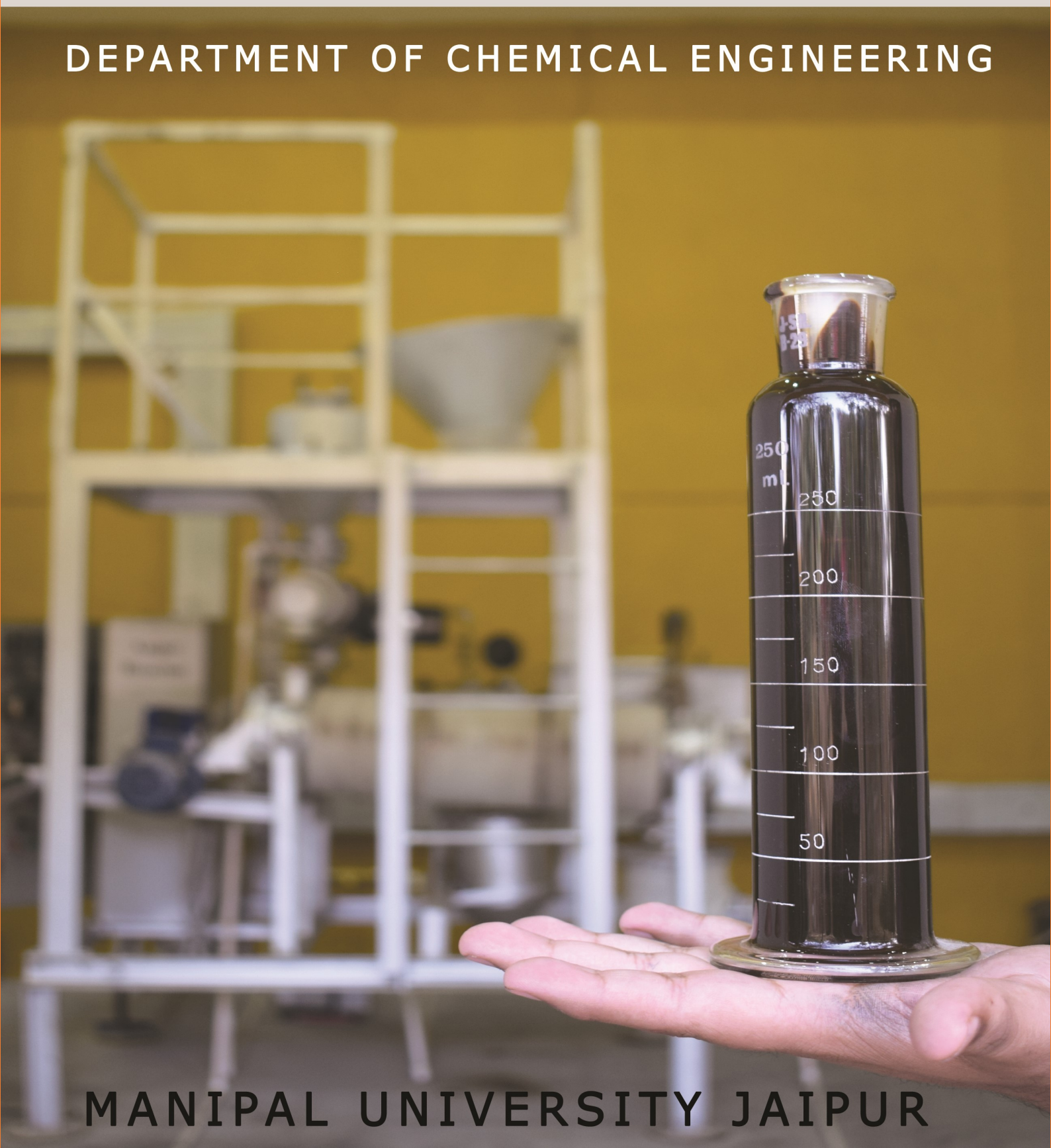
MAY,2018

INSPIRED BY LIFE

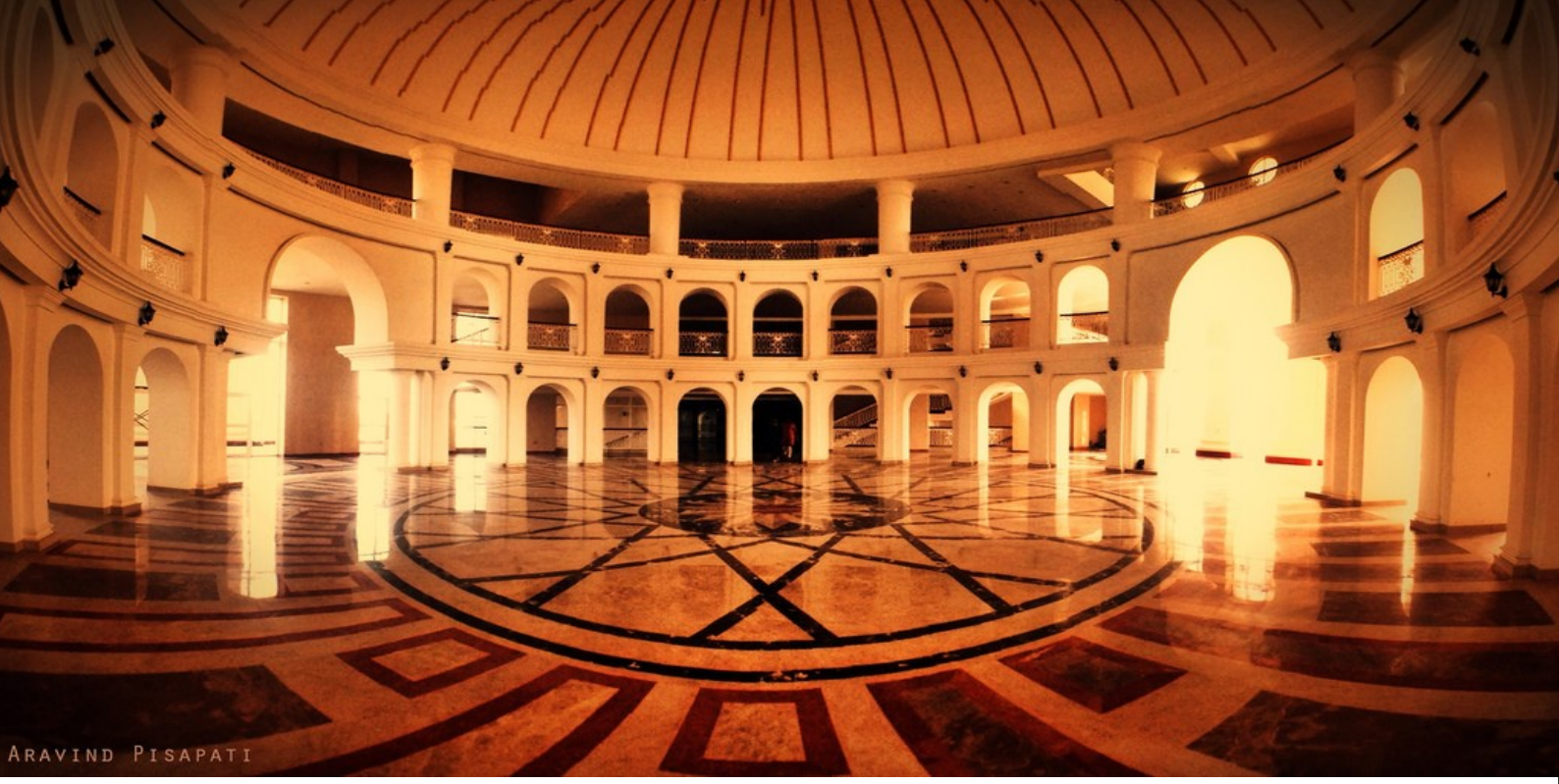
INAUGURAL EDITION

CHEMFLUENCE

DEPARTMENT OF CHEMICAL ENGINEERING



MANIPAL UNIVERSITY JAIPUR



ABOUT THE UNIVERSITY

The Manipal Education Group, with its heritage of excellence in higher education for over 60 years, launched Manipal University Jaipur (MUJ) in 2011. The permanent campus of the university is set up on 122 acres of land at Dehmi Kalan village near Jaipur, and is by far one of the best campuses in the region. MUJ has world class infrastructure, including state-of-the-art research facilities and modern library. In line with Manipal University's legacy of providing quality education, the university uses the latest and innovative methods and technology to impart education.

