



Gyanmanjari[®]
Innovative University



CHEMICAL ENGINEERING

Gyanmanjari Innovative University (GMIU)

Our Moto

दिव्यम् ददामि ते चक्षुः

(But you cannot see my cosmic form with these physical eyes of yours.
Therefore, I grant you divine vision. Behold my majestic opulence !)



Vision of University

Gyanmanjari Innovative University is dedicated to producing world-class professionals capable of converting global challenges into opportunities through "Value Embedded Education." It achieves this by providing a comprehensive range of academic programs, services, facilities, and technologies aligned with the university's curricula, offering diverse learning opportunities. The goal is to prepare professionals who are not only employable but also capable of becoming employers themselves. Additionally, the university focuses on cultivating critical thinking, effective communication, and learning skills in students while promoting the values of ethical behavior, responsibility, and commitment.



Mission of University

At Gyanmanjari Innovative University, our commitment lies in the relentless pursuit of academic excellence and research in science, engineering, and technology. We achieve this through a dedicated approach to our responsibilities, innovative teaching methods, and a firm belief in human values. Our overarching goal is to foster the development of our students into exceptional professionals with high ethical standards, preparing them to confront the challenges of the next millennium. By instilling a sense of social responsibility, we aim to fulfill the expectations of our society, ensuring that our graduates emerge as resourceful citizens poised to contribute significantly to making the world a better place.

Why to choose Chemical Engineering?

Choosing chemical engineering can be a rewarding decision for those who are passionate about science, problem-solving, and making a positive impact on the world. Here are some compelling reasons why you might consider pursuing a career in chemical engineering:

1. Diverse Career Opportunities:

- **Wide range of industries:** Chemical engineers are in high demand across various sectors, including pharmaceuticals, energy, food and beverage, environmental protection, materials science, and biotechnology.
- **Global scope:** Opportunities exist worldwide, allowing you to work in different countries and cultures.
- **Versatility:** The skills acquired in chemical engineering can be applied to various roles, such as research and development, process design, manufacturing, quality control, and management.

2. High Earning Potential:

- **Competitive salaries:** Chemical engineers often command competitive salaries due to the specialized knowledge and skills they possess.
- **Job security:** The demand for chemical engineers remains steady, even during economic downturns, ensuring job security.
- **Growth potential:** As industries continue to evolve and face new challenges, the need for chemical engineers is expected to grow.

3. Making a Positive Impact:

- **Addressing global challenges:** Chemical engineers play a crucial role in developing sustainable solutions to pressing global issues, such as climate change, energy shortages, and resource scarcity.
- **Improving quality of life:** Their work contributes to the development of essential products and technologies, including medicines, food, and materials that enhance people's lives.
- **Innovation and advancement:** Chemical engineers are at the forefront of innovation, driving advancements in various fields and shaping the future.

4. Intellectual Stimulation and Problem-Solving:

- **Challenging and rewarding work:** Chemical engineering involves complex problem-solving, critical thinking, and analytical skills.
- **Continuous learning:** The field is constantly evolving, requiring you to stay updated with the latest developments and technologies.
- **Intellectual growth:** The opportunity to work on cutting-edge projects and collaborate with experts can foster personal and professional growth.

5. Strong Foundation for Further Studies:

- **Versatile degree:** A chemical engineering degree provides a solid foundation for pursuing advanced studies in various fields, such as biotechnology, materials science, environmental engineering, or business administration.
- **Interdisciplinary skills:** The knowledge and skills gained in chemical engineering can be applied to other disciplines, making you a valuable asset in diverse industries.

If you have a passion for science, enjoy problem-solving, and are interested in making a positive impact on the world, chemical engineering could be the perfect career path for you.

The Need for Chemical Engineers: A Growing Demand

Chemical engineers play a vital role in a wide range of industries, making them highly sought-after professionals. Their expertise in designing, developing, and optimizing chemical processes is essential for addressing various global challenges and meeting the ever-increasing demands of modern society.



