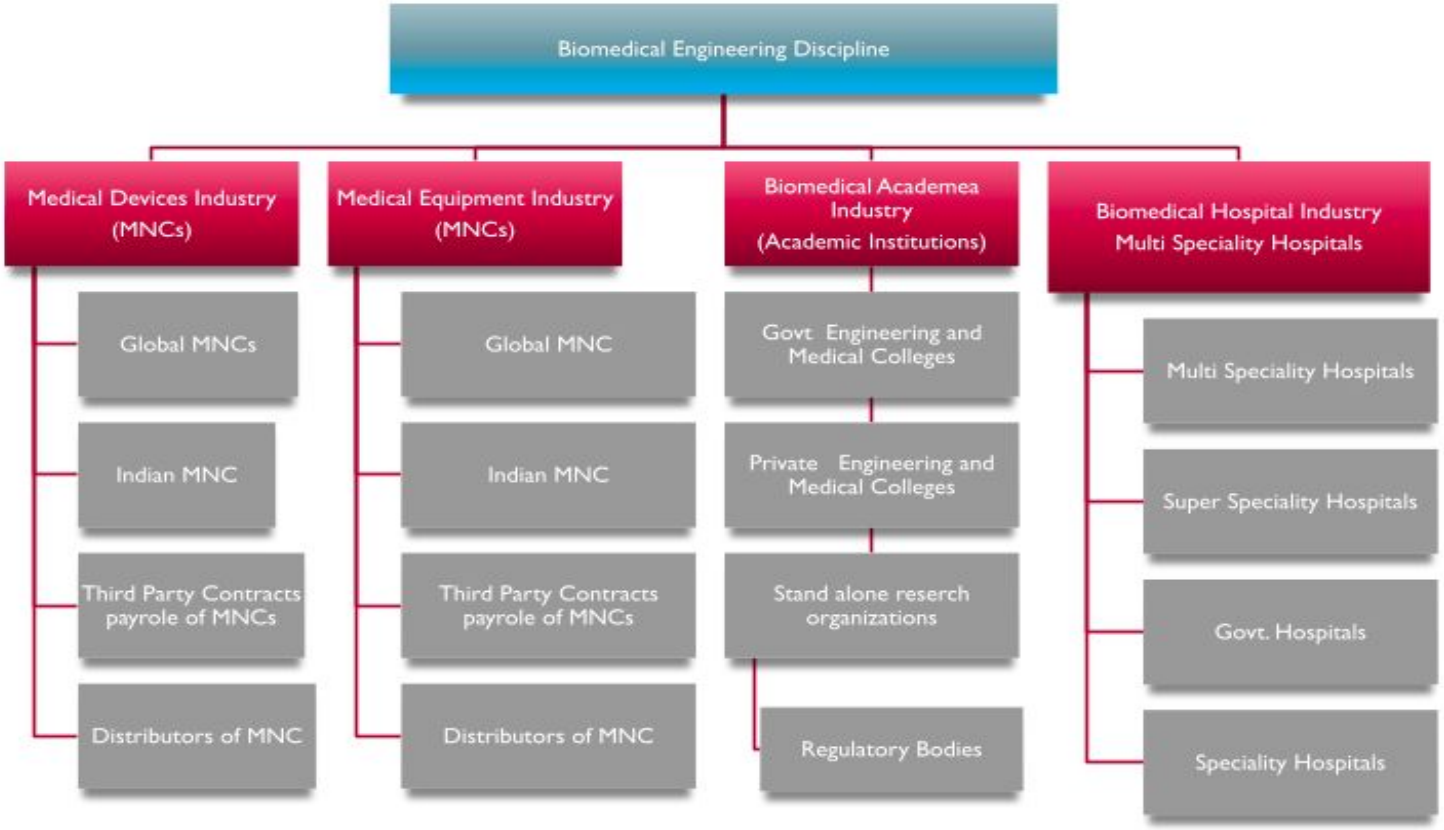


Figure 1: Overview of BME work opportunities.

