Agnel Charities'
Padre Conceicao College of Engineering , Verna
Department of Mechanical Engineering

Consortium of Students of Mechanical Engineering (COSME)

Presents

ECHO '19

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ECHO

(2018 - 2019)

Advanced Material Research

INSTITUTE PROFILE

On June 9, 1957 when the Ashram was inaugurated at Bandra, Mumbai, Our Founder, **Fr. Conceicao Rodrigues** spelt out his dream. "***Our principle aim will be to promote our rich heritage***", he said. As the first Indian Missionary Society, we have strived to serve our fellow citizens while nurturing this dream. The Ashram has branches all over India and is immersed in the development of modern Indian society at every level.

The Agnel Ashram in Goa spreading over 25 acres of verdant, hilly slopes, at Verna, was the fulfillment of a long felt need of providing technical education facilities for the youth of Goa. Within a span of two decades, the project has made considerable progress, thanks to the generous support from the Government, friends and well wishers.

Padre Conceição College of Engineering (PCCE) is an engineering college in Verna, Goa, India, established in 1997. The college is affiliated to Goa University, Taleigao, Goa, and the programmes are approved by All India Council for Technical Education (AICTE), New Delhi. The college is a part of Agnel Technical Education Complex, Verna, Goa. PCCE has 4 Bachelor disciplines: Mechanical Engineering, Computer Engineering, Electronics and Telecommunication Engineering and Information Technology and Masters in Information Technology

Institute Vision

" To establish a sustainable engineering ecosystem"

To strive towards excellence in Technical Education and Research by facilitating students with modern technology, interdisciplinary approach and problem solving ability to meet the needs of the industry, society and nation at large.

Institute Mission

- To continuously improve students' educational outcomes through effective teaching learning methodology.
- To provide students and faculty with advanced technology and excellent scholastic ambience for research.
- To provide opportunities for holistic development of students with a focus on self-learning, ethics, leadership, and entrepreneurship skills.
- To strengthen the network with alumni and industries.

Mechanical Engineering Department Vision:

To empower the students to serve the society and nation, by imparting value based education through contemporary infrastructure, excellence in education and research, in the realm of Mechanical Engineering

Mechanical Engineering Department Mission:

- To provide an effective and appropriate pedagogy to instill critical and proactive thinking in mechanical engineering students and empower them to make cogent contributions to the society.
- To endow the students with ethical values, professional and entrepreneurial skills and make them competitive at the national as well as global level.
- To develop alliances with Research & Development organizations, industries and alumni for excellence in teaching, research and consultancy.

Program Educational Objectives (PEO):

Within a few years of graduating, the Mechanical Engineering graduates will:

PEO 1: Have successful careers in industry, academia and entrepreneurship in various fields of mechanical engineering and allied disciplines.

PEO 2: Have professional, ethical, leadership qualities, and proactively address a variety of technical and societal problems.

PEO 3: Retain intellectual curiosity and disseminate knowledge through lifelong learning, to tackle the rapidly evolving challenges of the modern world.

PEO 4: Contribute effectively towards the advancement of industry, society and nation through research and development.

Program Specific Outcomes(PSO):

At the end of this program the student will be able to:

- Apply the knowledge of design, industrial, manufacturing, thermal engineering and multidisciplinary perspectives to address the needs of Mechanical Engineering systems.
- Develop and implement solutions for products and services with the help of engineering tools.

HOD'S MESSAGE

The year 2019, has indeed been wonderful for Mechanical Engineering Department & PCCE be it in our students organizing workshop for the juniors or otherwise gaining accolades in other co-curricular activities apart from showing up good performance in the acedemics. I am glad that Consortium of Mechanical Engineering (COSME) is doing extremely well in the sphere of teaching – learning . I am indeed pleased to know that this year the emphasis is on Material Research. Engineering has been ever evolving to develop materials with high strength to weight ratio. The interdisciplinary field of materials science, also commonly termed materials science and engineering, covers the design and discovery of new materials, particularly solids. The intellectual origins of materials science stem from the Age of Enlightenment, when researchers began to use analytical thinking from chemistry , physics & understand ancient, phenomenological observations in metallurgy and mineralogy. I would like to congratulate the faculty and students , and wish them the best .

- Prof. Joe Kurian

CO-ORDINATOR'S MESSAGE

COSME is a collegiate organization which stands for Consortium of Mechanical Engineering. The student committee of COSME' 2018 -19 , has indeed lived up to the expectations of the organization vis-à-vis creating learning opportunities for students by students be it in having a Robotics workshop in October 2018 , organizing a thrilling TECHYON event this year and organizing a well co- ordinated talk on LTA systems in February 2019. These clubbed with other activities at the TECHYON event will indeed place a last impression for students in the long run. Students, taking up such responsibilities indeed and executing them has indeed given me an opportunity to congratulate the committee for their dedication and hard work. I hope in the future too we have committees living up and even excelling better with task handed over them. Once again a big kudos to the team !

- Prof. Flasio Colaco

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ABOUT COSME

CONSORTIUM OF MECHANICAL ENGINEERS popularly called as COSME is a collegiate organization which relates the activities under Mechanical Engineering Department. COSME is among the most active student bodies in the institute which actively takes part in the TECHYON event and works under the banner of TURBULENCE thus gathering and forming students from the department of mechanical engineering leading to a more holistic approach in the undergraduate years. Mentored by experienced faculty members of the Mechanical Engineering department, students take upon many initiatives that prepare them to face the challenges of the future. COSME aims to create opportunities for the students to enhance their knowledge about the latest developments in the technological world by organizing various events.

Functions of COSME:

- Promoting the interests of students in various technical areas pertaining to mechanical engineering.
- To promote interaction between academia and industry by organizing industrial visits, special lectures and intellectual talks.
- Interacting with other technical societies, within and outside the institute to promote flow of knowledge and interest.
- To allow students to learn and focus on the cutting-edge technology by presenting it to the students in interesting manner through seminars and workshops.

COSME COUNCIL 2018–19

COSME FACULTY CO-ORDINATOR

Prof. Flasio Colaco

THE STUDENT COUNCIL (COSME)

Kendrick Fernandes

(PRESIDENT)

Sachin Desai

(SECRETARY)

Shravan Hegde

(TREASURER)

MATERIAL RESEARCH , WHAT'S IT ABOUT ?

Borker Sanish , (Mech VI)

Before the Research Let us get into the Science !

Materials science still incorporates elements of physics, chemistry, and engineering. As such, the field was long considered by academic institutions as a sub-field of these related fields. Beginning in the 1940s, materials science began to be more widely recognized as a specific and distinct field of science and engineering, and major technical universities around the world created dedicated schools for its study.

