IPS ACADEMY

INSTITUTE OF ENGINEERING & SCIENCE

DEPARTMENT OF CHEMICAL ENGINEERING

ANNUAL MAGAZINE 2019-2020

B'Reactive

From the Editor

Dear readers,

Welcome to the 8th edition of IPS Academy, Institute of Engineering & Science Chemical Engineering departmental magazine. It is our ecstasy to acquaint you with the blooming colours of chemical engineering through our annual magazine B' Reactive. This magazine would help you to branch out with different aspects and practical application of Chemical Engineering keeping the objective to familiarize and creating awareness of Chemical Engineering among students. Let us together explore through various implementation of the same. We would like to thank the management of IPS Academy, Institute of Engineering & Science and would like to appreciate all the reviewers and authors for sharing their ideas.

We expect that this magazine would help you to expand your views on chemical engineering and their implementation.

Editors...

Words from the desk of Head of Department

This decade is a time of unparalleled growth and change for India, with the opening up of the frontiers of the world through globalization, there is a need for efficient competence in the global scenario. This need for competence is what that drives our Department to strive for the pinnacle of success. Since its inception in the year 2004, the Department has always strived to create a cadre of professionals who are technically and professionally proficient.

The Department prides itself on preparing the students for creative careers in industries, academia and Government agencies. 400 numbers of students have successfully graduated and are catering to the needs of society. Our accomplished courses and adept faculties not only endeavor to cover the complete syllabus but to motivate students to learn beyond the syllabus which definitely develops complete knowledge of the subject (practical and theoretical) and develop skill sets of students to become promising engineers in future.

As per the need of current growing trend, the department have initiated post graduation course from 2010 in Chemical Engineering with specialization “Computer Aided Chemical Process Plant Design”. The Department has been successfully carrying out testing & IEDC projects over two years.

Dr. Rajesh Kumar Kaushal
Head
IPS Academy
Institute of Engineering & Science
Department of Chemical Engineering

Message from the Principal

Technical Education is the most potential instrument for socio-economic change. Presently, the engineer is seen as a high-tech player in the global market. Distinct separation is visible in our education between concepts and applications. Most areas of technology now change so rapidly that there is a need for professional institutes to update the knowledge and competence.

Institute of Engineering and Science, IPS Academy is a leading, premium institution devoted to imparting quality engineering education since 1999. The sustained growth with constant academic brilliance achieved by IES is due to a greater commitment from management, dynamic leadership of the president, academically distinctive and experienced faculty, disciplined students and service oriented supporting staff.

The Institute is playing a key role in creating and ambiance for the creation of novel ideas, knowledge, and graduates who will be the leaders of tomorrow. The Institute is convinced that in order to achieve this objective, we will need to pursue a strategy that fosters creativity, supports interdisciplinary research and education. This will also provide the students with an understanding and appreciation not only of the process of knowledge creation, but also of the process by which technology and knowledge may be used to create wealth as well as achieve social economic goals.

I am delighted to note that the engineering graduates of this institute have been able to demonstrate their capable identities in different spheres of life and occupied prestigious position within the country and abroad. The excellence of any institute is a measure of achievements made by the students and faculty.

Dr. Archana Keerti Chowdhary
Principal
IPS Academy
Institute of Engineering & Science

IPS Academy, Indore
Institute of Engineering & Science
Department of Chemical Engineering
Rajendra Nagar, A.B. Road, Indore 452012.
E-mail: hod.chemical@ipsacademy.org, Ph. 0731-4014606

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CONTENT

Chemical Engineering, New Era for Technical Education

Chemical engineering is one of the oldest core branch of engineering mainly process engineering which focuses on chemical process, thermodynamics, mass transfer, heat transfer, chemical reaction engineering, control, fluid mechanics.Almost all manufacturing industries employs chemical engineers to improve the production process mainly refineries, pharma industries, food process, paint and plastic industries to reduce inefficiency, maintain economy and safety standards, and design of various machineries. A chemical engineer can also work in the field of green energy as an environmentalist. A chemical engineer is able to work in the field of water treatment and reuse of household wastewater, as world is facing huge water crisis now a days. India has only 4 % of fresh water to fulfill requirement of world's 17% population. About 80% of water reaching households in India is drained out as waste through sewage.