Do-It-Yourself(DIY): Difference between Medical Equipment and devices with examples.

Figure 2: Overview of Sales Track in BME.

Do-It-Yourself(DIY): Identify the second best domain which makes best CEOs & global leaders in the world

"Life would be tragic if it weren't funny."

— Stephen Hawking

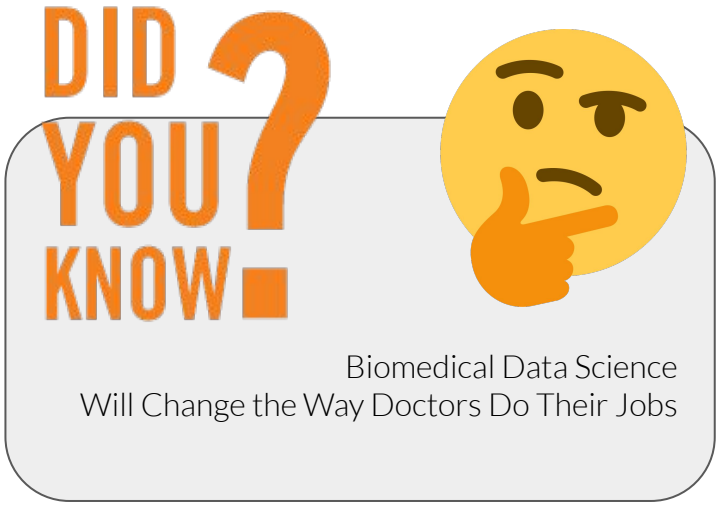
School and must have at least 6 years of experience in sales or applications. Yes if you are confused between sales and marketing, consider doing following DIY activity.

Do-It-Yourself (DIY) Activity: Difference between sales and marketing. Qualifications & experience required to be a marketing manager at medical devices or equipment MNCs.

4. "I want to join R&D in medical equipment and devices company after my B. Tech"

It is tough to get R&D / Design opportunities ($$$$) at MNC as fresher as it requires minimum masters or sometimes PhD as qualification and some focused experience in specific areas. However, Non MNCs are sometimes open to hire fresh biomedical engineers for R&D / Design ($$$).

Do-It-Yourself (DIY) Activity: Go to the career section of any top 10 medical devices or equipment company website, check opportunities in R&D / Design, and go through job descriptions carefully and learn about the minimum eligibility criteria.



5. "Only way to grow financially in biomedical is to do masters abroad and get settled there "

The only way to advance in biomedical engineering is to do a master 's degree. Settling abroad can be good for better quality of life, growing economically due to low inflation and currency exchange rates. Coming back to the topic let it be India or abroad, the growth in the industry not only depends on academic qualification but also the functions you are in, your performance and dedication towards the job. Considering academics and experience there of two career paths which I want to quote as examples :

1. 4 years of B. Tech + 3 years of experience in MNC + EMBA (Tire one B School) of one year + 2 years of middle management in sales can put you in maximum 25- 30 lakhs pay scale including incentive per annum in India (Total 10 years of Academics + Experience). In developed countries it can be five times of Indian pay scale.

2. 4 years of B. Tech + one or two years of Masters abroad + 3 years in PhD (Optional) + 2 years of entry level roles like staff engineer / Junior engineer / associate manager in R&D / Design can put you in maximum 15 lakhs pay scale including annum in India (Total Approx. 10-12 years of academics + experience). In developed countries it can be five times of Indian pay scale

"Any sufficiently advanced technology is indistinguishable from magic."

— Arthur C. Clarke

and can be estimated. In addition, if initial investment is not a challenge then candidates can opt for entrepreneurship after gaining some experience and look for building their own startup manufacturing or start medical devices / equipment distribution business. This is the best way to grow financially.

6. Hospital biomedical job is best

It depends on an individual choices.