Materials scientists emphasize understanding, how the history of a material (processing) influences its structure, and thus the material's properties and performance. The understanding of processing-structure-properties relationships is called the materials paradigm. This paradigm is used to advance understanding in a variety of research areas, including nanotechnology, biomaterials, and metallurgy.

Materials science is also an important part of forensic engineering and failure analysis – investigating materials, products, structures or components, which fail or do not function as intended, causing personal injury or damage to property. Such investigations are key to understanding, for example, the causes of various aviation accidents and incidents.

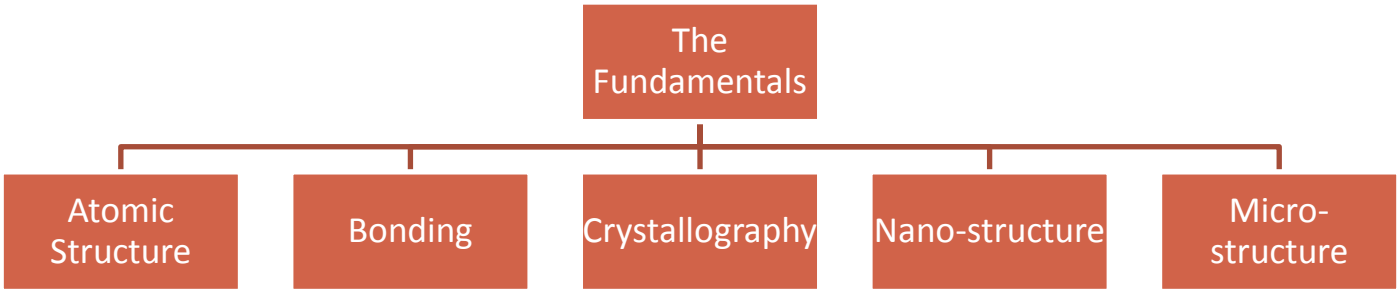
The material of choice of a given era is often a defining point. Phrases such as Stone Age, Bronze Age, Iron Age, and Steel Age are historic, if arbitrary examples. Originally deriving from the manufacture of ceramics and its putative derivative metallurgy, materials science is one of the oldest forms of engineering and applied science. Modern materials science evolved directly from metallurgy, which itself evolved from mining and (likely) ceramics and earlier from the use of fire. A major breakthrough in the understanding of materials occurred in the late 19th century, when the American scientist Josiah Willard Gibbs demonstrated that the thermodynamic properties related to atomic structure in various phases are related to the physical properties of a material. Important elements of modern materials science were products of the Space Race; the understanding and engineering of the metallic alloys, and silica and carbon materials, used in building space vehicles enabling the exploration of space. Materials science has driven, and been driven by, the development of revolutionary technologies such as rubbers, plastics, semiconductors, and biomaterials.

Before the 1960s (and in some cases decades after), many eventual *materials science* departments were *metallurgy* or *ceramics engineering* departments, reflecting the 19th and early 20th century emphasis on metals and ceramics. The growth of materials science in the United States was catalyzed in part by the Advanced Research Projects Agency, which funded a series of university-hosted laboratories in the early 1960s, "to expand the national program of basic research and training in the materials sciences." The field has since broadened to include every class of materials,

including ceramics, polymers, semiconductors, magnetic materials, biomaterials, and nanomaterials, generally classified into three distinct groups: ceramics, metals, and polymers. The prominent change in materials science during the recent decades is active usage of computer simulations to find new materials, predict properties and understand phenomena.

A material is defined as a substance (most often a solid, but other condensed phases can be included) that is intended to be used for certain applications. There are a myriad of materials around us; they can be found in anything from buildings and cars to spacecraft. The main classes of materials are metals, semiconductors, ceramics and polymers. New and advanced materials that are being developed include nanomaterials, biomaterials, and energy materials to name a few.

The basis of materials science is studying the interplay between the structure of materials, the processing methods to make that material, and the resulting material properties. The complex combination of these produce the performance of a material in a specific application. Many features across many length scales impact material performance, from the constituent chemical elements, it's microstructure, and macroscopic features from processing. Together with the laws of thermodynamics and kinetics materials scientists aim to understand and improve materials.



Structure

Structure is one of the most important components of the field of materials science. Materials science examines the structure of materials from the atomic scale, all the way up to the macro scale. Characterization is the way materials scientists examine the structure of a material. This involves methods such as diffraction with X-rays, electrons or neutrons, and various forms of spectroscopy and chemical analysis like Raman spectroscopy ; electron microscope analysis etc.

Structure is studied in the following levels.

Atomic structure

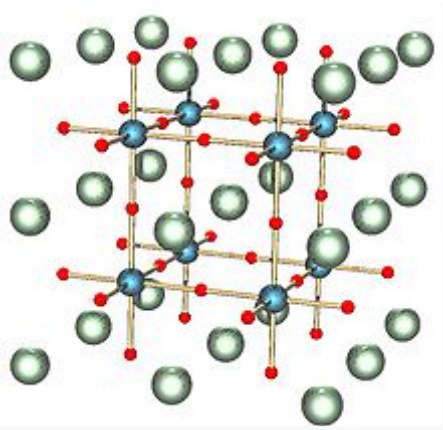
Atomic structure deals with the atoms of the materials, and how they are arranged to give rise to molecules, crystals, etc. Much of the electrical, magnetic and chemical properties of materials arise from

this level of structure. The length scales involved are in angstroms (Å). The chemical bonding and atomic arrangement (crystallography) are fundamental to studying the properties and behavior of any material.

Bonding

To obtain a full understanding of the material structure and how it relates to its properties, the materials scientist must study how the different atoms, ions and molecules are arranged and bonded to each other. This involves the study and use of quantum chemistry or quantum physics. Solid-state physics, solid-state chemistry and physical chemistry are also involved in the study of bonding and structure.

Crystallography



Crystal structure of a perovskite with a chemical formula ABX_3

Crystallography is the science that examines the arrangement of atoms in crystalline solids. Crystallography is a useful tool for materials scientists. In single crystals, the effects of the crystalline arrangement of atoms is often easy to see macroscopically, because the natural shapes of crystals reflect the atomic structure. Further, physical properties are often controlled by crystalline defects. The understanding of crystal structures is an important prerequisite for understanding crystallographic defects. Mostly, materials do not occur as a single crystal, but in polycrystalline form, as an aggregate of small crystals or grains with different orientations. Because of this, the powder diffraction method, which uses diffraction patterns of polycrystalline samples with a large number of crystals, plays an important role in structural determination. Most materials have a crystalline structure, but some important materials do not exhibit regular crystal structure. Polymers display varying degrees of crystallinity, and many are completely non-crystalline. Glass, some ceramics, and many natural materials are amorphous, not possessing any long-range order in their atomic arrangements. The study of polymers combines elements of chemical and statistical thermodynamics to give thermodynamic and mechanical descriptions of physical properties.

