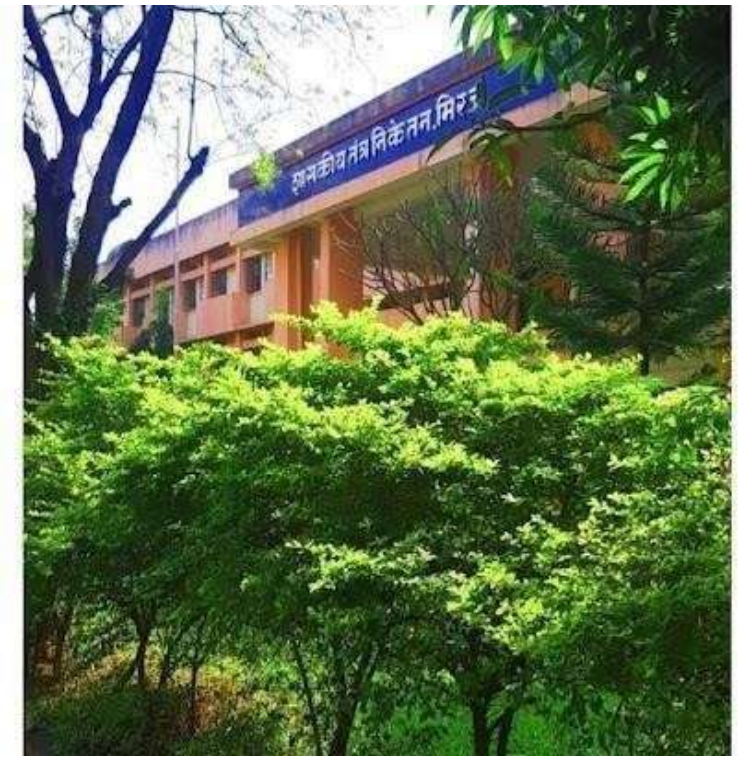
GOVERNMENT POLYTECHNIC, MIRAJ

DEPARTMENT OF MEDICAL ELECTRONICS

ABOUT INSTITUTE

Government Polytechnic, Miraj (Dist: Sangli), established in 1990 is presently running courses in Mechanical, Civil, Computer, Medical Electronics and Plastic Engineering. All the courses are recognized by AICTE, New Delhi and affiliated to MSBTE, Mumbai. In its constant endeavor of instilling quality technical education, Government Polytechnic, Miraj is engaged in various curricular and co-curricular activities The Institute has won the General Championship Trophy for its Overall Performance in DIPEX 2018



Capt. Dr. N.P.Sonaje

Principal

Message from Principal

It gives me immense pleasure in inviting you to the virtual tour of our Government polytechnic Miraj. Our Institute is one of the premier institutes imparting quality education. The Institute also runs the Medical Electronic course in this dynamic environment our endeavor is to make our students competent, confident, self-reliant, lifelong learners ready for change. The students are also encouraged to participate in co-curricular and extracurricular activities to highlight their talents. Overall, it has been a gratifying experience to go through the various activities performed by our college from medical electronic course . Also I welcome you to be a part of our second edition of magazine. Wishing you all the absolute best for your newsletter and magazine.

Date of publication: 1Feb 2023
Volume No.: 02/2023

ABOUT DEPARTMENT

Department was established in year 1995. It is unique course in Pune region of Maharashtra state. This course combines medical and engineering concept to support hospitals and healthcare industry. The Medical devices manufacturing sector plays an important role in improving medical treatment.

Presently handy and small medical devices manufacturing industry growing day by day.

Hence to give more skill based knowledge, six month internship for final year student's either in hospital or industry has been included in curriculum.

Dr. Nagesh Janrao

Head of Department

Message from Head of Department

I extend a very warm welcome to you for visiting the Department of Medical Electronics. Medical Electronics engineers are the one who design devices and measures that, solve medical and health-related problems by combining their knowledge of biology with engineering principles and practices. A medical electronics engineer is the doctor of those equipment's without which a real doctor or surgeon is helpless. The Medical Electronic Department is reputed for its knowledgeable, hardworking, and caring faculty members as well as enthusiastic, intelligent, and disciplined students. The department regularly organizes the expert/guest lecture, Hospital visit to cover content beyond curriculum and organizes the activities for student personality and professional development one of which activity include this digital magazine.

I would like to invite you to browse through the departmental second edition of magazine. We appreciate your interest and look forward for your involvement with our newsletter and magazine.

Vision of the Department

To educate and make socially, environmentally responsible diploma engineers for healthcare industry and empower them to face day-to-day challenges of medical equipment.

Mission of the Department

1. To educate and train students to solve broad-based problems in medical electronics by adapting professional skills and ethics.
2. To develop intellectual competency amongst medical electronics students so as to engage them with health care industry.
3. To apply technical skills to solve problems individually or as a team member to face challenges in healthcare industry.