The multidisciplinary university offers career-oriented courses at all levels, i.e., UG, PG and Doctoral and across diverse streams, including Engineering, Architecture, Planning, Fashion Design, Hospitality, Allied Health Sciences, Humanities, Commerce, Management, Communication, Basic Sciences, Fashion Design and Jewellery Management, etc.

The Manipal Education Group has been an inspiring leader in the fields of education, research and healthcare for a span of over six decades.

The group includes five universities, namely Manipal University (Manipal, Karnataka), Sikkim Manipal University (Sikkim), American University of Antigua (Caribbean Island), Manipal International University (Malaysia) and Manipal University Jaipur..

EDITORIAL

This is the inaugural issue of the Department of Chemical Engineering's very own newsletter. We are primarily starting this newsletter as a means of both exploring new avenues and knowing one another within this fraternity which is inclusive of both teachers and students. We thereby hope to use this newsletter to add to the knowledge base of both the professors and apprentices with information crafted in an enjoyable fashion thereby increasing the reader's access to information. This in turn would give vision to both, the people on writing for this newsletter as well as the one's reading it.

Time and again we've come across the phrase 'Chemical Engineering is Kitchen Engineering', that is, its applicable to every little thing that surrounds us. The only difference being, we add perspective to these little things, hence we look at them a little differently than others do. That's where we make the demarcation. Therefore, we build concepts on the basis of these simple fundamental operations which are then converted into complex real time working models. We break down the most intricate scenarios and rebuild them into something new with new applications all together.

A chemical engineer applies the knowledge of chemistry, physics, life sciences and mathematical modelling to develop, maintain and enhance the current standard of living. It is only until one reads more, they get aware about their field of study that they're pursuing, and will appreciate what's going on around the world. We'd like to convey regards to the editorial team which comprises of faculty and students for putting together content from not just within the department but from different parts of the world. This will be appreciated by the student experience within the department and will be made aware of what they're options in life could be. Opportunities come knocking at your doorstep but only do you know which one aids to your benefits will you be able to choose a professional major or a job. We'd like to thank Manipal University Jaipur for its undue support to showcase our vision to our fellow colleagues.

We'd also like to thank everyone involved for helping us come up with the design of the newsletter. We would appreciate further contribution from colleagues to our newsletter thereby helping us keep this initiative alive for a long period of time.

What's inside!

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Prof G.K. Prabhu

President

Manipal University Jaipur

FROM PRESIDENT'S DESK

I am glad to learn that Department of Chemical Engineering of Manipal University Jaipur is publishing its first newsletter 'Chemfluence'. The newsletter will provide its readers with conducive material to enhance their knowledge about the University as a whole and Dept. of Chemical Engineering in particular e.g. departmental activities, faculty information, student achievements, research information etc. in this particular domain.

Crossword puzzle section related to Chemical Engineering will make it more interesting and worth reading. The articles contributed by faculty and students will further entertain the readers in different ways.

It gives me immense pleasure in conveying my heartiest greetings to entire editorial and designing team and their mentors of Chemical Engineering for their initiative and efforts in giving the shape to the first 'Chemfluence'

I wish the entire team of Chemical Engineering all the success in their endeavors.