Nanostructure

Buckminsterfullerene nanostructure

Materials, which atoms and molecules form constituents in the nanoscale (i.e., they form nanostructure) are called nanomaterials. Nanomaterials are subject of intense research in the materials science community due to the unique properties that they exhibit.

Nanostructure deals with objects and structures that are in the 1 - 100 nm range.[8] In many materials, atoms or molecules agglomerate together to form objects at the nanoscale. This causes many interesting electrical, magnetic, optical, and mechanical properties.

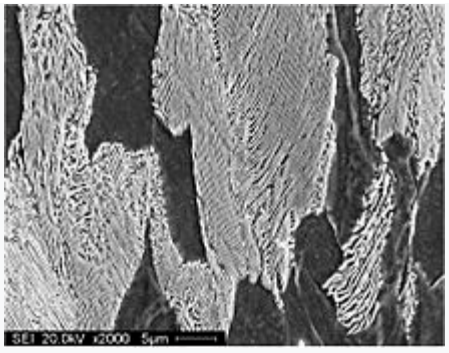
In describing nanostructures, it is necessary to differentiate between the number of dimensions on the nanoscale.

Nano-textured surfaces have *one dimension* on the nanoscale, i.e., only the thickness of the surface of an object is between 0.1 and 100 nm.

Nanotubes have *two dimensions* on the nanoscale, i.e., the diameter of the tube is between 0.1 and 100 nm; its length could be much greater.

Finally, spherical nanoparticles have *three dimensions* on the nanoscale, i.e., the particle is between 0.1 and 100 nm in each spatial dimension. The terms nanoparticles and ultrafine particles (UFP) often are used synonymously although UFP can reach into the micro-metre range. The term 'nanostructure' is often used, when referring to magnetic technology. Nanoscale structure in biology is often called ultrastructure.

Microstructure



Microstructure of pearlite

Microstructure is defined as the structure of a prepared surface or thin foil of material as revealed by a microscope above 25× magnification. It deals with objects from 100 nm to a few cm. The microstructure of a material (which can be broadly classified into metallic, polymeric, ceramic and composite) can strongly influence physical properties such as strength, toughness, ductility, hardness, corrosion

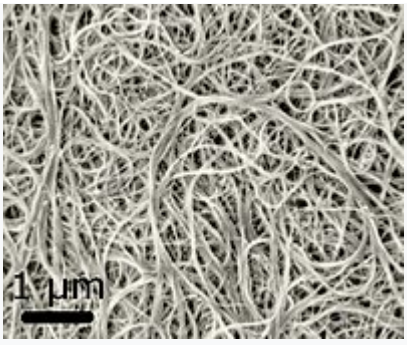
resistance, high/low temperature behavior, wear resistance, and so on. Most of the traditional materials (such as metals and ceramics) are micro-structured.

The manufacture of a perfect crystal of a material is physically impossible. For example, any crystalline material will contain defects such as precipitates, grain boundaries (Hall–Petch relationship), vacancies, interstitial atoms or substitutional atoms. The microstructure of materials reveals these larger defects and advances in simulation have allowed an increased understanding of how defects can be used to enhance material properties.

And , Now Let's look into the Research !

Materials science is a highly active area of research. Together with materials science departments, physics, chemistry, and many engineering departments are involved in materials research. Materials research covers a broad range of topics, following non-exhaustive list highlights a few important research areas.

Nanomaterials



A scanning electron microscopy image of carbon nanotubes bundles

Nanomaterials describe, in principle, materials of which a single unit is sized (in at least one dimension) between 1 and 1000 nanometers (10^{-9} meter), but is usually 1 nm - 100 nm. Nanomaterials research takes a materials science based approach to nanotechnology, using advances in materials metrology and synthesis, which have been developed in support of microfabrication research. Materials with structure at the nanoscale often have unique optical, electronic, or mechanical properties. The field of nanomaterials is loosely organized, like the traditional field of chemistry, into organic (carbon-based) nanomaterials, such as fullerenes, and inorganic nanomaterials based on other elements, such as silicon. Examples of nanomaterials include fullerenes, carbon nanotubes, nanocrystals, etc.

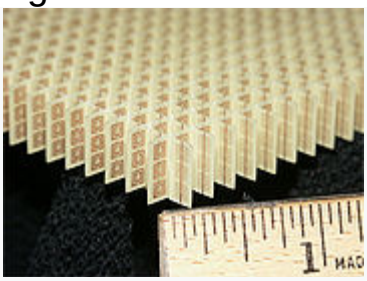
Biomaterials

The iridescent nacre inside a nautilus shell

A biomaterial is any matter, surface, or construct that interacts with biological systems. The study of biomaterials is called *bio materials science*. It has experienced steady and strong growth over its history, with many companies investing large amounts of money into developing new products. Biomaterials science encompasses elements of medicine, biology, chemistry, tissue engineering, and materials science.

Biomaterials can be derived either from nature or synthesized in a laboratory using a variety of chemical approaches using metallic components, polymers, bioceramics, or composite materials. They are often intended or adapted for medical applications, such as biomedical devices which perform, augment, or replace a natural function. Such functions may be benign, like being used for a heart valve, or may be bioactive with a more interactive functionality such as hydroxylapatite-coated hip implants. Biomaterials are also used every day in dental applications, surgery, and drug delivery. For example, a construct with impregnated pharmaceutical products can be placed into the body, which permits the prolonged release of a drug over an extended period of time. A biomaterial may also be an autograft, allograft or xenograft used as an organ transplant material.

Electronic, optical, and magnetic



Negative index meta material

Semiconductors, metals, and ceramics are used today to form highly complex systems, such as integrated electronic circuits, optoelectronic devices, and magnetic and optical mass storage media. These materials form the basis of our modern computing world, and hence research into these materials is of vital importance.

Semiconductors are a traditional example of these types of materials. They are materials that have properties that are intermediate between conductors and insulators. Their electrical conductivities are very sensitive to the concentration of impurities, which allows the use of doping to achieve desirable electronic properties. Hence, semiconductors form the basis of the traditional computer.

This areas of research like superconducting materials, spintronics, metamaterials, etc. The study of these materials involves knowledge of materials science and solid-state physics or condensed matter physics.

Computational materials science

With continuing increases in computing power, simulating the behavior of materials has become possible. This enables materials scientists to understand behavior and mechanisms, design new materials, and explain properties formerly poorly understood. Efforts surrounding integrated computational materials engineering are now focusing on combining computational methods with experiments to

drastically reduce the time and effort to optimize materials properties for a given application. This involves simulating materials at all length scales, using methods such as density functional theory, molecular dynamics, Monte Carlo, dislocation dynamics, phase field, finite element, and many more.

