SSN

(An Autonomous Institution)

Master of Engineering

Medical Electronics

ADMISSION

2020

Graduate Prospectus

M.E. Medical Electronics

M.E. Medical Electronics is a Two-year postgraduate programme; it is a specialized discipline that advances knowledge in Engineering and Medicine, through cross-disciplinary activities that integrates the Electronics and Engineering sciences with the Biomedical Sciences and Clinical Practices. This course helps to develop devices and procedures that solve medical and health-related problems by combining the knowledge of biology and medicine with engineering principles and practices. It offers research based and practise oriented intense learning with specialization in the following domains:

Medical Devices

Assist Devices and Implant Technology

Neurological Engineering

Bio Signal Processing

Applied Medical Image Processing

The curriculum of Medical electronics program at SSN was prepared keeping in mind that the students need to get trained to face the challenges in the modern Medical Devices industry by providing the necessary engineering knowledge and skills in problem analysis, design and development of solutions. It empowers the students to skilful usage of modern tools including data sciences, machine learning and virtual reality to the medical problems. The choice based specialization includes:

Machine Learning

Virtual Reality

Neural Networks

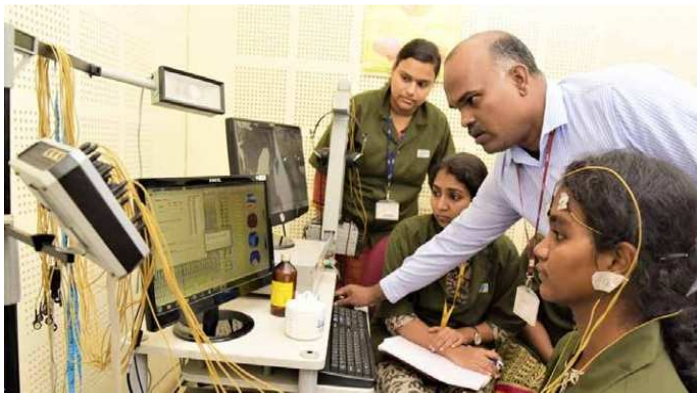
AI &Pattern Recognition

Brain Computer Interface

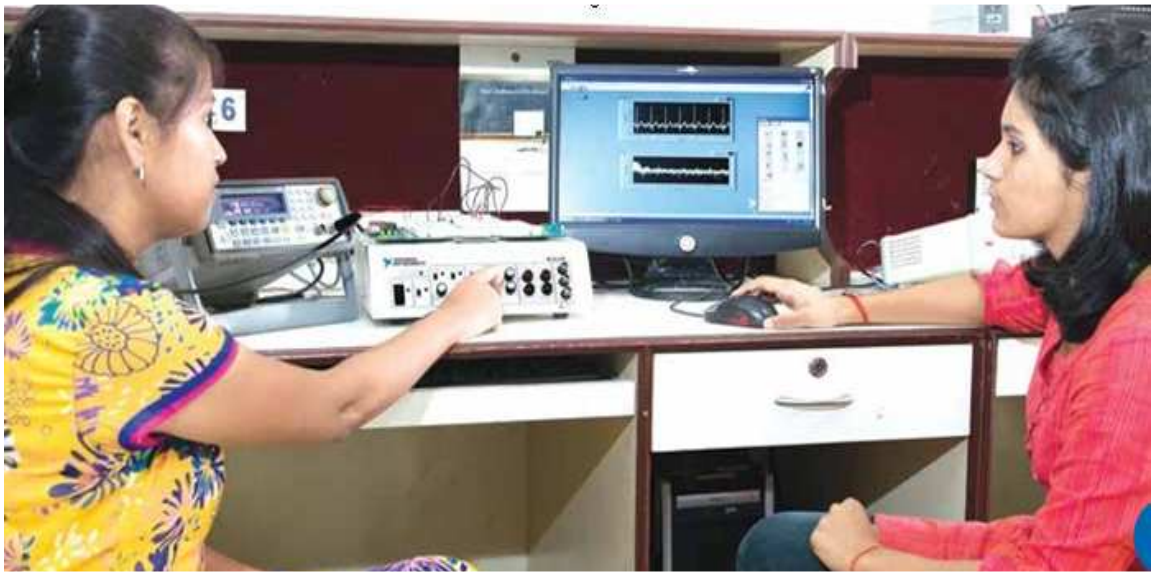
Wearable Devices & Tele Health Technology