Program Outcomes

1. **Basic and Discipline specific knowledge:** Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems.

2. **Problem analysis:** Identify and analyses well-defined engineering problems using codified standard methods.

3. **Design/ development of solutions:** Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs.

4. **Engineering Tools, Experimentation and Testing:** Apply modern engineering tools and appropriate technique to conduct standard tests and measurements.

5. **Engineering practices for society, sustainability and environment:** Apply appropriate technology in context of society, sustainability, environment and ethical practices.

6. **Project Management:** Use engineering management principles individually, as a team member or a leader to manage projects and effectively communicate about well-defined engineering activities.

7. **Life-long learning**: Ability to analyzes individual needs and engage in updating in the context of technological changes.

Event: **Poster presentation competition** on

(1) Role of Biomedical Engineer in Developing India

(2) Green Energy

(3) Emerging trends in biomedical engineering

Date of event: 15/09/2022

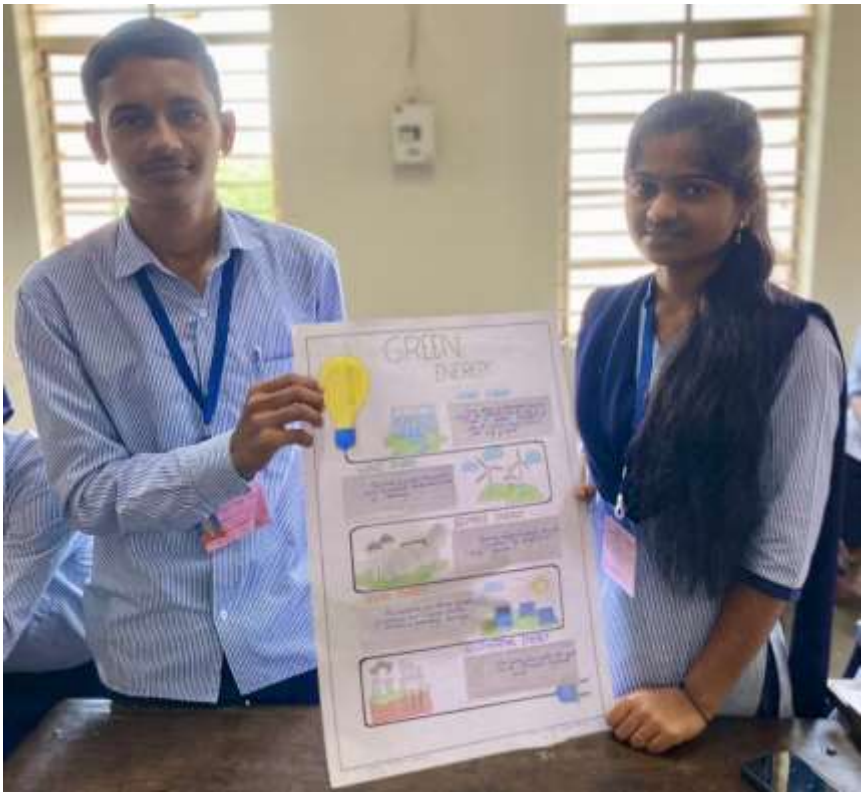
Objective of the poster presentation:

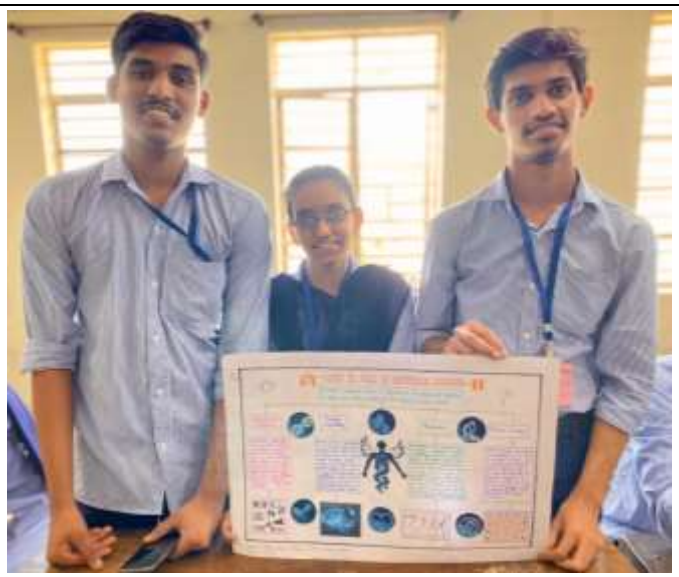
To create the awareness of

- Recent advanced technology in biomedical engineering
- Energy conservation technique and use of renewable energy

Program Outcomes: PO_1, PO_2, PO_3, PO_4, PO_5, PO_7

Event Highlights:


GREEN



The poster presentation competition was arranged on 15/09/2022. Total 30 students of FY, SY and TY Medical Electronics participated in the completion. Mr. D. D. Gaikwad and Mrs. M. S. Nitalikar worked as judge for the competition. For the success of the competition Dr. N. P. Sonaje, Principal Government Polytechnic Miraj, Dr. N. L. Janrao, HoD Medical Electronics, Dr. R. M. Ohol and Mrs. S. S. Patil, Lecturer Medical Electronics were worked.