Here are some key areas where chemical engineers are in high demand:

- **Energy Production:** As the world transitions towards cleaner and more sustainable energy sources, chemical engineers are crucial in developing new technologies for renewable energy generation (like solar, wind, and biofuels) and improving the efficiency of traditional energy sources (like fossil fuels).
- **Pharmaceutical Industry:** Chemical engineers contribute significantly to the development and production of new drugs, vaccines, and medical devices. Their expertise in process design, quality control, and scale-up is essential for ensuring the safety and efficacy of these products.
- **Environmental Protection:** Chemical engineers are at the forefront of developing sustainable solutions to environmental problems. They work on projects related to pollution control, waste management, and water treatment, helping to protect our planet for future generations.
- **Materials Science:** The development of new materials with advanced properties is driving innovation in various industries. Chemical engineers play a key role in designing and producing these materials, from high-performance polymers to advanced ceramics.
- **Food and Beverage Industry:** Chemical engineers are involved in the production of food and beverages, ensuring food safety, quality, and efficiency. They work on processes like food processing, packaging, and quality control.
- **Biotechnology:** With the advancements in biotechnology, chemical engineers are increasingly involved in the development of new bioproducts, such as biofuels, enzymes, and pharmaceuticals.

In summary, the need for chemical engineers is driven by:

- **Technological advancements:** The development of new technologies and processes requires the expertise of chemical engineers.
- **Global challenges:** Addressing issues like climate change, energy security, and resource scarcity necessitates innovative solutions that chemical engineers can help develop.
- **Growing population:** The increasing global population and rising living standards create a demand for products and services that rely on chemical engineering.

As the world continues to evolve, the demand for chemical engineers is expected to remain strong, making it a rewarding and promising career path.

Career Opportunities in Chemical Engineering

Chemical engineers play a vital role in a wide range of industries, making them highly sought-after professionals. Their expertise in designing, developing, and optimizing chemical processes is essential for addressing various global challenges and meeting the ever-increasing demands of modern society.

1. Industries

The chemical sector is a vast and diverse field, encompassing a wide range of industries that produce and utilize chemical products. Here are some of the major industries within the chemical sector:

Traditional Chemical Industries

- **Petrochemicals:** This industry produces a wide range of chemical products derived from petroleum and natural gas, including plastics, synthetic fibers, and petrochemicals used in the production of other chemicals.
- **Fertilizers:** This industry produces fertilizers used in agriculture to enhance crop yields and improve food production.
- **Paints and Coatings:** This industry produces paints, coatings, and adhesives used in various applications, such as construction, automotive, and industrial manufacturing.
- **Pharmaceuticals:** This industry produces drugs and medicines used to treat diseases and improve human health.
- **Pulp and Paper:** This industry produces pulp and paper products, including paper, cardboard, and tissue paper.
- **Textiles:** This industry produces textiles, including fabrics, clothing, and home goods.

Specialty Chemical Industries

- **Fine Chemicals:** This industry produces high-purity chemicals used in research, pharmaceuticals, and other specialized applications.
- **Agrochemicals:** This industry produces chemicals used in agriculture, such as pesticides, herbicides, and fungicides.
- **Electronic Chemicals:** This industry produces chemicals used in the manufacturing of electronic devices, including semiconductors, displays, and printed circuit boards.
- **Personal Care Products:** This industry produces personal care products, such as cosmetics, toiletries, and fragrances.
- **Biotechnology:** This industry uses biological processes to produce products such as pharmaceuticals, enzymes, and biofuels.

Other Industries

- **Environmental Remediation:** This industry specializes in cleaning up contaminated sites and mitigating environmental pollution.
- **Water Treatment:** This industry develops and provides solutions for water treatment and purification.
- **Food Processing:** This industry uses chemical processes to preserve, process, and package food products.
- **Energy:** The chemical sector plays a role in the production and storage of energy, including through the development of batteries and fuel cells.



These are just a few examples of the many industries within the chemical sector. The specific products and processes involved can vary greatly depending on the industry and the specific application.

Top Chemical Industries in India



The chemical industry is a vital sector of India's economy, contributing significantly to GDP and employment. Here are the top 10 chemical industries in India, based on various factors such as market capitalization, revenue, and impact on the economy:

1. Pidilite Industries Ltd.:

Pidilite Industries Ltd Known for its Fevicol adhesive brand, Pidilite is a leading manufacturer of adhesives, sealants, and construction chemicals.

2. SRF Ltd.:

SRF is a diversified chemicals company engaged in the manufacture of fluorochemicals, technical textiles, and packaging films.

3. Tata Chemicals Ltd.:

A subsidiary of the Tata Group, Tata Chemicals is a major producer of soda ash, sodium bicarbonate, and other chemicals. One of its plant is located in Mithapur near Dwarka in Gujarat.