Examples

- A Hospital Biomedical Job may be the most comfortable job to someone who does not enjoy travelling to new places or meeting people as it is an in house job, which does not require travelling. Having said that, it may have long working hours as an exception.
- A Hospital Biomedical Job in India may be good for someone who wants to be comfortable with steady and risk free low income. The challenge is hospitals pay very low salaries in India to BMEs but the situation is slightly better abroad due to currency differences and low inflation.
- A Hospital Biomedical Job may not be good for someone who likes fast-paced ecosystems, adventures, and risks, ready to go beyond the call of duty, grow economically, as well as grow within the organization.
- A Hospital Biomedical Job may not be good for someone who is very curious to learn technical stuff as there is very low exposure. Most of the things are taken care of by Service Engineers from MNC as medical equipment/devices at hospitals are under long term AMC / CMCs

The author's advice on misconceptions are:

1. Let us break the typical Indian stereotype mindset, which sets standards based on the nature of a job. No job is big or small, a job is job, and any job can lead to career growth. Growth in a career mainly depends on your career-planning, attitude, passion for learning, speed, risk-taking, dedication, knowledge, and skills.
2. Do not take rumors seriously. Talk to the right people. Do in-depth research , Try it yourself and validate the information.
3. Be optimistic and confident. Be positive and flexible. Take risks and challenges in life. Come out of your comfort zone.
4. Network with people, Offline and Online.

Career Planning for freshers

There are many opportunities for BME Freshers, but you need to be mindful before applying. If you are a fresher and looking for a job, do the following things first, towards planning your career.

1. Self-assessment: The first step towards planning a successful career path is to assess and understand

yourself. This includes your areas of interest, your long term and short-term goals, your strengths and weaknesses. Start by asking these questions:

- What are my areas of interest?
- What do I love doing the most?
- What is an organizational requirement basis my interest and strengths?
- What am I good at? What are the things I am bad at?
- What are my personal and professional goals?
- What skills do I require to be industry ready?
- What qualifications and experience do I have?
- Where do I see myself when I'm 50?

2. Market Research:

a. Now that you know your strengths and shortcomings, it's time to figure out how you are going to make yourself useful out there. Having a thorough idea about the market is the next step. Just how you'd research your next Wikipedia topic, start reading about what makes an organization profitable, what are their goals and vision, how can you contribute to their vision. Make sure you get an idea of the work culture, salary structure, growth opportunities etc.

b. Talk to your peers. Talk to your academic instructors. Talk to professionals who are working in different fields. This will give you a head start in your professional journey. Conduct informational interviews through which you'll get an idea about a job or career path, or try job shadowing a professional in which you observe, learn and develop yourself. Reach out to professionals within your network for these. Reach out. Because that's where you'll make a difference.

3. Validate your options

- Does my qualification, interest and experience align with the organizational goals?
- What type of industry suits me the best?
- What are the roles that appeal the most to me?

4. Identify the gap

By now you will have a fair idea of what you want and what you actually need to achieve them. Jot down the skills and areas of development.

Read various job vacancy posts. Get an idea of their requirements in terms of qualifications, skills, experience and start working on them. These could be skill gaps, experience gaps, qualification gaps, etc.

5. Fill the gap

Once you have assessed the gap, start working at various levels. Get an internship to gain experience. Work on

your interpersonal and social skills. This will give you a feel of the job role as well.

However, if at this juncture you feel that higher education is what interests you the most, go for it. But make sure that you have made up your mind. Look for the pros and cons and start working on it. This can be a master's degree in Business or Science etc. Align your goals before making any big investment.

You can also get offline certifications from Coursera, EdX, Udemy etc that will add a huge value to your resume. Distance learning is also an option.

6. Make a choice

By now you should have made up your mind. Narrow down all the shortlisted options. Preferably, 2 or 3. Assess the investments required and your areas of growth. Go for the role that fits in well with your interests, goals and abilities. And if you have honestly dedicated your time and energy in all the research and evaluation, you'll be confident and closer to achieving your goal.

7. Create an action plan

Now that you have finalized your career goal, create an action plan to achieve them.

Update your resume as per the industry standards, work on your soft skills, and keep networking. Be open to improvising along the way as and when needed.