Material Research in Industry

Mark Fernandes (Mech VI)

Radical materials advances can drive the creation of new products or even new industries, but stable industries also employ materials scientists to make incremental improvements and troubleshoot issues with currently used materials. Industrial applications of materials science include materials design, cost-benefit tradeoffs in industrial production of materials, processing methods (casting, rolling, welding, ion implantation, crystal growth, thin-film deposition, sintering, glassblowing, etc.), and analytic methods (characterization methods such as electron microscopy, X-ray diffraction, calorimetry, nuclear microscopy (HEFIB), Rutherford backscattering, neutron diffraction, small-angle X-ray scattering (SAXS), etc.).

Besides material characterization, the material scientist or engineer also deals with extracting materials and converting them into useful forms. Thus ingot casting, foundry methods, blast furnace extraction, and electrolytic extraction are all part of the required knowledge of a materials engineer. Often the presence, absence, or variation of minute quantities of secondary elements and compounds in a bulk material will greatly affect the final properties of the materials produced. For example, steels are classified based on 1/10 and 1/100 weight percentages of the carbon and other alloying elements they contain. Thus, the extracting and purifying methods used to extract iron in a blast furnace can affect the quality of steel that is produced.

Ceramics and glasses

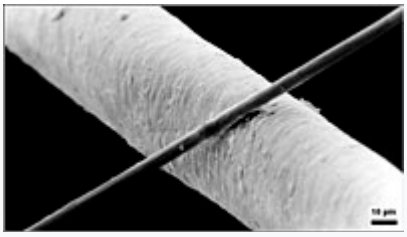
Si_3N_4 ceramic bearing parts

Another application of materials science is the study of ceramics and glasses, typically the most brittle materials with industrial relevance. Many ceramics and glasses exhibit covalent or ionic-covalent bonding with SiO_2 (silica) as a fundamental building block. Ceramics - not to be confused with raw, unfired clay - are usually seen in crystalline form. The vast majority of commercial glasses contain a metal oxide fused with silica. At the high temperatures used to prepare glass, the material is a viscous liquid which solidifies into a disordered state upon cooling. Windowpanes and eyeglasses are important

examples. Fibers of glass are also used for long-range telecommunication and optical transmission. Scratch resistant Corning Gorilla Glass is a well-known example of the application of materials science to drastically improve the properties of common components.

Engineering ceramics are known for their stiffness and stability under high temperatures, compression and electrical stress. Alumina, silicon carbide, and tungsten carbide are made from a fine powder of their constituents in a process of sintering with a binder. Hot pressing provides higher density material. Chemical vapor deposition can place a film of a ceramic on another material. Cermets are ceramic particles containing some metals. The wear resistance of tools is derived from cemented carbides with the metal phase of cobalt and nickel typically added to modify properties.

Composites



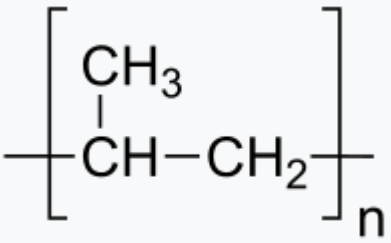
A 6 µm diameter carbon filament (running from bottom left to top right) siting atop the much larger human hair

Another application of materials science in industry is making composite materials. These are structured materials composed of two or more macroscopic phases.

Applications range from structural elements such as steel-reinforced concrete, to the thermal insulating tiles, which play a key and integral role in NASA's Space Shuttle thermal protection system, which is used to protect the surface of the shuttle from the heat of re-entry into the Earth's atmosphere. One example is reinforced Carbon-Carbon (RCC), the light gray material, which withstands re-entry temperatures up to 1,510 °C (2,750 °F) and protects the Space Shuttle's wing leading edges and nose cap. RCC is a laminated composite material made from graphite rayon cloth and impregnated with a phenolic resin. After curing at high temperature in an autoclave, the laminate is pyrolized to convert the resin to carbon, impregnated with furfural alcohol in a vacuum chamber, and cured-pyrolized to convert the furfural alcohol to carbon. To provide oxidation resistance for reuse ability, the outer layers of the RCC are converted to silicon carbide.

Other examples can be seen in the "plastic" casings of television sets, cell-phones and so on. These plastic casings are usually a composite material made up of a thermoplastic matrix such as acrylonitrile butadiene styrene (ABS) in which calcium carbonate chalk, talc, glass fibers or carbon fibers have been added for added strength, bulk, or electrostatic dispersion. These additions may be termed reinforcing fibers, or dispersants, depending on their purpose.

Polymers



The repeating unit of the polymer polypropylene

Expanded polystyrene polymer packaging

Polymers are chemical compounds made up of a large number of identical components linked together like chains. They are an important part of materials science. Polymers are the raw materials (the resins) used to make what are commonly called plastics and rubber. Plastics and rubber are really the final product, created after one or more polymers or additives have been added to a resin during processing, which is then shaped into a final form. Plastics which have been around, and which are in current includes polyethylene, polypropylene, polyvinylchloride (PVC), polystyrene, nylons, polyesters, acrylics, polyurethanes, and also rubbers, which have been around are natural rubber, styrene-butadiene rubber, plastics.

Polyvinyl chloride (PVC) is widely used, inexpensive, and annual production quantities are large. It lends itself to a vast array of applications, from artificial leather to electrical insulation and cabling, packaging, and containers. Its fabrication and processing are simple and well-established. The versatility of PVC is due to the wide range of plasticisers and other additives that it accepts. The term "additives" in polymer science refers to the chemicals and compounds added to the polymer base to modify its material properties.

Polycarbonate would be normally considered an engineering plastic (other examples include PEEK, ABS). Such plastics are valued for their superior strengths and other special material properties. They are usually not used for disposable applications, unlike commodity plastics.

Specialty plastics are materials with unique characteristics, such as ultra-high strength, electrical conductivity, electro-fluorescence, high thermal stability, etc.

The dividing lines between the various types of plastics is not based on material but rather on their properties and applications. For example, polyethylene (PE) is a cheap, low friction polymer commonly

used to make disposable bags for shopping and trash, and is considered a commodity plastic, whereas medium-density polyethylene (MDPE) is used for underground gas and water pipes, and another variety called ultra-high-molecular-weight polyethylene (UHMWPE) is an engineering plastic which is used extensively as the glide rails for industrial equipment and the low-friction socket in implanted hip joints.