4. UPL Ltd.:

UPL is a global leader in the agrochemical industry, offering a wide range of crop protection solutions.

5. Aarti Industries Ltd.:

Aarti Industries is a leading manufacturer of specialty chemicals and pharmaceuticals used in various industries.

6. Gujarat Fluorochemicals Ltd.:

Gujarat Fluorochemicals is a major producer of fluorochemicals, used in various industries such as refrigeration, air conditioning, and pharmaceuticals.

7. Deepak Nitrite Ltd.:

Deepak Nitrite is a leading manufacturer of organic and inorganic chemicals, serving various industries including dyes, pharmaceuticals, and agrochemicals.

8. Godrej Industries Ltd.:

Godrej Industries is a diversified conglomerate with a significant presence in the chemicals sector, manufacturing products such as soaps, detergents, and agrochemicals.



9. Himadri Speciality Chemical Ltd.:

Himadri Speciality Chemical is a leading manufacturer of specialty chemicals used in various industries such as paints, coatings, and adhesives.



10. Atul Ltd.:

Atul is a diversified chemicals company engaged in the manufacture of a wide range of products, including dyes, intermediates, and agrochemicals.

11. Gujarat Alkalies & Chemicals Ltd

Gujarat Alkalies & Chemicals is a major producer of caustic soda, chlorine, and other chemicals. It has manufacturing facilities in Vadodara.



12. Nirma Ltd.:

Nirma is a leading manufacturer of detergents, soaps, and other consumer products. It has manufacturing facilities in Bhavnagar & Vadodara.



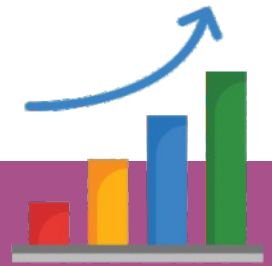
13. Reliance Industries Limited

Reliance Industries Limited is one of India's largest private sector companies, with interests in a wide range of industries, including petroleum Refining and Petrochemicals. Reliance is a global leader in refining and petrochemicals, with a large refining complex in Jamnagar, Gujarat, and petrochemical plants across India.

14. Essar Group

Essar Group is a diversified Indian conglomerate with interests in a wide range of industries, including:

- i. **Steel** : Essar Steel is one of India's largest steel producers, with facilities in Hazira, Gujarat.
- ii. **Oil and Gas** : Essar Oil operates a refinery in Vadinar, Gujarat, and has exploration and production activities in India and abroad.
- iii. **Power** : Essar Power develops, builds, and operates power plants across India.



These are just a few examples of the many successful chemical industries in India. The country's chemical sector is poised for continued growth, driven by factors such as increasing industrialization, rising domestic demand, and a focus on innovation and sustainability. Gujarat has got immense opportunities in Chemical sector because of the presence of Special Economic Zone. Most of the Chemical Industries are located in Gujarat only.

2. Research: A Dynamic Field

Chemical engineering research is a dynamic and ever-evolving field that plays a crucial role in addressing global challenges and driving technological advancements. Researchers in this area explore a wide range of topics, from developing sustainable materials to optimizing chemical processes.

Key Areas of Research in Chemical Engineering:



1. Sustainable Materials:

- o **Biodegradable plastics:** Developing environmentally friendly alternatives to traditional plastics.
- o **Renewable energy materials:** Creating new materials for solar cells, batteries, and other renewable energy technologies.
- o **Smart materials:** Designing materials that can sense and respond to their environment.

2. Process Optimization:

- o **Energy efficiency:** Improving the energy efficiency of chemical processes to reduce costs and environmental impact.
- o **Process intensification:** Developing smaller, more efficient processes that require less energy and resources.
- o **Process control:** Implementing advanced control systems to improve process stability and quality.

3. Biotechnology:

- o **Biofuels:** Producing fuels from renewable biological sources.
- o **Biopharmaceuticals:** Developing new drugs and therapies using biological processes.
- o **Biomaterials:** Creating materials inspired by biological systems for medical applications.

4. Environmental Engineering:

- o **Pollution control:** Developing technologies to reduce pollution from industrial processes and waste streams.
- o **Water treatment:** Improving water purification and desalination processes.
- o **Climate change mitigation:** Developing solutions to reduce greenhouse gas emissions and mitigate the effects of climate change.