8. Review choices

Always review your professional goals as per the market trend. Since they keep changing, be ready to make changes to your individual goals. You may want to learn new skills or completely change your career path. It is important to stick to something that you truly like and are happy doing.

Pro Tips

1. **Keep updated**: Read. Read. And read. If you keep yourself updated, you'll always be a step ahead of others.
2. **Be open to new opportunities**: Experiment in your initial years. If you do not find a desired role or company in your city, be open to exploring other geographies.
3. **Be realistic**. Be practical: Keep in mind your personal circumstances and available resources.
4. **Network**: Connect with professionals within your network. Getting someone's support and advice can speed up the process and broaden your perspective.
5. **Switch career**: It is never too late to start over. No matter how old you are, if you are not happy with your current profession, do not hesitate to switch.
6. **Find a mentor**: Find a mentor or a coach within your network. It can make a huge difference to your

career in the end. You can also take help of a professional counselor.

Career options

As mentioned earlier there are many opportunities for BME freshers. There are many functions in an MNC where biomedical engineers with added qualifications like MBA / professional certifications are considered.

For example the three domains namely Sales Management (Most demanding & highly paid $$$$$), Applications / Clinical management ($$$$), Service Engineering ($$$) where freshers are considered right after B. Tech for entry-level roles.

Candidates are considered for Testing and Validation ($$$) , Quality Control and Assurance ($$$$), Regulatory Affairs Domain ($$$$) with additional professional Certifications or knowledge in Change Management , Risk Management And Quality Management System (QMS) which complies with ISO 9001 , ISO 13485 , ISO 14001 , ISO 50001, OHSAS 18001 / ISO 45001 , ISO 27001 , ISO 13485, ISO 14971 , US FDA 21, CFR Part 820 and CE

Since I am into business management, I may be in a better position to talk about career progression in sales at MNC. As mentioned, always have second thoughts from the right people. Here are few facts around Sales Management opportunities in MNCs

Sales Management at Medical Equipment MNCs (India)

In the next few pages are illustrated, the various tiers of sales management positions available in medical equipment MNCs in India. Along with the listing of tiers, is consolidated information on the requirements, responsibilities and estimated salary. Browse through the various tiers to get an understanding of the various positions available as well as the possible room for career advancement in sales management.

(The most demanding and highly paid as of now in India for a Biomedical Engineer)						
Designation	**Minimum Experience (Years)**	**Minimum Educational Qualification**	**Coverage**	**Individual Contributor / People Manager**	**Reports to**	**Pay (in Lakhs / Annum INR)**
Sales Executive	0-2	Biomedical Engineering Fresher (Preferred) Or any other Life Science Degree	Covering A City	Individual Contributor	Area Sales Manager	3.5-6 Lakhs / Annum fixed salary + Sales Incentives + Business Expenses (Food Travel Stay Communication Etc.)
Sr. Sales Executive	2-3	Experienced Biomedical Engineering or Fresher (Preferred) Or any other Life Science Degree	Covering two or more Cities	Individual Contributor	Area Sales Manager	6-7 Lakhs / Annum fixed salary + Sales Incentives + Business Expenses (Food Travel Stay Communication Etc.)
Key Accounts Manager KAM	3-4	Experienced Biomedical Engineer (Preferred) Or any other Life Science Degree	Covering Important Hospital Accounts within City	Individual Contributor	Area Sales Manager	7 -9 Lakhs / Annum fixed salary + Sales Incentives + Business Expenses (Food Travel Stay Communication Etc.)

"We are an impossibility in an impossible universe."