Facilities

Medical Instrumentation Lab



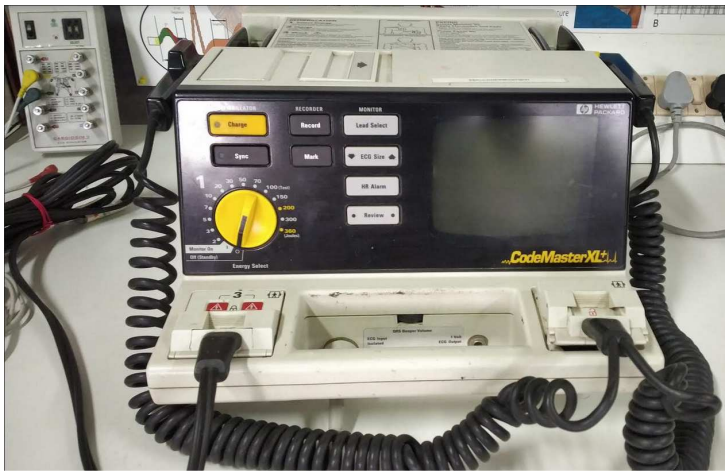
This laboratory is the launchpad for several national hackathon winning projects. It involves in the design and development of prototypes of medical devices Carefully structured experiments familiarize students with the underlying physiological principles, design and analysis of medical instrumentation; transducers, biopotential amplifiers, computer interfacing, basic signal processing and the installation, calibration, preventative maintenance and repair of biomedical equipment. Facilities include LabVIEW, NI Elvis, Philips Patient and Central monitoring Station, Multi-channel Telemetry, Bio amplifiers, Philips ECG recorder, EEG with visual and auditory evoked potentials, EMG Machine, Audiometer, Ultrasonic flow meter, DAQs, various sensors and workstations.



Facilities

Diagnostics & Therapeutic Equipment Lab

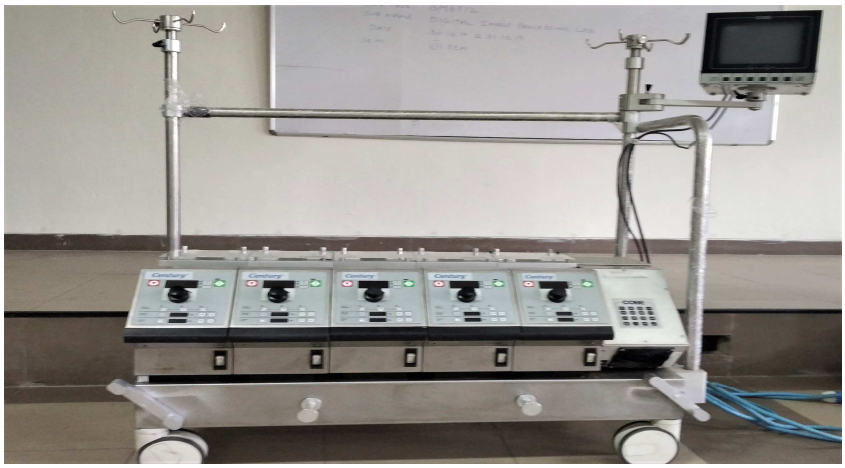
This lab supports student research with an environment to record their body signals and analyses the same using BioPac MP45 data acquisition system.



It is well equipped with sophisticated equipment that includes:

COBE Heart lung machine, PACE medical Pacemaker, Siemens Ventilator, Baxter Dialyzer, HP Code master Defibrillator, Microwave and Shortwave Diathermy, Fluke Surgical Analyzer, Fluke electrical safety Analyzer, Infusion pump, Biopac Telemetry and Wearable Devices.