Metal alloys

Wire rope made from steel alloy

The study of metal alloys is a significant part of materials science. Of all the metallic alloys in use today, the alloys of iron (steel, stainless steel, cast iron, tool steel, alloy steels) make up the largest proportion both by quantity and commercial value.

Iron alloyed with various proportions of carbon gives low, mid and high carbon steels. An iron-carbon alloy is only considered steel, if the carbon level is between 0.01% and 2.00%. For the steels, the hardness and tensile strength of the steel is related to the amount of carbon present, with increasing carbon levels also leading to lower ductility and toughness. Heat treatment processes such as quenching and tempering can significantly change these properties, however. Cast Iron is defined as an iron–carbon alloy with more than 2.00%, but less than 6.67% carbon. Stainless steel is defined as a regular steel alloy with greater than 10% by weight alloying content of Chromium. Nickel and Molybdenum are typically also found in stainless steels.

Other significant metallic alloys are those of aluminium, titanium, copper and magnesium. Copper alloys have been known for a long time (since the Bronze Age), while the alloys of the other three metals have been relatively recently developed. Due to the chemical reactivity of these metals, the electrolytic extraction processes required were only developed relatively recently. The alloys of aluminium, titanium and magnesium are also known and valued for their high strength to weight ratios and, in the case of magnesium, their ability to provide electromagnetic shielding. These materials are ideal for situations, where high strength to weight ratios are more important than bulk cost, such as in the aerospace industry and certain automotive engineering applications.

Semiconductors

The study of semiconductors is a significant part of materials science. A semiconductor is a material that has a resistivity between a metal and insulator. Its electronic properties can be greatly altered through intentionally introducing impurities or doping. From these semiconductor materials, things such as diodes, transistors, light-emitting diodes (LEDs), and analog and digital electric circuits can be built, making them materials of interest in industry. Semiconductor devices have replaced thermionic devices (vacuum tubes) in most applications. Semiconductor devices are manufactured both as single discrete devices and as integrated circuits (ICs), which consist of a number—from a few to millions—of devices manufactured and interconnected on a single semiconductor substrate.[11]

Of all the semiconductors in use today, silicon makes up the largest portion both by quantity and commercial value. Monocrystalline silicon is used to produce wafers used in the semiconductor and electronics industry. Second to silicon, gallium arsenide (GaAs) is the second most popular semiconductor used. Due to its higher electron mobility and saturation velocity compared to silicon, it is a material of choice for high-speed electronics applications. These superior properties are compelling reasons to use GaAs circuitry in mobile phones, satellite communications, microwave point-to-point links and higher frequency radar systems. Other semiconductor materials include germanium, silicon carbide, and gallium nitride and have various applications.

STUDENT ACHIEVEMENTS

TECHNICAL

[2018 - 2019]

The Below mentioned are a few of Our Mechanical Students who had outstanding performance at various intra and inter state events :

S.No.	Date	Participant	Event and Venue	Award
1	7-02-2019 to 8-02-2019	Gojay Helekar	Anantara, Damodar College of Commerce and Economics	Third
2	20-02-2019 to 21-02-2019	Pranyud Kankonkar	Battle Galactica-Techurja, Agnel Institute of Technology, Assagao	First
3	20-02-2019 to 21-02-2019	Carlton Rebello	League of Bots-Techurja, Agnel Institute of Technology, Assagao	Second
4	9-03-2019	Mahendra Desai	Robosoccer- Ignitron, Don Bosco College of Engg., Margao	First
5	9-03-2019	Mahendra Desai	Robosumo- Ignitron, Don Bosco College of Engg., Margao	Third
6	9-03-2019	Mahendra Desai	Robowars- Ignitron, Don Bosco College of Engg., Margao	First
7	9-03-2019	Sanish Borker	Designer- Ignitron, Don Bosco College of Engg., Margao	Third
8	1-04-2019 to 2-04-2019	Mahendra Desai	Robowars- Techtwister, RIEIT, Shiroda	First
9	1-04-2019 to 2-04-2019	Mahendra Desai	Robosoccer- Techtwister, RIEIT, Shiroda	Second

Workshop on Basic Robotics :

In anticipation of the annual technical event, COSME in association with teams BHP and Phoenix (The college`s forefront student robotics teams) held this workshop for the junior first and second year students of engineering. The endeavor being that it would improve participation in the event while introducing them to this seemingly dauntless world. Needless to say, it was a smash success with around 96 students from the college participating in

Robowars @ TECHYON ‘ 2018 :

The club played an active part in organising Techyon {specifically in ‘Mechfest’, the banner of events under the Mechanical department}. It was 3 days of fun, competition and companionship as students put their technical know-how into gear, while learning from fellow competitors on how to improve. Events like Robowars dazzled the crowds with its battle, while others like mechanism and contraption building put the participants’ ingenuity to the test.

NON-TECHNICAL, SPORTS & CULTURAL

[2018 - 2019]