— Ray Bradbury

(The most demanding and highly paid as of now in India for a Biomedical Engineer)						
Designation	**Minimum Experience (Years)**	**Minimum Educational Qualification**	**Coverage**	**Individual Contributor / People Manager**	**Reports to**	**Pay (in Lakhs / Annum INR)**
Territory Sales Manager TSM / District Sales Manager DSM	4-6	Experienced Biomedical Engineer (Preferred) Or any other Life Science Degree	Covering one or more districts within the state	Individual Contributor	Area Sales Manager	9 -10 Lakhs / Annum fixed salary + Sales Incentives + Business Expenses (Food Travel Stay Communication Etc.)
Area Sales Manager ASM	6-8	Experienced Biomedical Engineer with Full Time /Executive MBA (Preferred) Or any other Life Science Degree with MBA	Covering One or two states	Individual Contributor or Can be People Manager	Area Sales Manager	10 -17 Lakhs /annum fixed salary or even more + Sales Incentives + Business Expenses (Food Travel Stay Communication Etc.)
Regional Sales Manager RSM	8-10	Experienced Biomedical Engineer with Full Time /Executive MBA from one of the Top B-Schools (Preferred) Or any other Life Science Degree with tier I MBA	Covering Three or more states of a region	People Manager	Zonal Sales Manager	17 -23 Lakhs fixed salary / Annum, even more + Sales Incentives + Business Expenses (Food Travel Stay Communication Etc.)
Zonal Sales Manager ZSM	10-12	Experienced Biomedical Engineer with Full Time /Executive MBA from Top B-Schools (Preferred) Or any other Life Science Degree with tier I MBA	Covering Minimum Two Regions	People Manager	National Sales Manager / Sales Manager	23 -30 Lakhs fixed salary / Annum or even more + Sales Incentives + Business Expenses (Food Travel Stay Communication Etc.)
National Sales Manager / Sales Manager	12-14	Experienced Biomedical Engineer with Full Time /Part Time/Executive MBA from one of the Top B-Schools (Preferred) Or any other Life Science Degree with tier I MBA	Covering Complete India in terms of Sales of particular product line / Group	People Manager	Business Unit Head	30-40 Lakhs fixed salary / Annum or even more + Sales Incentives + Business Expenses (Food Travel Stay Communication Etc.)
Business Unit Head / Manager	14-16	Experienced Biomedical Engineer with Full Time /Part Time/Executive MBA from one of the Top B-Schools (Preferred) Or any other Life Science Degree with tier I MBA	Complete India in terms of Business of particular product line /Group	People Manager	Country Head / India General Manager / India CEO	40-60 Lakhs fixed salary / Annum or even more + Sales Incentives & Company Equity Shares (Optional) + Business Expenses (Food Travel Stay Communication Etc.)
Country Head / India General Manager / India CEO	16-18	Experienced Biomedical Engineer with Full Time /Part Time/Executive MBA from one of the Top B-Schools (Preferred) Or any other Life Science Degree with tier I MBA	Complete India or may be SARRC or APAC in terms of multiple product lines or product Groups in terms of Heading over all functions (Sales Marketing, HR Finance, Supply Chain etc.)	People Manager	Global CEO	70 Lakhs to 1 Crore fixed salary / Annum or even more + Company Equity Shares Sales Incentives + Business Expenses (Food Travel Stay Communication Etc.) In addition to it , top 15 MNCs offer perks like : HRA for decent size Bungalow and a luxury car with driver for official use

"God does not play dice with the universe."

— Albert Einstein, The Born-Einstein Letters 1916-55

How to prepare and apply

Remember you are just a fresher and you will not be getting any managerial or leadership roles directly. To reach there you have to go through all the stairs on the way to your career. So if any sales/ Applications or a service engineering job has been listed, be flexible to apply, irrespective of salary which is being offered, base location or brand. Work there for at least for a year then try for some better opportunity (this is for both UG and PG candidates)! After getting the experience only, you will be able to move on to higher positions in the Medical Devices and Equipment industry.