There are so many opportunities in the field of Chemical engineeringto become entrepreneur with a small scale industry. Anyonecan start his own business with a very less amount of funding at small or micro scale level for the production of soap, detergent, and all types of cleaning agents (toilet cleaner, phenyl, dish wash, floor cleaner, and hand sanitizer)chemical treading etc.

Dr. R.K.Kaushal

Head
IPS Academy, IES
Chemical Engineering Department

"Your achievement impersonates your identity, value that"

Alisha Mansoori (III yr Chemical Engineering Batch 2017-2021)

The second INAE Youth Conclave organised by IIT Kharagpur on Aug 11-12, 2018. The Conclave was organized in two phases. Phase I (Mar 23-25, 2018) involved a Pre-Conclave activity where students from different engineering colleges presented their ideas on six identified problem statements amongst which I opt for Swachh Bharat category. We were required to prepare a report on the problem statement chosen by us with developed strategy to solve the problem. All the shortlisted student groups were invited in the final conclave (Phase II) to present projects based on the problem statements they had worked upon earlier.

We designed a working prototype and named it as "Smart Dustbin". This Dustbin was able to segregate the biodegradable, non-biodegradable and metallic waste automatically on the application of the switch bases on different moisture sensors. My team was awarded second in the phase I in paper presentation and third in the phase II in prototype presentation. This winning experience boosted our confidence and communication skills as well.

I have been awarded with the best solution in industry defined problems for representing a self created prototype “modus operandi” managing and recycling e-waste.

"Graphene- The new wonder material"

Sahil Khan (II yr Chemical Engineering Batch 2018-2022)

Have you ever wondered of a television screen or mobile phone screen which is flexible and foldable and as thin as a piece of paper, flexible solar panels, a material 200 times stronger than steel, 200 times more conductive than silicon, transparent, strong, flexible and very light weight. Graphene as indicated by its name is extracted from graphite, the material which is used in pencils.

It is entirely composed of carbon atoms. Graphene is a 2-Dimensional arrangement in a hexagonal honey comb pattern. In the coming decade Graphene would replace Li Ion batteries in laptop and cell phones nano-anodes would rapidly recharge the batteries within no time. In medical field Graphene would have tremendous effect on bioelectric sensor, bio imaging devices, DNA sequencing, artificial heart implants and many more. Last but not the least Grapheme filters water most effective water filtration material available till date. It will reduce the energy cost of desalination plant by approximately 98% and the sea water can be utilized thus creating a new scenario in the world and would ultimately make this world a better place to live in.

“Industrial Engineering Requirements”

Anik Ashirwadam (II yr Chemical Engineering Batch 2018-2022)

We know that in past few years he demand of skilled engineers in India has increased but due to lack of required skills the employers are not ready to hire Industrial Engineering requirements the engineers. According to a report more than 90% of engineers are not industry because they lack deep rooted technical knowledge, presentation skills and industrial exposure.

In India Chemical engineering is a underrated branch of engineering. Many people opt this branch when they have no choice. These engineers just pass the exam and are left unemployed. But in last few years, the passive nature towards the branch has and industries are hiring skilled chemical engineers in sectors.

For excelling in the field one should be used to of industrial exposure which can be taken by internship. AICTE has officially said that internship of 500 -600 hours is mandatory for an engineering graduate which would rewarded by credits.

Possessing all above skills makes you industry ready person and Chemical engineers can make most of its use as demand is increasing more than the supply in India.

“Energy Resources in India”

Anshika Singh (I yr Chemical Engineering Batch 2019-2023)

Energy resources are very much important in the context of economic development in our country.With the growing industrialization, mechanization of agriculture, and the development of transportation sector,the demand for energy conservation is increasing day by day. Thus a positive correlation exist between economic growth and demand for energy. Moreover, consumption of energy for domestic uses and public lightening has also been increasing.

In India the GDP has increased at the rate of 3.7 percent while the energy consumptuon has increasedat the rate of 6.2 per annum. The consumption of energy is low in India as compared to other countries consumption.in the sector of chemical engeneering there is a vast use of the energy but effectively.there should be a proper idea for the consumption of resources depending upon its availability.in many chemical industries vast amount of chemicals are used so that the work can be done effectively.

Oil and Coal are the major chemical resources used in industries and various other sectors.in India coal is the principal source of electricity with the significant development of thermal power projects based on coal.