Dr. Abhishek Sharma

Associate Professor and Head

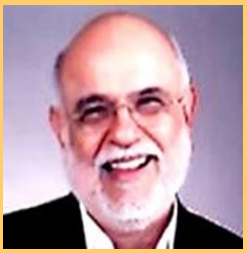
Department of Chemical Engineering

Manipal University Jaipur

LETTER FROM THE HEAD

I am quite pleased to provide this message for our department's first newsletter. I have joined the organization few years ago when the department was in nascent stage. We have built this department step by step with a team of highly motivated and committed faculty members. Currently, we have a team of ten academicians with industrial and research experience from different parts of the world. The department has already created an impact in terms of giving world-class education to our students by having state of the art curriculum and need based research and development activities. We have world class lab facilities to provide detailed technical experience to our students about principles of transport phenomena, reaction engineering and process modelling and control. In today's world, there is a huge demand of expert chemical engineers with a sharp knowledge of unit operations and process design. Our focus is strictly on building professional Chemical Engineers having a good grasp on fundamentals and able to apply them convincingly for solving industrial problems. Our research is in-line to the country's requirement and we are determined to solve problems related to waste, energy and water. We have established Waste to Resource Lab for treating solid waste such as plastics and agro-residues for generation of fuel, energy and chemicals. In the end, I would like to quote Burke that "Education is the chief defense of a nation", and we are working to create a strong nation by educating the future generations.

MEET THE



Prof. Raj Sharma
Emeritus Professor

Prof. Raj Sharma, heart of the chemical engineering department, joined Manipal University Jaipur in 2014 as Professor Emeritus. He completed his BS / MS / Ph.D. from Colorado School of Mines, USA. His major contributions are in the areas of Energy - coal, oil and gas, Alternate Energy, Water, Environment, Venture Capital Investments, Technology Evaluation, Tracking, Trends, Thermodynamics, ANNs, Heat Transfer, Process Design, Simulation and Optimization, Quantitative Techniques, Operations Research and many more.

Dr. Abhishek Sharma
Associate Professor and HoD

Dr. Abhishek did his Ph. D. from Curtin University, Australia and completed his graduation (B. Tech.) from MNIT-Jaipur, India. His contribution to research areas are on Bio-fuels, Process design and development, Multi-scale modelling and reactive multi-phase Computational Fluid Dynamics (CFD) modelling.

Dr. Anand Gupta Chakinala
Associate Professor

Dr. Anand completed his Ph. D. from University of Twente in Netherlands; M.Phil. from University of Abertay Dundee, Scotland; M.Sc. from Loughborough University, United Kingdom and did his graduation B.E. from Karnataka University, India. Some of his research areas are bio-fuels, oxo-process technology, industrial waste produced water treatment, catalysis and many more.

Dr. Manisha Sharma
Assistant Professor

Dr. Manisha completed her Ph. D. and M. Tech. from Malaviya National Institute of Technology Jaipur (MNIT Jaipur) and B. E. from Rajasthan University Jaipur. She was honored as a gold medalist during M. Tech. at MNIT Jaipur. Her research areas are: Process modeling and simulation, Reactive adsorption, Water / wastewater treatment, Reaction engineering, and Separation processes.

Dr. Subhajit Majumdar
Assistant Professor

Dr. Subhajit did his Ph. D. and M.E. from BITS-Pilani and his graduation B.E. from University of Pune, India. His Research Areas are: Bio-based pollutant removal techniques, environmental biotechnology, process design, modeling and simulation.

FACULTY

Ir. Nandana completed her PDEng. from Eindhoven University of Technology, Netherlands; M. Tech. from Osmania University, India and completed her graduation B. Tech. from Osmania University, India. Her research areas are soot ash removal in residue gasification, hydrodynamics of liquid-solid fluidization, polyethylene production and process operations.

Ir. Nandana Chakinala
Assistant Professor

Dr. Gaurav completed his Ph. D. from Newcastle University, United Kingdom and graduation B.E. from University of Pune, India. His research areas are: nanomaterial synthesis and characterization, carbon capture storage and utilization, X-ray photoelectron spectroscopy, surface science, heterogeneous and homogeneous catalysis, biocatalysis, plasmonics, nanomotors, nanofluids, photochemistry, photocatalysis, and pedagogy

Dr. Gaurav A. Bhaduri
Assistant Professor

Dr. Md Oayes completed his Ph. D. from IIT Bombay, India; M. E. from IIT Roorkee, India and did his graduation B. E. from University of Calcutta, India. Some of his research works are on thin film polymeric composite membranes, membranes for industrial gas separations, metal complex facilitated gas transport, multi-component gas transport & modeling through membranes, multi-component packed bed adsorption for wastewater treatment.