- **Mr. Krishnank Fallary** from the Mechanical Dept. won championship title in the intercollegiate-badminton tournament organized by Damodar college of Arts and Commerce.
- , **Mr. Vipul G. Kulkarni** and **Mr. Shane Braganza** bagged the third place in Inter collegiate Chess Tournament organized by Goa University.
- **Mr. Marc Rebeiro** begged bronze medal in 200 m Backstroke style competition at the Inter Collegiate Swimming championship at Fatorda Complex.
- **Mr. Rohit Mardolkar** begged bronze medal in 87+ kg category in the Inter collegiate tae- kwondo Championship organized by Goa University.

~~~~~~~~~~~~~~~~ Glimpses of the ~~~~~~~~~~~~
SPORT EVENTS

NSS UNIT @ PCCE

- The NSS Unit of PCCE helped in the organization of Induction Day Program of the colLege which was held on 27th July 2018.
- The NSS Unit of PCCE in association of DHS, Govt. of Goa undertook the National De- worming Day programme. The NSS Coordinator Mr. Shubham Gauns trained the NSS Volunteers on the way the programme has to be undertaken and the NSS Volunteers undertook the programme.
- The PCCE NSS Cell organised a drive to collect relief materials for flood-hit Kerala in August 2018. Materials such as bedsheets, blankets, drinking water, Hair oil, toiletries, etc were collected. The staff and students of PCCE contributed towards the good cause.The total no. of volunteers present was 13.
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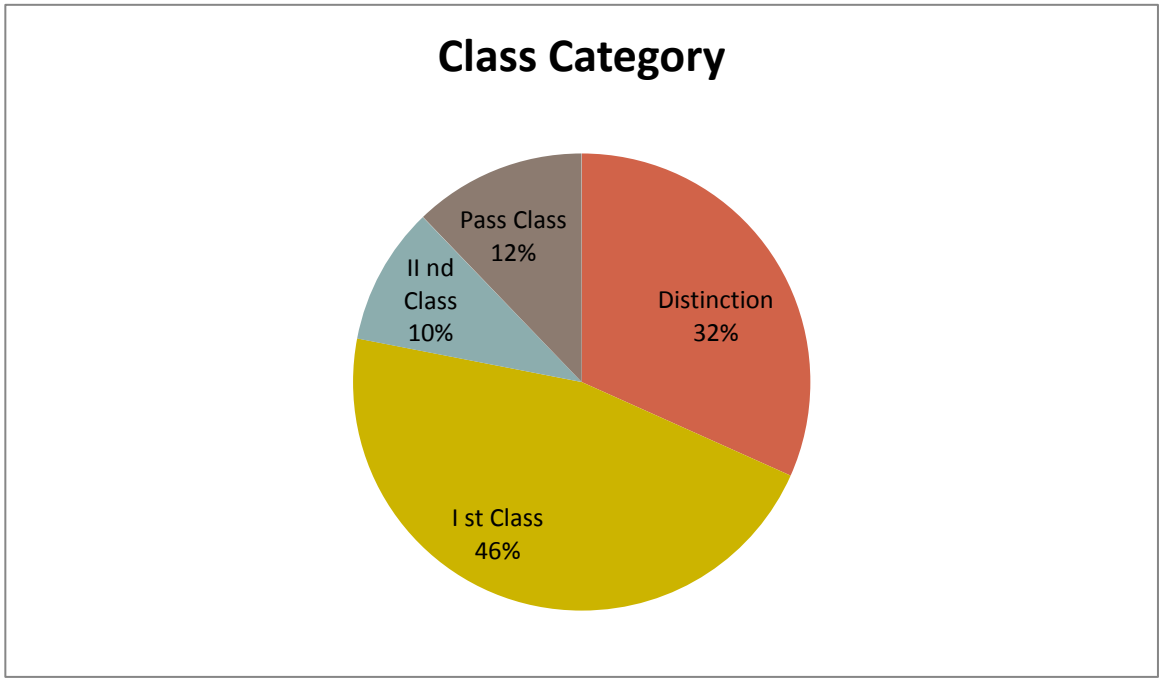
- Honourable Prime Minister of India, the NSS day in PCCE was celebrated under the banner, “Garbage Free Goa”. The following events were conducted on 22nd September & 24th September 2018.
- PCCE NSS Cell organised the annual Trek to Mainapi Waterfall Netravali on 3rd November 2018.
- Many Mechanical Students and faculty too were much involved in organizing the NSS events.

MAY' 2018 Examinations

63 Students from the 2014- 2018 Batch , answered the B.E – Mechanical (Semester VIII) Examination. 41 out of the 63 students successfully passed out as graduate mechanical engineers.



Toppers in Semester VIII	
Rank	**Name**
1	Singh Rishabh Kumar
2	Prabhu Prawar Mahadev
3	Sakhardande Parth Prasad
Toppers in Semester VI	
Rank	**Name**
1	Desai Sachin Shripati
2	Bhagat Desai Shreyas
3	Neil Savio Moniz
Toppers in Semester IV	
Rank	**Name**
1	Belani Yash Raj
2	D'silva Nahil Ian Flores
3	Kubal Nikhil Kishore

DEC' 2018 Examinations

Toppers in Semester VII	
Rank	**Name**
1	Dessai Sachin Shripati
2	Gauns Vishwajit
3	Pereira Peter
Toppers in Semester V	
Rank	**Name**
1	Kubal Nikhil Kishore
2	D’silva Nahil Ian Flores
3	Kulkarni Vipul
Toppers in Semester III	
Rank	**Name**
1	Dessai Mahendra
2	D’souza Brandon Benedict
3	Lobo Emmnauel

Field Visits

FIELD VISIT TO IIT-B

The students visited the Aeronautical and the Cryogenics department at the Indian Institute of Technology at Powai on 26th February 2019. Students were escorted by PhD scholars to the Aerospace Dept. There were educated on the importance of Lighter-Than-Air systems. The students were also informed about a project, two students were working on which was about mooring of aerostat. After this they escorted the students to a lab where they had the autoclave machine and explained about its working and different kind of composites can made using that machine. And finally they showed the lab in which students were working on a shock tube.

A Report

TECHYON '18

- TECHYON 2018 an annual inter-collegiate technical event was powered with Passion and Excellence! The three day event was inaugurated on the 10th of October 2018 by Chief Guest, Mr. Ganesh Pushpakumar, Senior manager of Substation, automation and protection, digital grid, Siemens India and Guest of Honour, Mr. Vishwesh Kamat, Part-ner at Glazetek Systems in the presence of Rev. Fr. Anthony Castello, Director, Rev. Fr.Seby Rodrigues, Assistant Director, Dr. Mahesh Parappagoudar, Principal, Head of De- partments, Staff and students.
- This year we had invited students from higher secondary and high school who partic- ipated in select events namely: General Quiz, Debate and Science fair. We had a great response from these schools. We received a very positive feedback from the students that for the first time an engineering college has organized an event exclusively for stu-dents of HSS.
- The valedictory function of TECHYON 2018 was held on 12th October 2018. The Chief Guest for the event was Mr. Neil Pinto, Alumnus, Deputy Manager – Quality Assurance, CG Power and Industrial Solutions Ltd.
- The events were co-ordinated by the following faculty members Mr. Amey Wadekar, IT department, Ms. Cynara Fernandes, computer department, Ms. Avita Lotlikar, ETC department and Mr. Gaurak Phaldessai, Mechanical department.
- The overall faculty co-coordinator for TECHYON 2018 was Ms. Alzira Xavier, Chairper-son, Cultural Committee.

MITHYA' 19

PCCE's annual cultural event Mithya 2019 was held from 13th to 16th of March 2019.

Mithya 2019 was declared open by the chief guest Mr. Dhruv Sincro, Alumnus of PCCE and lead actor in the blockbuster Konkani film AMIZADE.

Mithya 2019 had very exciting events for staff and students. The staff teamed up with students for events like cake décor and mehndi competition. The events were judged by professionals in their respective field.

All departments competed with each other to win this year's crown of champions, but it was the Mechanical department who conquered it all on the final day. Computer, Information Technology and ETC departments won the second, third and fourth places respectively.

The four day event ended with a closing ceremony. The chief guest for the closing ceremony was Ms. Sonia Shirsat, the best Fadista (Fado singer) in India of all time. Also present for the closing ceremony was, the Director, Rev. Fr. Anthony Castello, Assistant Director, Rev. Fr. Mathew Sequeira and Principal, Dr. Mahesh Parappagoudar who handed over certificates to the winners of individual events and trophies to the winners of ACE events.