5. Energy Systems:

- o **Carbon capture and storage:** Developing technologies to capture and store carbon dioxide emissions.
- o **Hydrogen production:** Producing hydrogen as a clean energy carrier.
- o **Energy storage:** Developing efficient energy storage systems for renewable energy integration.

Research Methods in Chemical Engineering:

- **Experimental:** Conducting experiments in laboratories to test hypotheses and gather data.
- **Computational:** Using computer simulations and modeling to predict the behavior of chemical systems.
- **Theoretical:** Developing mathematical models and theories to explain chemical phenomena.



Chemical engineering research is a multidisciplinary field that often involves collaboration with researchers from other disciplines, such as chemistry, physics, materials science, and biology. By conducting research in these areas, chemical engineers are contributing to a more sustainable and prosperous future.

3. Academic Career: A Rewarding Path

Chemical engineering is a versatile field that offers a wide range of academic career opportunities. Whether you're passionate about research, teaching, or a combination of both, a career in chemical engineering can be both fulfilling and rewarding.

Key Academic Paths

1. Research:

- o **Ph.D. Program:** Earning a Ph.D. in chemical engineering is a common pathway for those interested in research. This involves conducting original research, publishing papers, and contributing to the advancement of the field.
- o **Postdoctoral Research:** After completing a Ph.D., many researchers pursue postdoctoral positions to gain further experience and specialize in a particular area.
- o **Faculty Positions:** With sufficient research experience and publications, you can apply for faculty positions at universities and colleges. As a faculty member, you'll teach courses, supervise students, and conduct your own research.



2. Teaching:

- o **Secondary Education:** If you enjoy teaching at the high school level, you can pursue a teaching degree with a specialization in chemistry or a related field.
- o **Community Colleges:** Community colleges often hire chemical engineers to teach introductory courses.
- o **Universities and Colleges:** With a Ph.D. in chemical engineering, you can teach undergraduate and graduate courses at universities and colleges.



3. Administration:

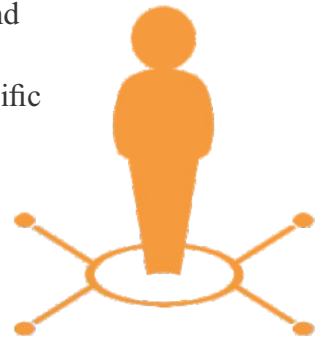
- o **Academic Administration:** Many chemical engineers with experience in research, teaching, or industry transition into academic administration roles, such as department heads or deans.
- o **University Administration:** Some chemical engineers may also pursue careers in university administration, working on strategic planning, resource allocation, and policy development.



Areas of Specialization

Within chemical engineering, there are many areas of specialization to consider:

- **Biomedical engineering:** Developing medical devices, pharmaceuticals, and biomaterials
- **Environmental engineering:** Addressing environmental challenges such as pollution and climate change
- **Materials science and engineering:** Designing and developing new materials with specific properties
- **Energy engineering:** Developing sustainable energy technologies
- **Process engineering:** Optimizing chemical processes for efficiency and safety
- **Nanotechnology:** Working with materials at the nanoscale to create new products and applications
- **Pharmaceuticals**
- **Agrochemicals**
- **Petrochemicals**



By combining your passion for chemical engineering with a strong academic foundation, you can embark on a rewarding and fulfilling career.

4. Process Design and Simulation: A Promising Career Path

Process design and simulation is a specialized field within chemical engineering that involves the development, optimization, and analysis of chemical processes. Chemical engineers working in this area play a crucial role in designing and improving chemical plants, refineries, and other industrial facilities.



Process Design and Simulation A Promising Career Path

Key Responsibilities

- **Process Development:** Designing new chemical processes or modifying existing ones to meet specific requirements.
- **Simulation:** Using computer software to model and simulate chemical processes, allowing for the evaluation of different design options and optimization of operating conditions.
- **Economic Analysis:** Assessing the economic feasibility of proposed processes, considering factors such as capital investment, operating costs, and product revenue.
- **Safety and Environmental Assessment:** Ensuring that processes comply with safety and environmental regulations.
- **Troubleshooting:** Identifying and resolving problems that may arise during the operation of chemical processes.