Dr. Md Oayes Midda
Assistant Professor

Dr. Anees completed his Ph. D. from IIT Bombay, India; M. Tech. from BITS-Pilani, India and completed his graduation B. E. from Amravati University, India. His research areas are nanoporous and macroporous materials, chemical and biosensors, self assembled monolayers, catalysis.

Dr. Anees Khan
Assistant Professor

Dr. Harsh completed his Ph.D. from Rensselaer Polytechnic Institute, USA and completed his B.Tech. from Harcourt Butler Technological Institute Kanpur, India. His research areas are Soft matter, complex fluids, microfluidics, DNA-electrophoresis.

Dr. Harsh Pandey
Assistant Professor

THOUGHTS OF PROJECT PG!

In today's era of high competition and pursuit of excellence simple graduation is not enough, thus many students opt to go for further education. However, most of the students that want to pursue higher education are clueless towards the choice of universities or programs that they want to undertake. Well the current article gives students an overview of how to prepare for Project PG (i.e. post-graduation).

One of the most ideal conditions for opting to go for post-graduation is to be aware of the current employment trend and current needs of the market. This is mostly a judgment call and is dependent on the student's awareness about current market trends. This can result from an interpersonal or professional counseling with working professional or career advisors. However, another driving factor for encouraging post-graduation is interest to excel in a particular field of interest.

If one has not had sufficient industrial exposure to make decision, it is highly recommended that one may spend time in a job profile of one's interest to gauge the need of the market in that area. This time could be anything between six months to five years. I would personally recommend a student to do post-graduation in a particular aspect of the field of graduation i.e. environmental engineering for civil and chemical engineering, petroleum or petrochemical engineering for chemical engineering, Nanotechnology for the basic sciences and all engineering disciplines and so on; rather than doing a general course of post-graduation in the discipline. Specialty courses help you take a greater career jump if you have an experience of five years or more in the particular area. It is also good for changing career paths to new avenues of higher potential.

Personal motivation for post-graduation should be driven by extensive reading in the field. Say for example, if you read some news article about a novel discovery/invention and you go reading about it in detail, either by reading the exact research article or by having a thorough background of the discovery/invention. If it is directly related to your field of undergraduate study, it helps you take more interest in that particular subject and thus making you take a right decision to pursue the same for post-graduation studies. This gives you an opportunity for developing a research career in particular.

Though one is aware of a long term vision, the next step comes execution of Project PG. The major question then comes is where do I go for post-graduation? Which university? Which country? One way to look at is if you have an area of interest, search for faculty active in that area of research. That would be a good university to go to. Most Master's program have a research component; this approach helps you to get a big leap into that area. Not everyone is interested in research, but many are looking for better opportunities in industry. There are post-graduation programs that help you do a year of industrial placement, increasing your employability for a better future.

University selection for specialized courses is a bit tricky as many people gauge universities based on general rankings rather than subject rankings. All national and international ranking organizations rank universities based on courses and an overall rank. If you are interested in a particular course, it would be advisable that you look at subject ranking. Not all universities run undergraduate courses, for example Cranfield University in the UK is a post-graduate university leading in energy and aeronautics, however it does not get on to the international ranking lists due to lack of undergraduate courses, but is listed in subject rankings. Therefore, getting a degree from a high rank university might look good on your resume, but might not make you highly employable. Obviously, the employability market is country dependent, but some basic principles remain the same.

Hope that this article helps the reader to have a preliminary awareness on how to start preparing for Project PG. Do remember the most important thing is to learn for self-development not for career growth, when you try to be better than what you were yesterday every other good thing will come your way.