Ms. Sonia Shirsat handed over the trophy to the students of the Mechanical department, the winners of MITHYA 2019. The event was co-ordinated by the Cultural Committee.

Kendrick Fernandes
President, COSME

Photos of Techyon ' 18

ISHRAE COLLEGIATE CHAPTER [2018 - 2019]

The Installation- ISHRAE @ PCCE
4th October ' 2018

The ISHRAE official induction program of Student's Council at Padre Conceicao College of Engineering (PCCE), Verna - Goa was successfully held on the 4th of October 2018. ISHRAE stands for Indian Society of Heating, Refrigeration and Air-conditioning Engineers. The chapter was first installed in PCCE in the year 2005. The honorable dignitariesof the function were **Mr. Manoj Pandey** (President of ISHRAE Goa Chapter) as the Chief Guest, **Mr. Nirmal Sanzgiri** (Process Freelancer) as the Guest of honor, **Mr. Anish Souza** (Proprietor, Sun 360) as the keynote speaker, **Mr. Sunil Shetye** (Students Chair ISHRAE Goa chapter), our principal, **Dr. Mahesh Parappagoudar** and HOD, **Mr. Joe Kurian**. The assembled spectators were the student members of ISHRAE. **Mr. Mohnish Borker**, faculty coordinator for ISHRAE PCCE Chapter, gave the vote of thanks to the dignitaries.

The program commenced with a welcome speech given by the Principal of our college wherein, he encouraged the students to be part of such national level professional bodies. It was followed by an address by the Head of the Department, Prof. Joe Kurian. Post that, the installation of student's council took place, wherein the representatives took an oath for their respective posts. Mr. Sunil Shetye Students Chair ISHRAE Goa Chapter wished the new Council members all success for their tenure, encouraging them to conduct more activities under ISHRAE banner. The Guest of honor for the function Mr. Nirmal Sanzgiri

(L) - Mr. Anish Souza with Mr. Mohnish Borker, ISHRAE – Faculty Coordinator at PCCE.
(R) – The Council Members for 2018 – 19 with Guests and Faculty.

spoke about the development of engineering aptitude in students. He also expressed his support towards any kind of help needed to students in attaining knowledge and experience on HVAC. The formal session

was followed by an expect talk given by Mr. Anish Souza on the topic “Solar Powered Heat Pumps”. Mr. Anish Souza also spoke about “Power conservation” and its benefits for the society. Prof Mohnish Borker, faculty coordinator for ISHRAE PCCE Chapter, gave the vote of thanks to the dignitaries. Lastly mementos were presented to the dignitaries. The program was concluded by singing the National Anthem.

ISHRAE Faculty Co-odinator Mr Mohnish Borker with his Team of Students

ISHRAE
Activities Report
[2018 – 2019]

WORKSHOP

A one day workshop was organized on Psychometrics and Heat Load Calculations on 16th November 2018 from 9:30am to 5:00pm at The Queeny Hotel, Airport road, Vasco Goa

Topics covered:

1. To understand Heat Load Calculation Sheet
2. To study psychometric charts & properties of Air, IAQ & Comfort
3. To decide Apparatus Due Point (ADP)
4. To study different factors for Solar Heat Gain

The main speaker for the event was Mr. Vikram Murthy

ACREX 2019:

ACREX 2019 was held for 3 days starting from 27 February 2019.The group of ISHRAE members including the t two staff coordinators Prof. Mohnish Borker and Prof. Prasad Pawar reached the Bombay exhibition center where AXREX 2019 was held. The first day started off with an opening ceremony after which all member of our ACREX group got their ID which was required for the entry. Companies from more than 25 countries participated in this event to present their innovative ideas in Hall 1 & Hall 2 in this exhibition.

The first company whose presentation we witnessed was by “EMPIRE FASTENERS” who displayed the screws, bolts, nuts, special fasteners of their company which were made of both ferrous and non-ferrous metals in different shapes and thread styles.

Among the 100’s of products that were under display we were able to see only a few of them due to lack of time. The one of the few products which caught our attention were:

1) ClimaCheck performance analyzer which can be used to document all types of vapour compression systems.

2) Ergonomic vacuum lifters by SCHMALZ.

3) Product by FREUDENBERG group which were different kinds of air filters.

4) HVLS fans by Ecoair. And many more.

FACULTY ACHIEVEMENTS

[2018 – 2019]

Journal Publications /Book Chapter

S No	Name of the Authors	Title of the Paper	Name of the Journal
1	**Dr. Mahesh B. Parappagoudar**,	Comprehensive Modelling, Analysis and Optimization of Furan Resin-based Moulding Sand System with Sawdust as an Additive	Journal of the Brazilian Society of Mechanical Sciences and Engineering, Springer Publications
		Study of the effect of nano-silica particles on resin-bonded moulding sand properties and quality of casting,	Silicon, Springer Publications, Vol. 10(5), pp. 1921-1936. (SCI Indexed Journal, IF: 1.21).
		Application of Statistical Modelling and Evolutionary Optimization Tools in Resin-Bonded Molding Sand System	Handbook of Research on Investigations in Artificial Life Research and Development, IGI Publisher, Chapter 07, 2018, pp. 123-152.
2	**Mohnish Borker**	Electricity Generation From Living Plants Using Microbial Fuel Cells	International Journal of Engineering & Technology, 7 (4.5) (2018) 534-537

Conference Publications

1	**Dr. Geethalakshmi K.**	Influence of Gamma Radiation on Mechanical Properties of S – Glass Fiber/Epoxy Composite	IOSR Journal of Engineering, Special Issue, Vol. 2, pp. 52-55
		An Investigation on the Mechanical Properties of Glass Fiber – Epoxy Based Composite	IOSR Journal of Engineering, Special Issue, Vol. 2, pp. 56-60
2	**Joe Kurian**	Design Fabrication and Testing of Indirect Natural Convection Solar Dehydrator for Drying Copra	National Conference on recent innovations in Engineering Science, Technology & Management at AITD, Assagao
3	**Gaurak Phaldessai**	Design Fabrication and Testing of Indirect Natural Convection Solar Dehydrator for Drying Copra	National Conference on recent innovations in Engineering Science, Technology & Management at AITD, Assagao