1. Start with your Resume and LinkedIn Profile hand in hand

Have two types of resume (A) Visual resume for sending to Humans (Hiring Manager / HR Managers) and (B) ATS resume for machines and bots.

a. Optimize your LinkedIn Profile as per your resume. Ensure there must not be any difference between the two.
b. Create a LinkedIn welcome note template with your introduction , purpose, role which you want to apply for , how you are suitable for the role , ask them their official email ID , phone number and CTA – (Call to Action) . Welcome notes are normally sent to someone over DM (Direct Message) on LinkedIn, who has recently accepted your connection request. Read some good articles online and watch some YouTube videos on this.
c. Consider hiring a Resume Designing or LinkedIn optimization service if you can invest a bit , because this investment can pay you back 10 times, once you get your dream job .
d. Optimize your Email Signature

DIY Activity:

- Learn what is visual resume and ATS resume , download some good templates and make each one of two for yourself
- Learn how to optimize LinkedIn Profile, read some good articles online and watch some YouTube videos on this
- Create general non-job specific welcome notes for using them in LinkedIn DMs
- Create a good covering letter template for yourself.
- Make a professional email signature online for yourself and include in your Gmail or outlook)

2. Know your target companies

- Go to the company website or wiki page of the company , learn about their products , vision , mission , corporate leadership , global presence, Indian presence and local presence in your city.
- Go through the careers tab, and look for various job roles and check out the job descriptions
- Look for the closest opportunity as per your academic qualification, consider 0-3 years of experience even if you have zero experience.

"The most incomprehensible thing about the world is that it is at all comprehensible."
— Albert Einstein

- Understand the qualification gaps, skill gaps, specific job requirements. Try to fulfill the gaps ASAP and make yourself suitable for specific type of role which you want to apply

DIY Activity: Google about top 30 medical equipment and devices companies in the world and mug up the sequence as per year 2020 ranking.

3. Modify your resume according to the Job description

- 98% resumes are rejected when you apply directly on job listing either on an official website or job board because of ATS (applicant tracking system). The ATS algorithm tries to match the keywords of your resume to the job description and gives your resume a minimum score and eliminates accordingly.
- To avoid this problem , candidate must try to correlate the keywords present in the job description with the ATS resume
- Same goes with Visual resume as well where you have to match everything as per job description

4. How to apply

I. Check for available opportunities in the career section of the company official website or any good job board like Naukri.com and apply with ATS resume.

II. Do not upload visual resumes on job listings because integrated ATS in the website backend cannot digest visuals, tables, photographs or any type of special characters present in your visual resume and simply may reject your application. In case of direct applications on the company career section, one should be extra careful because it is not limited to rejection at that point but the candidate can be barred from applying for the next 6 month.

III. As mentioned, Visual resumes are more appealing to humans not machines and bots like ATS, you need to find your target audience (Humans) over LinkedIn. Get connected to the same Hiring Manager who might be your future boss in the company as per job listing. Also get connected to the HR managers who might be hiring for the role which you saw on the website.

IV. Once they accept your connection request, send them a welcome note (Job specific or non-job specific according to situation) over LinkedIn DM.

V. Once you get their positive reply, asking your resume over their official email ID, send your "Visual Resume in PDF" with a covering letter in the email body with an email signature.

VI. Do an instant follow-up over call/SMS/WhatsApp right after your application hits their inbox. Do appropriate follow up as suggested by them or periodic follow-ups at least twice in a week till you get proper update on your application

Pro Tips: If you ask me which the best method is, I would say "reaching out to the hiring manager or HR manager over LinkedIn directly and sending a visual resume over email is better than applying for a job listing

"Reading, after a certain age, diverts the mind too much from its creative pursuits. Any man who reads too much and uses his own brain too little falls into lazy habits of thinking."
— Albert Einstein

on a company website or job board". This is for a simple reason that ATS can reject your application just because your resume is not ATS compliant. Second reason is that you are getting a direct reference from HR or the hiring manager wherein the possibility of getting a call for an interview is much higher compared to other methods.

Sometimes vacancies are not listed or not mentioned , there might be several factors like they must not have updated the career section , there might be some technical error in their HRMS or the company TA team don't feel their official website as a relevant medium for promoting job vacancies openly . In this situation also, a direct approach really helps over LinkedIn.

"How and What To Prepare For A Job Interview?"