- Dr. Gaurav Bhaduri
Assistant Professor

CHEMICAL ENGINEERS

Chemical Engineering – Roles and Opportunity

When I got the request for writing an article for the very first newsletter of our department, I thought off writing this article. I feel that our students are bit confused about their future opportunities because our first pass-out batch is yet to come.

This article is being written keeping in mind the students' perspective (specifically, for our **PRECIOUS** final and pre-final year students). All of you are the future of the Chemical Engineering Department of Manipal University Jaipur (MUJ). After all, your performance "outside MUJ" will make the department "**shine"**. There is no happiness greater for a teacher, when his students shine outside and get appreciated by others.

I have framed this article with four basic questions with probable answers. Here you go –

What is Chemical Engineering?

Chemical engineering is a branch of engineering that essentially deals with almost all the engineering subjects to identify and solve technical problems. This branch has many features of a core branch of engineering. It is more or less an evergreen branch.

What do you think, Chemical Engineers do?

Chemical Engineers act as the link between scientific invention and product manufacture. They turn ideas into useful products with the help of the basic knowledge of chemistry and engineering. In the present perspective of world's demand in energy and environmental friendly processes, a chemical engineer plays a vital role. Here is a list in broad sense.

What are the opportunities in Chemical Engineering?

The world's market demand for chemical engineers is much more than its production. Chemical Industry has no signs of slowing down. In fact, in the present scenario, it is expanding owing to the demand of new economic and environmental friendly technologies; and with this expansion, new job opportunities are also being generated. You will have the options for higher study (abroad or top institutes in India) which is much in demand, OR you will have the options for jobs at public and private sectors in the area of energy, environment, oil, petroleum refining, fertilizer, cement, pharmaceuticals, foods & beverages, and many more. There is magnitude of industries which are related to chemical engineering.

What do you think, how it works?

Continuing education is a must for chemical engineers due to always-changing technology. So, read, think and practice to gain your knowledge. Ultimately, it is the concept, idea & knowledge, which matters the most. The main thing is how you are applying your concept & knowledge towards solving a practical problem; that is what matters the most. This is how it works. There is no short way.

SO,

WORK HARD,

WORK SMART

AND

DON'T GIVE-UP!

-Dr. Md Oayes Midda
Assistant Professor

Myths Debunked about Chemical Engineering

Yes you read it right! When I started with this article I had to write something about chemical engineering and I was so confused about what to write? And at that exact moment someone came and asked, "Hey! don't you work with test-tubes and all?" and that's when this topic came up. It's amazing how incredible imagination people have about chemical engineering? and what's more amazing is their confidence about the fact that they are right. So now that a lot of people have been already put under radar with that statement, let's start with few of the most common misconceptions people have about this incredible branch of engineering.

1. "We deal with a lot of Chemistry", if you ever ask this question to a chemical engineer the instantaneous response would be, "We do?" Chemical engineering relies on the fundamental science of chemistry as mechanical relies on classical physics. Chemical engineering revolves around mathematical and physical aspects of designing while it also has a broad scope in biology and material sciences.

2. "Chemical engineers are mostly male", yes a huge percentage of us work on field in oil and gas, but that does not mean we are mostly men. As per data collected by ACS (American Chemical Society) the ratio of female to male in chemical engineering is 9:16, whereas, even today the female to male ratio in mechanical engineering is 1:6.

3. "Chemical Engineers only work in oil and gas", it is true that many chemical engineers work in the area of oil and gas but our prospects do not end there. Chemical engineers work in various other professions including energy and environment, pharmaceuticals, polymers, material sciences, biochemical engineering etc. Wherever there is some kind of processing involved a chemical engineer is present. That's why chemical engineers are also called as "Process Engineers".

4. "Does chemical engineering even matter?" By now you might have got the answer for this. Yes it matters, we make the real difference to quality of life for all. We are required everywhere, from making of medicines to making of your phone to the paper that you write on and the pen you write with. Our presence is everywhere, and it will always be there.

-Shruti Katti (III year,)

EXPRIMENTING WITH WORDS

AT TOUGH TIMES

When the road is long and the end is far,
Nothing seems to be fair.
I close my eyes, to breath in sigh
No one seems to be there.