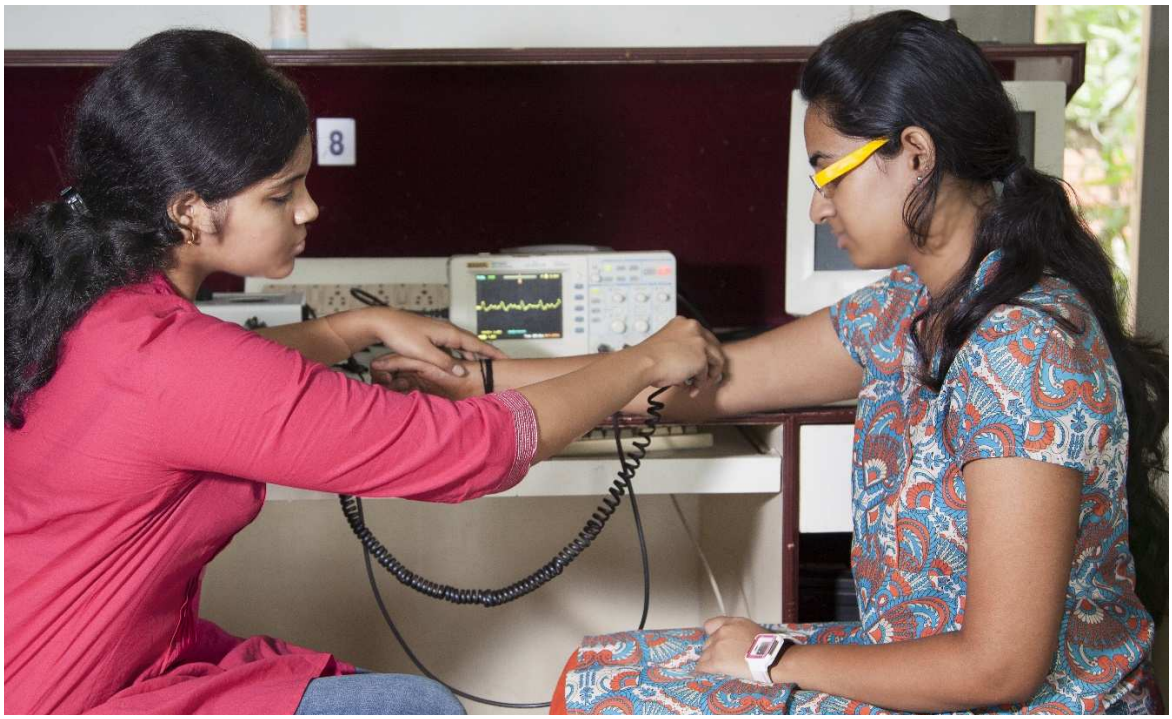
Students in this lab get the opportunity to work themselves on the high end hospital equipment, explore the internal components, service, maintain and conduct safety checks, the knowledge of which tremendously helpful in their own design processes.



Facilities

Electronics and Integrated circuit Lab

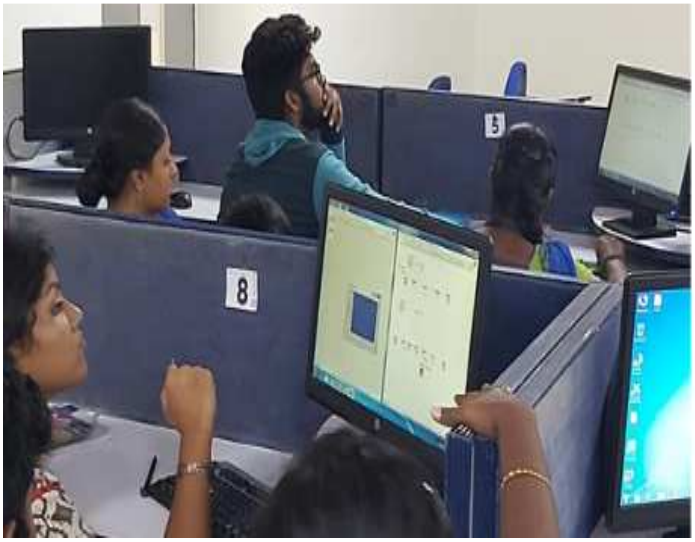
This laboratory involves in understanding the basic concepts, working and characteristics of different electronic devices and integrated circuits. Students are trained to construct, analyse and troubleshoot designed circuits. Software based circuit simulation experiments and hardwired experiments are performed.