Event: Industrial visit at

Echo friendly SLRM Centre, Biogas plant, 84a,

Khamakar Colony, Sangli-kolhapur Road, Jaysingpur, Dist. Kolhapur

Date of visit: 14/11/2022

Company CEO: Mr. Kundan Chavan, ME (Chemical Engg.)

Objective of the visit:

To study the

- Production of biogas from household waste.
- Factors affecting the production of biogas from waste.
- Waste management by reducing adverse impacts of waste materials on human health and the environment.

Program Outcomes: PO_1, PO_2, PO_3, PO_4, PO_5, PO_6, PO_7

CO: Use renewable energy resources for energy conservation

Technical data:

Floating Dome type Bio-Methanization Plant (Model : BG1)

(a) Input: Segregated Organic Waste

The plant is designed for processing food and kitchen leftovers. Degradable waste is processed by the plant through 'Bacterial Decomposition' of biodegradable matters. Plant outputs are biogas and organic manure.

Feed stocks like wood shavings, straw, grass, coconut shells, non-degradable oils, contaminants, disinfectants, contaminated/ adulterated food waste should be completely avoided for feeding into the biogas plant.

Soft papers, paper tissues and other fibrous materials may be accepted to a certain extent, but takes longer time for getting digested. The overall mass of these slow degrading materials should not exceed 2% of the total incoming materials.

Inorganic materials such as plastic, glass, stones and metal must be segregated prior to the process as they do not contribute to the gas production and cause technical problems.

(b) Output 1: Biogas

Various factors such as feed stock characteristic and plant operation practices may affect biogas production, its composition and quantity. Assuming typical food waste and proposed treatment technology, following biogas parameters may be expected.

(c) Output 2: Digested Slurry

The digested slurry is segregated into Solid and Liquid Manure. Solid Manure can be filled into bags and stored for farming use or sold at bio-manure market. Liquid Slurry after dilution with Water may be applied for “Organic Farming” or gardening purposes.

(d) Model : BG1

Bio-gas plants are made of non-breakable and long lasting (Min. 15-20 Years). Fiber reinforced plastic (FRP) material with water jacket system (For evacuation i.e. deodorization and feed warming purpose).

Plant capacity = (10 Kg solid waste + 20 liters of waste water per day + 1 kg cow dung/Bioculture mixture)

Gas production rate = 1 kg gas

Gas types	Specification
Methane (CH_4)	60.00 %
Carbon dioxide (CO_2)	39.00 %
Oxygen (O_2)	0.10 %
Nitrogen (N_2)	0.40 %
Temperature	35.00 ^oC

Event Highlights:

Event: **Hospital visit**

at Bharti Vidyapeeth Deemed University Medical College & Hospital, Sangli

Date of visit: 23/11/2022

Objective of the visit:

To create awareness of

- Biomedical waste management in a hospital.
- Waste segregation in hospital according to the colour coding.
- Disposal of biomedical waste by using Incinerator.
- Safety and precautionary measures in a hospital.

Program Outcomes:

Program Outcomes: PO_1, PO_2, PO_3, PO_4, PO_5, PO_6, PO_7

Program Specific Outcomes: PSO_1, PSO_2, PSO_3

CO:

- Manage biomedical waste effectively.
- Apply safety and precautionary measures during waste management

Technical data:

Disposal of medical waste through incineration is one of the most reliable technologies. As the most common medical waste incineration (MWI) system, controlled-air incineration is predominantly set up at health care centers and other medical institutions. It is also known as starved-air incineration, two-stage incineration, or modular combustion.

There are mainly two stages of the waste combustion in this mechanism. In the first stage, waste is fed into the primary, or lower, combustion chamber, which is operated with less than the stoichiometric amount of air required for combustion. Combustion air which is also called as primary or under fire air enters the primary chamber from beneath the incinerator hearth (below the burning bed of waste). In the primary (starved-air) chamber, the low air to-fuel ratio dries and facilitates. Volatilization of the waste and most of the residual carbon in the ash burns. Under these circumstances, combustion gas temperatures are relatively low.