Energy resources are the most important part in today’s world and also being a chemical engineer we all should know the importance of all these resources.

“Plastic as a Liquid fuel”

Ashit Tiwari (II yr Chemical Engineering Batch 2018-2022)

Plastics have become an indispensable part in today's world. Being non- biodegradable in nature it is our responsibility to convert this into useful form. We can now convert plastics into diesel with the help of catalytic pyrolysis .A wide range of catalyst used in the pyrolysis process are ZnO,MgO,CaCO3,CaC2,SiO2etc. The thermal decomposition of plastic waste is carried out in a room maintained at 700°C at a heating rate of 10°C min^-1.The system is continuously purged with N2 adsorption - desorption isotherm at 77K in ASAP 2020 micrometer equipment ,We use a fixed bed bench scale pyrolysis stainless steel batch reactor .1Kg of plastic wastes is loaded into reactor for each pyrolysis reaction .The reactor is heated by liquid propane gas at heating rates of 10,15,20&25°C min^-1.Reaction was carried out at 500°C for 10 minutes under a flow of nitrogen purge gas .Catalyst are added in pellets form rather than in powder form to increase the rate of chemical reaction .The resulting gas products are collected via water cooled condenser .And liquid fuel is obtained separately . Presence of catalyst slightly increased the yield of oil. Pyrolysis based biorefineries are being established nowadays .They have greater potential to convert waste such as plastic and biomass waste into energy and other useful products in order to achieve maximum economic and environmental benefit. With the increasing population the use of plastic has also increased .So ,pyrolysis of plastic waste is an important step in the successful decomposition of plastic waste into useful fuel and other gaseous products .The oil obtained from pyrolysis of plastic has similar properties to that of diesel and gasoline. In this way we can say that pyrolysis at modern times is the best way of converting plastic waste into useful forms.

What is Environmental Engineering?

Ashutosh Sethi (III yr Chemical Engineering Batch 2017-2021)

We are now used to using technology for accomplishment of our works. Urbanization along with uncontrolled settlement, research and industrialization though have made our life simple, sophisticated and easier, but on the other hand; all these activities also deteriorates environment directly or indirectly. Therefore, environmental engineers are expertise who minimizes the increasing pollution protecting environment by invention and designing plans and devices for the same.

Therefore, Environmental Engineering is a branch of engineering that develops knowledge for protecting environment through technological medium. Hence, the subject is an amalgamation of concept of Engineering and science that steps ahead to decrease environmental pollution by innovative ideas and creation.

What do Environmental Engineers do?

There are number of activities and work that is accomplished by Environmental Engineers.

Some of them are listed below: Designing system in order to control pollution. Modification of existing equipment. Planning new processes for controlling environmental pollution.

Working with national and international group to solve problems related to public health and water supply system.

Detecting amount of pollution in the environmental agents, like air, water etc.

Designing projects for environmental protection. Analyzing data to keep a check in the environment.

Environmental engineers work to improve recycling, waste disposal, public health, and water and air pollution control, according to the U.S. Bureau of Labor Statistics.

We provide you help in writing environmental engineering essay, coursework and assignment in different topics.

1. Scope of Environmental Engineering
2. Solid waste management
3. Water supply and treatment
4. Wastewater treatment
5. Management of air pollution
6. Land management
7. Public health and quality of water

“Biosensor- The smart Detective"

Glori Anand (I yr Chemical Engineering Batch 2019-2023)

Nanostructured tip-shaped biosensors have drawn attention for biomolecule detection as they are promising for highly sensitive and specific detection of a target analyte. Nanomaterials have demonstrated significant impacts in various fields of optics, electronics, energy and sensors.

Nanostructured thin films have opened the possibility to fabricate electrochemical sensors and biosensors with high power of detection due to intrinsic properties associated with their dimensions at nanoscale level. These interesting properties can be explained based on the organization level obtained when molecular arrangement is obtained at a solid conductor substrate. Moreover, the possibility to improve the detection limit in biosensing devices can be also explained by using compatible materials such as natural polymers. The aim objective behind the utilization of these materials is to combine the high power of detection with preservation of the structural integrity of the biomolecules and, also, maintaining their biocatalytic activity. Hence, further resarch on these topics can work wonders.