Data Acquisition lab

This laboratory is involved in the acquisition of medical signals and images and implementation of signal processing and image processing algorithms for biomedical applications. Facilities include Analog Discovery Kit, OMAP L-138 DSP& ARM Processor kits, Digital Storage Oscilloscope, MATLAB 2019b with Image Processing Tool box (Campus license), Lab view software, DAQs, various sensors and workstations.

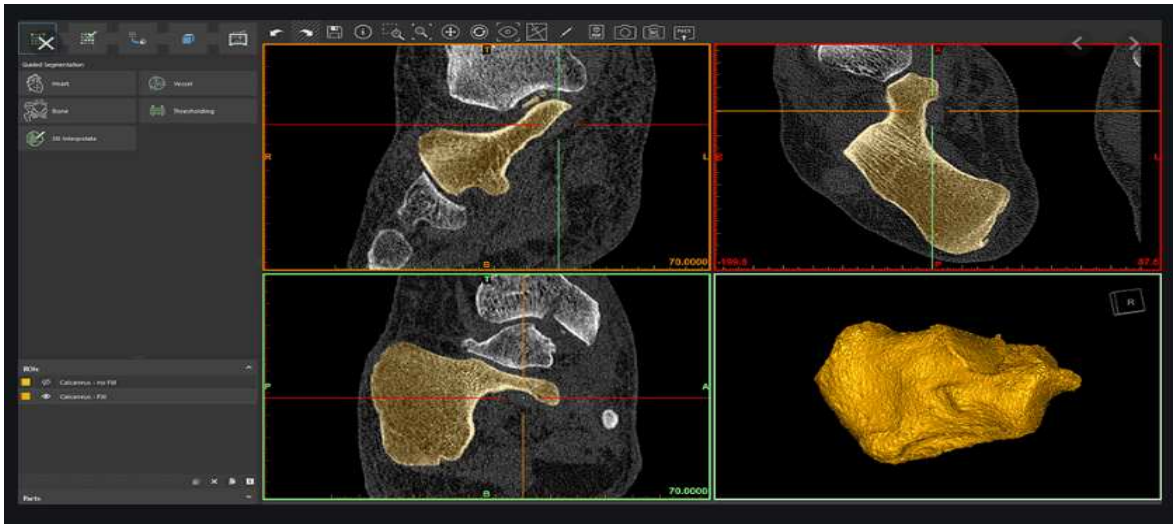
Facilities



Medical Software Lab

This laboratory is concerned in the design and development of embedded systems for biomedical applications.It is equipped with microcontroller kits and IDE tools, PSoC development kits DAQ, NI myRio-1900, FPGA Zynq-7000 SoC – Xilinx board, SMD soldering station and workstations.

3D Modeling and Fabrication



The facility has Materialize – mimics in-print to create 3D models from the medical scans. 3D models are fabricated with the in house 3D printer for a desirable and specifications.