- Get your resume printed out on bond paper
- Buy a nice lather folder and arrange your resume, internship letters , grade sheets and certificates in a chronological order from present to past
- Buy good set of western formals (family of blue or white/ grey color) and well-polished pair of shoes are recommended (applicable for male and females)
- Blazer is advisable based on climatic situation example: Blazer or suit can be opted if you are in Delhi during winter but cannot opt the same at Chennai during summers. If aren't comfortable in your dress you may spoil your interview
- Appropriate personal grooming and hygiene for males like clean shaven or trimmed beard and nails, is advisable.
- Females can do basic makeup, accessories like white pearls or formal handbags are recommended.
- Practice your introduction pitch, prepare some common questions which might be asked from the resume. Also some product related, technical and clinical questions can be asked followed by personality related questions. It is recommended to do mock practice in front of the mirror and check on body language or one can get help from friends or family members for the same.

What happens in a Medical Devices / Equipment Company job interview?

The obvious and most important procedure followed by the medical devices or equipment core companies for recruitment are

1. Hiring Manager round (Functional Manager round/Line manager/ with someone who might be your immediate boss): Mode of this interview can be personal / telephonic or through video conferencing. It will be more of your introduction and mainly questions will be related to the details mentioned in your resume. In addition to this there might be questions related to personal life , something which is not mentioned on the resume , your goals and personality related questions
2. HR Manager Round (Human Resource Manager Round): Mode of this interview can be personal / telephonic or through video conferencing. Your communication skills, background, academic credentials etc. are thoroughly checked by the HR. Salary expectations , location preferences and bit of personality related questions are asked.

"We are stuck with technology when what we really want is just stuff that works."
— Douglas Adams, The Salmon of Doubt

3. Panel of HR Manager + Hiring Manager + Business Head round: This round is the most crucial round; mostly it will be in person at the corporate headquarters of the company. Questions can be technical, behavioral, situational, personality related, objective, ethics and compliance related. You also can be asked to prepare a quick presentation on a given topic and they may check your presentation skills, public speaking body language, and confidence while answering critical questions related to your presentation.

Pro Tips: Core companies generally do not conduct aptitude tests because they are not bulk recruiters like IT companies. IT companies normally conduct aptitude test strategies just to eliminate weak candidates. Even if there is an aptitude test, there is a saying "IF YOU HAVE R.S AGARWAL IN YOUR HAND YOU WILL BE IN SAFE HANDS" prepare for the aptitude test from R S Agarwal thoroughly. If previous question papers are available on the web, then go through and solve them.

In a Core interview, you don't have to know everything about this world. You just need to know what all you have mentioned in your "RESUME", as it will determine the possible questions which may be asked.

In case of a Telephonic interview, be available on time, charge your phone, ensure you are in good network presence, and sound proof room, use earphones with mic for better audio quality. For any reason if you don't get a call on time from the hiring manager or HR manager, consider doing a follow up right after waiting for 3 minutes max. Sometimes, hiring/HR managers purposely delay the call and use this technique to check if you are punctual, your presence of mind, and follow up skills.

In case of video conference, ensure you have good uninterrupted internet connectivity , power supply, PC with good specs , good quality camera with mic, sound proof room with good background (you can leverage virtual backgrounds),

In case of personal interview, be on the spot at least 45 minutes in advance and get gel with the environment at the reception area and surroundings. Remember, the interview is anytime ON, once you are at office premises.

"How to Make A Choice This Is the Right Company for You?"

Do not hesitate to take up any job if it comes to you because this is the only way for a fresher to enter into the medical devices and equipment industry. Gain knowledge and some work experience, then try for some better opportunity within the organization or outside. Even if you are going for M. Tech / MS or MBA post your work experience, you might get special credits towards the same, depending on the institution where you are applying.

Incase if want to know something more, reach out to the author on LinkedIn (preferred) "with your updated profile" (URL: www.linkedin.com/in/s-hari-prasad)

"THE BETTER YOU WILL DO FOR YOUR CAREER THE BEST WILL BE YOUR FUTURE. SO, ALL THE BEST FOR UPCOMING ENDEAVORS."