“Indian Chemical Industry”

Manaswi Chamlikar (III yr Chemical Engineering Batch 2017-2021)

In India, chemical industry was recognized in late 1930’s when ICC, Indian Chemical council was founded in the year 1938 by Acharya P.C. Ray, Raj Mitra and B.D. Amin along with a group of industrialist for promoting the interests of nascent chemical industry. ICC’s main concern was to establish chemical industry which could fulfil general need like of paints, textiles, drugs, PVC and various others.

ICC progressed with time. The Indian chemical industry has witnessed a rapid growth of above 9 % since 2010. The Indian chemical industry consists of both large and small scale industries and presently there are more than 70,000 chemical manufacturing units located in the country. Some of them are TATA Chemicals, BASF, Gujrat Heavy Chemicals and many more. One of the basic cause of above mentioned growth is the Government policies and is one of the sector where 100% FDI is permissible. The major growth drivers are increased domestic consumption, diversified industry which produces world class products. Due to this its export potential is raised. According to ICC, industry will undergo changes as Western companies will try to invest in Asia as increased availability of Natural and different other gases and dependency over naptha as major feedstock for petrochemicals complexes would go down.

Indian Chemical industry has the potential for rapid growth provided some of the imperatives are taken care of. There are various good opportunities if grabbed at right time will reap gold in future.

“Scope of chemical engineering”

Praveen Kumar Pandey (II yr Chemical Engineering Batch 2018-2022)

Chemical engineering is a branch of engineering that deals with the engineering and development of chemicals/processes to identify and/or solve technical glitches. This branch of engineering has a diverse field such as nanotechnology, petroleum refining plants, mineral processing, etc. It actually combines the knowledge of engineering and chemistry to convert raw material into valuable form.

What Chemical Engineer do.

The duties and responsibilities of the chemical engineers generally includes:

• Designing and inventing new chemical processes/products.

• Construction, installation and supervision of manufacturing plants and equipment.

• Providing safety measures for chemical industry work conditions.

• Development of advanced and improved manufacturing processes.

Scope of chemical engineering:

Chemical engineering was something about the industrial scale production of chemicals. Chemical is indeed a very broad field and its application in diverse sector such as textile, plastics, food, petroleum, pharmaceutical and more.

Currently, the Indian industrial sector is on its way of expansion, creating

more opportunities chemical engineering students in areas of production, designing, research and development. As a result, there will be a surge in demand for chemical engineers in emerging industrial sectors in years a head.

Want to be a Chemical Entrepreneur?

Ranjeet Singh Sekhawat (III yr Chemical Engineering Batch 2017-2021)

Chemical engineering is a diversified branch of engineering. It just started with the time when you make morning coffee for yourself, make breakfast and lunch, when you wash your cloth with some magical powder, wash bathroom with some liquid. It's just all there. But it not just stops there, it spreads its tentacles all over the place. Entrepreneurship is one of them. They both are just perfect for each other like a cherry on a cake. They balance each other so well that both are the fastest growing occupation all around the globe. A chemical entrepreneur is a person who is good at both technical as well as management fields (MBA is not compulsory). Entrepreneurship is about what, why and how. What's your idea is all about, how you going to do it, why you want to do it. All the three questions are perfectly full filled by chemical engineers. Chemical enEntrepreneur directly deals with day to day problem of people like you and me. They get in touch with the real life tangible crises so that they get the exact need of the people and full fill them by converting that problem into a profitable Business model. Chemical engineers deals with weird and intrusting stuff like making magnetic cooling system which can reach to absolute zero temperature (recent project set up by researchers from the department of physics at the Technical University of Munich) and this soon will serve the worlds different needs. They actually have a plane to market the other prototype of their model really soon. It's just an example of chemical Entrepreneur. We don't know how these chemical entrepreneurs will change the face of the world but let us expect for the best.

“Metal Organic Frameworks”

Rupam Dalal (III yr Chemical Engineering Batch 2017-2021)

Metal-organic frameworks (MOFs) are organic-inorganic hybrid crystalline porous materials that consist of a regular array of positively charged metal ions surrounded by organic 'linker' molecules. The metal ions form nodes that bind the arms of the linkers together to form a repeating, cage-like structure. Due to this hollow structure, MOFs have an extraordinarily large internal surface area.
Researchers have synthesized MOFs that feature a surface area of more than 7000 square meters per gram. To put this into context, If you could lay out the available surface area in a teaspoon of this material (around a gram of solid), it would cover an entire soccer field.