Credits and Electives

	CORE			ELECTIVE		
Category	FC Fundamental Course	PC Professional Core	PE Professional Elective	OE Open Elective	EEC Employability Enhancement Course	Total
Credits	4	30	12	3	21	70

Professional Core (PC)

- Bio Signal Processing
- Applied Medical Instrumentation
- Biomedical Equipment
- Anatomy and Human Physiology
- Biomechanics
- Applied Medical Image Processing
- Medical Imaging and Radio Therapy
- Assist Devices and Implant Technology

Professional Electives (PE)

- Biomedical Optics
- Health Care and Hospital Equipment Management
- Biomedical Informatics
- Rehabilitation Engineering Technology Biomaterials and its Characterization
- Bio MEMS and its Applications
- Cognitive Neuro Science
- Pattern Recognition and Its Applications Machine Learning Techniques
- Telemedicine and Telehealth Technology

- Computer Based Medical Instrumentation
- Optimization Techniques
- Real Time Embedded Systems
- Ethics and Standards in Health care
- Brain Computer Interfaces and its Application
- Advanced Neural Computing
- Nanostructured Materials and Processing
- Physiological System Modelling and Simulation
- Biomedical Research Techniques
- Wearable Devices and Technologies

Employability Enhancement Courses (EEC)

- Mini Projects
- Hospital Training
- Project (Phase I and II)

Teaching Methodology

Classroom Component

SSN offers E-learning enabled classrooms. Medical electronics is truly interdisciplinary. It deals with a wide range of subjects from anatomical, physiological, and clinical to advanced engineering concepts. This demands different modes and styles of teaching by the subject experts at classes including demonstration, case studies, modeling and audio-visual clips. This is effectively managed by the learning management system (LMS). The lecture materials and are uploaded on the LMS which can be accessible anywhere by the students with their SSN id.

Mini Projects/Projects

Mini project at SSN serve as a launching pad to quickly test the nuances of selecting the right project. Medical products design demands high level of skill sets and attention to details. Testing the ideas before the main project, gives an edge ahead to sort out the limitations and to take corrective measures with help of the mentors to come up with a successful design. Industrial or Clinical Collaborative projects are taken as main projects that is being conducted in two phases. Students publish their scientific findings as conference/ journal publications apart from thesis.

Practical Components

Medical electronics program offers lab integrated courses apart from practical courses. The industry ready course contents are taught with integrating early practise experiences with the lecture materials. The program is supported by world class lab facilities and carefully designed practical course structure. It emphasises the true understanding of the dynamics of the experiment performed using expensive real medical equipment rather than using the study modules. This way, students gets hands on experience with actual medical devices like defibrillators, ventilators, heart lung machines, pacemakers, rather than having to work with their unintuitive dummy replicas.

Hospital Training / Industrial Visits/ Internships

Students are given opportunity to gain field experience by shadowing the clinicians and MedTech professionals. This allows them to understand the field requirements and ideate better engineering solutions to the clinical problems at the early stage itself, and work with the help of their mentors towards relevant device development during their main project. Students are encouraged to take industrial visits and project internships. The numerous experiences gained from this training include: understanding the workflow and to discover their area of interest, acquiring basic knowledge of the working principle of medical equipment and their maintenance and safety precautions.

Invited Lectures/workshops

Industrial and academic experts are invited to campus to deliver guest lectures and workshops on the topics of MedTech trends

Internal Funding/Patents

SSN funds highly innovative ideas of the students, supports it to realizing the prototype and helps in patenting the ideas through its dedicated research centre and innovation cell.

Ph.D. Program

Department of BME at SSN is recognised as a Research Center by Anna University and it has 8 recognised research supervisors. SSN provides stipends for highly talented meritorious students registering for PhD after their PG. Stipends may also be availed through NDF schemes as SSN has been selected as Private Self Financing Research Center by AICTE for admitting PhD candidates under this scheme.