		Distillation for Liquor using Electrical Induction Heating	National Conference on Alternative Methods to Resolve Energy Crisis at KVG college of Engineering, Sullia
4	**Mohnish Borker**	Experimental Investigation of Sediment Plant Microbial Fuel Cell for Different Grass Species	National Conference on Recent Innovations in Engineering Science, Technology & Management, AITD Goa

5	**Prasad Pawar**	Distillation for Liquor using Electrical Induction Heating	National Conference on Alternative Methods to Resolve Energy Crisis at KVG college of Engineering, Sullia

Participation at Workshops / Seminars & Courses Completed

SR.NO	NAME OF FACULTY	DATE	FDP / Training Activities / STTPs	ORGANISED BY
1	**Mr. Saeesh Verenkar**	AUGUST 31, 2018	POSITIVE PSYCHOLOGY: MARTIN E. P. SELIGMAN'S VISIONARY SCIENCE	Coursera
		19TH JULY,2018	PROGRAMMING FOR EVERYBODY (GETTING STARTED WITH PYTHON)	Coursera
		28-30th June,2018	"Faculty Development Program for Student Induction (FDP-SI)"	Tatyasaheb Kore Institute of Engineering & Technology, Kolhapur organized by All India Council for Technical Education (AICTE).
2	**Mr. Dattaprakash Vernekar**	15th March, 2019	Blended Mode Workshop on "Moodle Learning Management System"	DBCE, Fatorda, Goa (TLC, ICT at IIT Bombay)
3	**Mr. Prasad Pawar**	24TH JUNE TO 26TH JUNE	FDP program on Student induction	VTU, Belagavi

		15th March, 2019	Blended Mode Workshop on "Moodle Learning Management System"	DBCE, Fatorda, Goa (TLC, ICT at IIT Bombay)
		21 JULY 2018	NPTEL WORKSHOP	DBCE,FATORDA(NPTEL IITM)
4	**Mr. Pushparaj Pingulkar**	15th March, 2019	Blended Mode Workshop on "Moodle Learning Management System"	DBCE, Fatorda, Goa (TLC, ICT at IIT Bombay)
5	**Mr. Mohnish Borker**	15th March, 2019	Blended Mode Workshop on "Moodle Learning Management System"	DBCE, Fatorda, Goa (TLC, ICT at IIT Bombay)
6	**Mr. Flasio Colaco**	22 June, 2019	Python Workshop	GEC, Farmagudi, Goa (TLC, ICT at IIT Bombay)
		15th March, 2019	Blended Mode Workshop on "Moodle Learning Management System"	DBCE, Fatorda, Goa (TLC, ICT at IIT Bombay)
		Jan - March 2019	Fundamentals of Fluid Power	University of Minnesota, Coursera

Guest Lectures Conducted

A talk on Lighter than air systems : 14th Feb' 2019 , Theme : Aviation

An Airship

Dr. R.S Pant, IIT-B

On 14th Feb' 2019 , Dr. R.S. Pant, Professor - Aerospace Dept., IIT-Bombay spoke about his research and the work-along with his students-do and how it is a perennially evergreen field. Students and faculty marvelled at his simplicity and clarity of explanation. His session was followed by a one-on one interaction with the students while giving details on doing internship at IIT-B.

A talk on Autonomous Courses after Graduation : 28th March' 2019 , Theme : Professional Trainnig

The faculty from the Asian Academy of Professional Training interacted with the students of BE Mechanical on various options to employ in and how to make yourself employable. They stressed on the fact on the importance of Plant planning-designing a production plant across various sectors and the dearth of engineers needed. They eve explained on how the piping done was not something for every person; rather the expertise needed to design them to cross harsh conditions and terrains safely, especially in the high risk petroleum and chemical sectors.

FACULTY PROFILE

Dr. Mahesh Parappagoudar	**Phd – (IIT – Kharagpur) –** Mechanical Engineering Professor & Principal (Industry Exp.– 2 Years, Teaching Exp.– 25Years) Area of Interest – Manufacturing science, Soft computing
Prof. Joe Kurian	**Phd – pursuing (Goa University)** **M.Tech (IIT-Madras) –** Maintenance Engg. & Management. Professor (Industry exp. – 5 Years, Teaching Exp.– 19 Years) Area of Interest – Mechanical vibrations, Industrial automation , Six sigma management
Dr. Geethalaxmi K.	**Phd (NIT, Surathkal) –** Containerless Extrusion Professor (Teaching Exp. – 19 Years) Area of Interest – Polymer composites, Nano-structured materials
Prof. Saeesh Verenkar	**M.Tech (SRM University) –** Computer Aided Design Assistant Professor (Industry Exp - 01 Year, Teaching Exp. – 05 Years) Area of Interest – FEM, Mechanical vibrations, Composites
Prof. Dattaprakash Vernekar	**M.Tech (V.J.T.I, Mumbai University) –** Automobile Engg. Assistant Professor (Industry Exp - 01 Year, Teaching Exp. – 04 Years) Area of Research – I.C engines, Energy conversion
Prof. Marvin Fernandes	**M.E (Mumbai University) –** Machine Design Assistant Professor (Industry Exp - 01 Year, Teaching Exp. – 04 Years) Area of Interest – Engg. Mechanics, Hydraulic machinery
Prof. Prasad Pawar	**M.Tech (M.G.University, Kerala) –** Thermal Power Engg. Assistant Professor (Teaching Exp. – 1.5 Years) Area of Interest – Fluid mechanics, Heat transfer
Prof. Pushparaj Pingulkar	**M.Tech (N.I.E, VTU) –** Machine Design Assistant Professor (Industry Exp. – 2 Years, Teaching Exp. – 02 Years) Area of Interest – Kinematics, Dynamics of Machinery, FEA
Prof. Mohnish Borker	**M.Tech (NIT, Calicut) –** Energy Engg. & Management Assistant Professor (Teaching Exp. – 02 Years) Area of Interest –Thermodynamics, Renewable Energy

Prof. Ramdas Pandit	**M.Tech (VIT, Bangalore)** – CAD-CAM Assistant Professor (Industry Exp. – 04 Years ; Teaching Exp–02 Years) Area of Interest – FEA, Vibrations, SCM
Prof. Gaurak Phaldessai	**M.Tech (NIT, Jamshedphur)** – Thermal Engineering Assistant Professor (Industry -01 Year, Teaching – 1.5 Years) Area of Interest –Thermal Engg., CFD, Phase change material, Solar technology
Prof. Flasio Coalco	**M.Tech** (Manipal University) - Thermal Science and Energy Systems Industry:1 Year 5 Months Teaching:3 Years Areas of Interest:Thermal design, Solar technology, Engine research, LCA, Engineering Graphics.
Prof. Pratik Sawardekar	**M.E (Goa University)** – Industrial Engineering Assistant Professor (Industry - 02 Years, Teaching – 03 Years) Area of Interest – Multi-Criterion Decision Making, Optimization Techniques
Prof. Sanket Prabhudessai	**B.E (Goa University)** – Mechanical Assistant Professor (Teaching - 02 Years) Area of Interest – Engg. Graphics, Machine Design