MOFs offer unique structural diversity in contrast to other porous materials – uniform pore structures; atomic-level structural uniformity; tunable porosity; extensive varieties; and flexibility in network topology, geometry, dimension, and chemical functionality. This allows researchers the successful control of framework topology, porosity, and functionality.
MOFs unique structure design and tenability – crystalline porous materials that are composed of both organic and inorganic components in a rigid periodic networked structure – is not readily accessible in conventional porous materials, e.g., purely inorganic zeolites. Mofs 3-dimensional porous structure allows us to finally capture or separate a gas molecule at ambient or near ambient temperatures which has a really great applications as current methods of gas separation Are very costly and are not sustainable in many ways .It can be designed for specific molecule or nano-substance for e.g – designing a nanometer size membrane for separation of particular gas for purifying purposes
Mof is one of the prominent class of material for hydrogen storage as the main problem in hydrogen powered car is its storage, For transportation, the overarching technical challenge for hydrogen storage is how to store the amount of hydrogen required for a conventional driving range (>300 miles) within the vehicular constraints of weight, volume, efficiency, safety, and cost. Durability over the performance lifetime of these systems must also be verified and validated, and acceptable refueling times must be achieved MOFs are a class of very promising materials for H2 storage at 77 K and moderate pressure (<100 bar). The “node-and-linker” approach offers the capabilities of designing and preparing porous framework materials with new topologies and fine-tuning framework structures. There are several MOF materials that have reached the DOE 2010 H2 storage targets either as gravimetric or as volumetric stores albeit at 77 K and under intermediate pressures. However, the application of MOF materials in on-board mobile H2 storage systems requires a further substantial improvement over the current best results, with particular consideration required regarding the weight and cost of cryogenic systems and high pressure containers.

“Chemical Engineering”

Sajal Gupta (II yr Chemical Engineering Batch 2018-2022)

Chemical engineering refers to applied chemistry. This is the branch of engineering that is concerned in coming up with, constructing, and working of machines and plants that perform chemical reactions to solve sensible issues or create helpful products. It starts within the research laboratory, very similar to science, nonetheless progresses through the implementation of a complete method, its maintenance, and ways of testing and increasing it's yeild in a sustainable way.

The distinction between chemical engineers and alternative sorts of engineers is that, chemical engineer's apply information of chemistry additionally to alternative engineering disciplines. Chemical engineers generally are known as 'universal engineers' as a result of their scientific and technical mastery, the vision of chemical engineering is therefore broad. the majority see chemical engineering as study of chemistry exclusively however truly chemistry play's solely 10% role whereas on the opposite hand physics, arithmetic and biology play a serious role in here.

The region, automotive, biomedical, electronic, environmental, medical, and military industries obtain the talents of chemical engineers so as to assist develop and improve their technical aspects, such as:

•High strength fibers, fabrics, and adhesives for vehicles

•Biocompatible materials for implants and medical specialty

•Films for optoelectronic devices

•Semiconductor chips for processors

Chemical engineers study mathematics, energy and mass transfer, thermodynamics, fluid mechanics, separation technology, matter and energy balances, and other topics of engineering, plus they study chemical reaction kinetics, process design, and reactor design. A chemical engineer needs to be analytical and meticulous.

Some chemical engineers, famous as process engineers, concentrate on a selected method, like reaction (a reaction of gas chemically to form alternative chemicals) or polymerisation (making plastics and resins).

Cosmetics-" Wise use of chemical engineering"

Simran Baweja (I yr Chemical Engineering Batch 2019-2023)

Chemical engineers design and apply methods that combine ingredients for cosmetics and personal care products. Growing consumer interest in clean living is fueling the demand for cosmetics which are produced in a sustainable way, using natural ingredients and which contain fewer harmful chemicals. One such technique is emulsion- a process that forces oil and water by using an agent to stabilize molecules—produces lotions, sunscreens, liquid foundations, and body creams. Creating lipsticks from clay for thickness, minerals to add sparkle and agents for moisture and the ability to stay applied to lips. As a chemical engineer one can work as an industrial production manager whose duties include assuring that products meet company, industry, quality standards and government standards, solve problems in production and protect the safety and health of workers.