Event Highlights:

Waste segregation

Incineration plant

Ash collection

Control panel

The visit was arranged under the course Energy and Biomedical Waste Management. Mrs. S. S. Maske, Biomedical Engg. Department, Bharti Vidyapeeth Deemed University Medical College & Hospital, guided the students. Total 30 students of TY Medical Electronics and 02 staff members Dr. R. M. Ohol and Mrs. R. M. Sathe visited the hospital.

Event: Micro project competition

Date of event: 25/11/2022

Objective of the Micro project competition:

- To manage project effectively and communicate about well-defined engineering activities.
- To provide the platform and unleash the potential of the students by showcasing their innovative projects developed.
- To show student's innovative project at higher level and the process boosted their confidence.

Program Outcome : PO1, PO2,PO3, PO4, PO5,PO6 PO7

Program Specific Outcome: PSO1, PSO2,PSO3

Schedule : Date: 25 November 2022

- Registration : 11:00am To 12:00pm
- Opening ceremony : 12:00pm–12:30pm
    - Assessment of Project: 12:30pm–2:00pm
- Project Exhibition: :2:30pm–3:30pm

Event Highlights:

The Department of Medical Electronics, Government Polytechnic, Miraj organized micro project competition on 25/11/2022. In this competition total 45 of students of FY, SY and TY Medical Electronics have actively participated and demonstrated their micro projects to experts, faculty members and general audience comprising students of various branches. The inaugural of the micro project competition witnessed the presence of (Capt). Dr. N. P. Sonaje, Principal Government Polytechnic Miraj, Dr. N. L. Janrao, HoD Medical Electronics, along with medical electronics faculty and staff. Dr. R. M. Ohol and Mrs. R. M. Sathe worked as judges for this competition. The event became a grand success with the moral support of Dr. N. L. Janrao, HOD Medical Electronics Department, and all other respected faculty members.

A Pacemaker Operated by Electricity Generated by Kinetic Energy of the Heart

Dr. R. M. Ohol

A pacemaker is a life-saving device used in patients suffering from cardiac diseases. The pacemaker controls the patient's heartbeat by providing artificial pulses to the heart through lead wires. Millions of people rely on pacemakers. Pacemakers are of two types, namely external and internal pacemakers. The application of an external pacemaker is for temporary purposes only. In contrast, internal pacemakers fit permanently in a patient's chest with severe heart disease—it requires surgery.

Fabrication of internal pacemakers utilizes biocompatible materials. The working of pacemaker depends on batteries which provides necessary power to run, and batteries must be replaced every five to ten years. Those replacements require surgery, which can be expensive and increase the risk of complications and infections in the patients. Solving the battery problem for any implantable biomedical device is challenging. Many researchers are working on medical sensors within the body. According to researchers from Dartmouth College in the United States, the heart's motion is powerful, and it is possible to convert the kinetic energy of heart's motion into electricity.

It is important to highlight that a piezoelectric material is an alternate solution to convert motion in to electricity. Piezoelectricity comes from the Greek word piezo, meaning to press and generate electricity. The piezoelectric materials are non-conductive, lightweight, and flexible for the piezoelectric effect to occur and work. Devices that use the direct piezoelectric effect include microphones, pressure sensors, wristwatches, hydrophones, and many other sensing types of devices.

The piezoelectric effect acts like a miniature battery as it produces electricity. A piezoceramic material placed between the two metal plates generates electricity when it is compressed. Also, the piezoelectric effect is reversible, on applying a potential difference across the material it shows deformation.

Piezoelectric materials are of two types namely naturally occurring piezoelectrics and man-made piezoelectrics. The naturally occurring piezoelectrics are Berlinite, Quartz, Rochelle, Topaz and Tourmaline. Whereas man-made piezoelectrics are Perovskite materials and tungsten-bronze materials exhibit piezoelectricity.

To prepare a piezoelectric ceramic, fine powders of the constituent metal oxides are mixed in a proper proportion. This mixture has to be heated in order to obtain a uniform powder. The powder is then mixed properly using an organic binder and is designed into specific shapes, e.g., discs, rods, plates, etc. mixture after sintering again for a specific time and under a fixed temperature. As a result of this process,

the powder particles of the ceramic system attain a thick crystalline structure. The mixture is cooled and, if needed, cut into specific shapes.

The future of piezoelectricity is very promising. This technology is constantly evolving and becoming more efficient and less expensive. There are many potential applications for piezoelectricity, and it's expected that this technology will continue to grow in popularity in the years to come. The proposed altering pacemaker converts the kinetic energy of the lead wire connected to the heart into electricity that can be used to keep the working of pacemaker.

Editor's board

Faculty member

Smt. S.S.Rathi

Student member

Rasika Mane –TYMU

Dhairyashil Chougale TYMU

Vaibhav Borse-TYMU

Samarth Autade-TYMU

Shreya Chavan-SYMU

Ratnadeep Varpe-SYMU