Faculty Details

Dr. A. Kavitha
Prof. & Head
Biosignal processing, Mental Imagery, Neuro Imaging, Virutal Reality

Dr. V. Mahesh
Associate Professor
Machine Learning, Brain Cognition, Analog Circuits

Dr. S. Pravinkumar
Associate Professor
Model Building, Vocal fold vibration Analysis, Machine Learning

Dr. L. Suganthi
Associate Professor
Mathematical Modelling, Embedded Systems, Biosignal processing

Dr. S. Bagyaraj
Associate Professor
Gait Analysis, Rehabilitation Engineering, Neuroscience

Dr. J. Vijay
Associate Professor
Medical Image, Signal Processing, Medical System Design

Dr. S. Arun karthick
Associate Professor
Medical Textile, Nano technology

Dr. B. Geethanjali
Associate Professor
Brain Cognition, Bioinstrumentation, Bio-signal Processing

Dr. K. Nirmala
Associate Professor
Image processing, Diagnostic and therapeutic equipments, Biomedical Instrumentation

,
Dr. Sachin Gaurishankar Sarate
Assistant Professor
Biomaterials, Sports Biomechanics and Ergonomics

Ms. M. Dhanalakshmi
Assistant Professor
Bio-Signal and speech signal processing

Ms. R. Nithya
Assistant Professor
Rehabilitation Engineering and Image Processing.

Dr. R. Subashini
Assistant Professor
Biochemistry, microbiology,

Ms. B. Divya,
Assistant Professor
Cognitive neuroscience

Program structure& Admission Criteria

Eligibility	**First Class or 60 % Mark in B.Tech./B.E. in Biomedical, Biotechnology, Electrical, Electronics and communication, Instrumentation, Mechanical, Computer Science and Information Technology, Engineering Sciences, or MBBS or other 4 year equivalent course**
Mode of selection	Preferences will be given for GATE cleared students
Foreign nationals	Admissions are open for Eligible Foreign Nationals (Check PG admission page)
Residential program	All the PG program at SSN College of Engineering are residential programs. Students can choose their residential preferences at the time of admission.
Societal Impacts	Medical Electronics is a traditional engineering skill with applications in medical field, these engineers works hand-in-hand with health-care professionals (physicians, nurses, therapists, etc…) to solve a wide variety of health related problems affecting the society. These Engineers are also involved in designing medical instruments, devices, and software to develop new procedures or technology for the local, national and global needs of the society.
Students clubs	There are various Technical and Non-Technical clubs at SSN, students can get involved in any clubs and get their leadership skill nurtured. The SSN student chapter of IEEE Engineering and Biology Society organizes campus in-house activities such as technical workshops, tutorials, and speaker talks, project competitions for members and global networking opportunities. Clubs like EDC gives students to nurture their Entrepreneurial thoughts / aspirations

Student Learning Outcomes

Our Medical Electronics program has been carefully structured to ensure that after successful completion the students will be able to apply their learned skillsets to developing the solutions to the complex MedTech problems. It prepares the students for:

Knowledge and Skills – The program inculcates the body of knowledge and skills necessary to operate independently and cooperatively, act responsibly, work effectively in designing, executing, communicating and documenting the process, thus adding values in their professional practices.

Employment– It substantiates the skillset required for healthcare service providers and Medical Technology industry. So that the students can be employed as a professional in the medical devices development, design process management, medical device regulations or allied fields.

Research Capabilities - It is an important aspect in any post- graduation study particularly in the medical devices field where changes and rapid advances are the norms. The program prepares the students in the inter disciplinary research cutting across the traditional fields to By preparing the students it profoundly contributes to the research and development in the healthcare field.

Professional Management and Soft Skills – Being inter disciplinary the Medical Electronics discipline empowers the students in honing their team management and communication skills. In the process of medical device design, the students have to interact with the clinicians, medical devices companies and incubation centers, articulate their ideas and suggest the means and methods to practically realize it. This enables the graduates to communicate effectively at clinical, technical and professional levels and to serve as team members or leaders with good interpersonal skills.

Career and Placement

Medical devices industry is a great place to build a career. Recent pandemic episodes has made the governments across the world to realize healthcare system as their top priority and to invest heavily to modernizing and restructuring it. The Medical Technology industry is known to be one of the most innovative industry. It adapts quickly the changes and trends in the technology and therefore the medical devices products demands rethinking and new design challenges. This drives the MedTech companies to seek for young talented manpower on board. Medical Electronics program with the help of industrial experts is structured to meet the demands of the industrial expectations.