Career Paths

- **Process Design Engineer:** Working in engineering firms or industrial companies to design and develop new chemical processes.
- **Process Simulation Specialist:** Focusing on the use of simulation software to optimize existing processes or evaluate new design options.
- **Process Optimization Engineer:** Improving the efficiency and performance of existing chemical processes.

Student Development Activities at Chemical Engineering Department, GMIU

1. Industry visit at Lion Dyes Chem, Chitra GIDC on 28/08/2024

Industry Profile:

Lion Dyes Chem is a private chemical industry manufacturing Orange dye used in Pharmaceutical industry. It is a small unit producing about 600 kg /batch. A single batch takes almost 2.5 days to complete. The plant was having many types of equipments used in chemical industries along with a boiler, chiller, RO plant, a drying unit, cooling tower and distillation column.

The Objective of Visit

To give a hands on practical experience to the students about how in reality the industries work. The aim was to provide an insight to the students about the application of the theories that they study in the classroom.

About Visit

The plant was in full running condition at that time and a new batch was fed to the reactor. The plant was having three floors, each having a different set of equipments and processes being carried out at that floor. The staff in the industry illustrated the complete process to the students and also answered the queries raised by the students. It was a very fruitful visit and students were happy to practically see all the equipments and machines that they had viewed only in textbooks.



2. Micro Project

Objective

Preparing 1% Starch Solution



About Project:

The project deals with laboratory management. Some chemicals are not available in the market in ready to use state. They need to be prepared whenever required onsite. One of them is Starch solution. So, students were first taught and explained the whole procedure. Then they were instructed and guided to prepare the solution themselves. Students were divided into 2 groups so that everyone can get some task to perform



3. An Expert Talk on Reduce, Reuse and Recycle on 07/08/2024

About Expert:

Dr. Vinod Chavda, Research Scientist, CSMRI Bhavnagar.

Objective of Talk

The talk was focusing on Recycle, Reuse and Reduce strategy for sustainable development. To understand how modern technology can help in reducing the pollution and conserve environment.

About Expert Session

The expert described various case studies like that of Bauxite and Lignite, where a lot of metals and minerals are wasted and only one is extracted. He explained how the other minerals and metallic compounds can be extracted and used and hence, a lot of waste can be reduced and on the contrary, it will be utilized at various places.



4. Expert Sessions By Senior Scientist Of CSMCRI Bhavnagar

About Expert:

Dr. J R Chunawala, Senior Scientist, CSMRI Bhavnagar, Director : Dr. Kannan Srinivasan.

Objective :

Objective of this expert is to make students aware about the current cutting edge analytical instruments used in research and technological advancement in the field of salt and marine technologies. Dr. Chunawala gave in depth details of various technological advancements of salt and marine chemicals. Dr. Kannan Srinivasan motivated students for the study with clear conceptual and logical ways and encourage to solve local problems with research ideas and product developments.



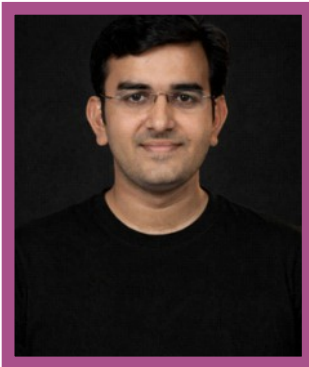
FACULTY PROFILE



Dr. Koushik Ghosh

Head of Department

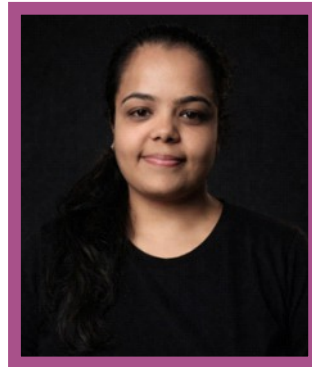
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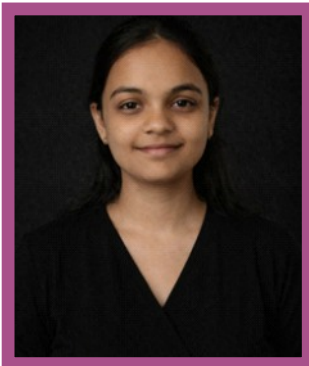
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DEPARTMENT PROJECT TECHMANJARI 2026





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कौशल्यलक्षी शिक्षा से जुडो।**



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