"I learned very early the difference between knowing the name of something and knowing something."

— Richard P. Feynman

Congratulations Reader,

On behalf of the BioScope team, we wish you all the very best with your career. We hope this article helped you understand the prospects of biomedical engineering jobs in India. For more information on job prospects & academic/research pursuits, feel free to check out the Alumni Connect events held by the department.

It features speakers from all walks of academia & industry in biomedical engineering. What's more? They are all alumni of the SRM-Institute of Science & Technology. So if you have any questions, concerns or doubts, be sure to get them clarified at the next Alumni Connect talk.

Yours Sincerely,
Team BioScope

About the Author

Mr. S. Hari Prasad is a biomedical engineering graduate and alumni of the SRM Institute of Science & Technology (formerly SRM University), belonging to the batch of 2007-2011. After graduation, Mr. Hari has gone on to complete his MBA from the Xaviers Institute of Business Management Studies in 2015 and completed his Executive Programme in Sales & Marketing (EPSM) from the Indian Institute of Management, Calcutta (IIMC).

He also has 10+ years of business management experience in core medical equipment devices MNCs.

DID YOU KNOW?

Medical Equipment Manufacturing OEMs are the 6th largest employer in the world.

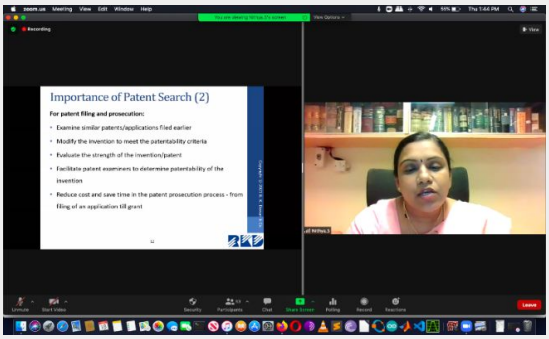
The first medical device ever invented was the stethoscope.

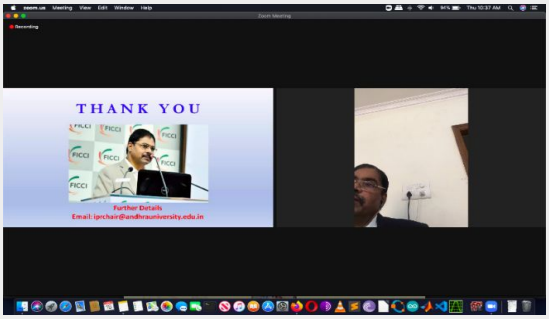
Medical Equipment manufacturing dominates the life sciences industry.

The medical equipment industry is one of the major exporters in the world.

"The scientist is not a person who gives the right answers, he's one who asks the right questions." — Claude Levi-Strauss

GALLERY





Pictures from top-left (clockwise):

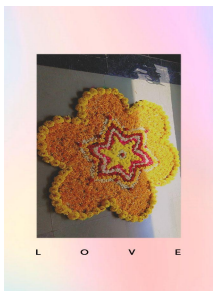
1. Inaugural Function – CBRHI (For more, refer next page)
2. Ms. S Nithya at the IPR & patent workshop.
3. Dr. Purushothaman at the IPR & patent workshop.

Pictures from top-left (clockwise):

1. Research Day presentations held virtually.
2. Handing of research day awards.
3. Proceedings from the NCREAT-2021.
4. Interactive activities at the Clinical Biodesign webinar.

"You can't use up creativity. The more you use, the more you have."

-- Maya Angelou, Poet



"The opposite of a correct statement is a false statement. But the opposite of a profound truth may well be another profound truth." — Niels Bohr

"Practice like you've never won. Perform like you've never lost"

– Michael Jordan

For enquiries & suggestions,
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Contact us at: 044-27417854

For more information about the department, please visit
https://www.srmist.edu.in/engineering/department-of-biomedical-engineering