Industry placement

An increasing number of medical technology companies both in India and abroad considers the complete knowledge of medical electronics and thrust for innovation are essential for hiring. Medical devices companies emphasise on the quality and safety of the medical devices as any malfunction may severely harm the patient. Therefore, they prefer the candidates with knowledge and understanding of the medical field specific manufacturing process requirements and regulations. This gives an edge for Medical Electronics graduates to adept for wide range of opportunities in these companies. The career development cell at SSN coordinates with these companies and arranges campus placement every year.

Entrepreneurship

SSN alumni have established a number of successful MedTech start-ups not only in India, but also in the countries like USA and Singapore. An entrepreneurial spirit can aid even the most academically accomplished student to go that extra mile in realising their dreams. Entrepreneurial skills are best inculcated from one's student days onwards, and SSN firmly believes a complete education includes this kind of orientation. The Entrepreneurship Development Cell (EDC) at SSN Institutions helps in fostering innovation and promoting entrepreneurial skills among SSN students.SSN is a member of The National Entrepreneurship Network (NEN). The Technology Business Incubator at SSN is an on-campus facility which leverages all the resources that are available within the campus. This serves a launching pad for enthusiastic entrepreneurs with visionary ideas.

Research Career/ Academic Placements

Students aspire for academic and research positions further acquires the sufficient knowledge and skillsets through competent Doctoral programs in India and abroad. Research is a culture at SSN and therefore the students fare extremely well in obtaining academic and research positions in the top universities and research laboratories of the world. SSN also offers meritorious stipends to continue in-house research after post-graduation through PhD programme.

Academic and Industry Partnership

The department has **academic and project partnerships** with

- Drexel University, Philadelphia, USA (for a joint MS program)
- Birmingham City University, United Kingdom
- Sri Ramachandra Medical College and Research Institute, Chennai
- National Institute for Empowerment of Persons with Multiple Disabilities, Chennai

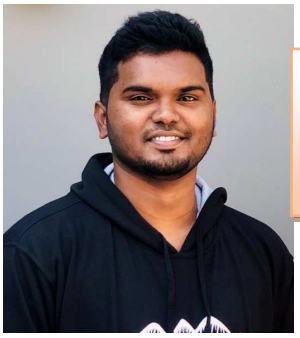
Industrial partnership (for medical device design and software development) with

- RECYCL3D Calgary, Alberta, Canada.
- Horizon Engineering Solutions, Waterloo, Canada
- Neolight,USA
- Wildbox Technologies, Singapore
- HCL Technologies, India

Our prime Recruiters include

- Philips
- HCL Technologies (Health Care Division)

Notable Alumni



Mr. Guhan from 2016 passed out batch is a Research scholar in the Dept of BME, NIT Raipur. He is currently working on EEG based functional brain connectivity analysis on dyslexic children during various cognitive processing.

Ms. Bhuvaneshwari from 2016 passed out batch, is a Research assistant in the Computational Intelligent Laboratory, The University of Memphis. She is currently working on the area of Computational Imaging and Bio-optics

Ms.Vardhini. P from 2017 passed out batch is currently pursuing her Ph.D at IIT Madras in Applied Mechanics Department

Notable Alumni

Mr. Kapardi from 2017 passed out batch is currently pursuing Ph.D in department of Biomedical Engineering, at **IIT Hyderabad** under the institute fellowship category

Ms. Sivaranjani from 2017 passed out batch currently pursuing Ph.D in the Faculty of Information and Communication Engineering at **Anna University,** Chennai

Ms. Preethi Kurian from 2019 passed out batch, is currently working on an Orthopaedic project as Senior Software Engineer at HCL Technologies since July 2019 with experience in software verification testing and in test software architecture design.

Contact

Dr. A. Kavitha

Professor and Head

Department of Biomedical Engineering

SSN College of Engineering

Kalavakkam – 603110

Email: kavithaa@ssn.edu.in

Phone: +91 44 27469700 Extn: 365