With a heavy heart, I pick myself
And dust the sand off.
For moving ahead isn't easy cake
I knew it from the start.

In this journey, I made some mates,
And few were left behind.
Without any-one of them,
My journey couldn't be defined.

Now that I reach the top,
To my greatest surprise
What I thought was the end,
Was a speed bump in disguise.

-Dr. Gaurav Bhaduri
(Assistant Professor)

Diary of a Chemical Engineer

I was told chemistry is a mystery,
But then again, chemical is not chemistry.
I thought CPC was only number of moles,
But no, there were loopholes.
I liked material balances,
But then later on I realized it's not any less than most challenges.
Why do I not get this dilemma?
Good lord transport phenomena.
I thought electrons were the only things that could get transferred,
Until I came across momentum, heat and mass transfer.
Initially I felt that the solution to any industrial breakdown was being hasty,
That's when I came across process safety.
As for summer internships,
Why do I get the feeling that I'm more like a sinking ship?
When you go to look at it, it's not chemical that is a mystery,
It's just that each subject has a little history.

-Gopika Menon (III year)

यह रौशनी में भी सन्नाटे हुआ करते है,

बंद अँधेरे कमरे में बैठ कर एक एक आंसू भी दीए की ज्योत लगते है,

गरम हवा की थाप जब भी पतियों की त्वचा पर पढ़ा करती है

खिल खिलाती, शिर शिराती पतिया भी मौन लगती है.

-Shubham Goel (IV Year)

Caution ! Chemical

Field visit to Akshaypatra, Jaipur

A visit to Akshaypatra's Kitchen was organized for Chemical Engineering students on October 1, 2016. An exposure to different unit operations involved in food preparation on a large scale was provided to the students.

Invited Talk

An invited talk on "Role of a Chemical Engineer in the Process Industry" by Prof. Siddhartha Mukherjee, Director – Technology Air Liquide Global E&C Solutions India Private Limited was delivered on November 5, 2016. Starting from process and plant designing, site selection, construction, pre-commissioning and commissioning, the tasks and responsibilities of a chemical engineer in a process industry were discussed.

Workshop

A Workshop on "Engineering Applications of Numerical Methods" was organized on January 28, 2017. Speakers from various reputed institutes (IIT, NIT, and BITS Pilani) were invited. Students and faculty members from various branches of engineering and science participated in the workshop. The relevance and applications of numerical methods in various fields of engineering were discussed.

Hands-on practice on numerical methods using MATLAB was also provided to participants.

Engineers At Work.

Industrial Visit

An Industrial visit to Union Carbide Corporation, Bhopal was organized for B. Tech. (Chemical Engineering III year students) on March 25, 2017 as a part of their course on Process Safety Analysis. The objective of this visit is to impart safety culture among the students as well as to show the importance of safety in a production plant that has now developed into a scientific discipline which includes highly technical and complex theories and best safety practices.

IIChE Student Chapter Inaugration

Indian Institute of Chemical Engineers (IIChE) Student Chapter MUJ was inaugurated on September 15, 2017. Prof. M.O. Garg, Professor, Department of Chemical Engineering, IIT Bombay and Former Director, Indian Institute of Petroleum, Dehradun was the chief guest on the occasion. The inauguration ceremony was followed by an invited talk by Prof. Garg on "Simultaneous Production of High Purity Benzene and U.S. Grade Gasoline from C6 Heart Cut of FCC Gasoline: 1000 Days from Concept to Commissioning".

The talk was intended to share the experience of overcoming the challenges and limitations that are encountered when transferring the technology from inception to commission.

Symposium

A Symposium on "Sustainable Chemical Process Technologies" was organized on 31st March 2018 . Speakers from various reputed institutes (IIP, Reliance Limited, ICT Mumbai , Honeywell Ltd., CSIR) Students and faculty members from various disciplines of engineering & science participated in the symposium. Many new and upcoming technologies & ideas were shared by the speakers for making our Industrial Processes 'Sustainable'.

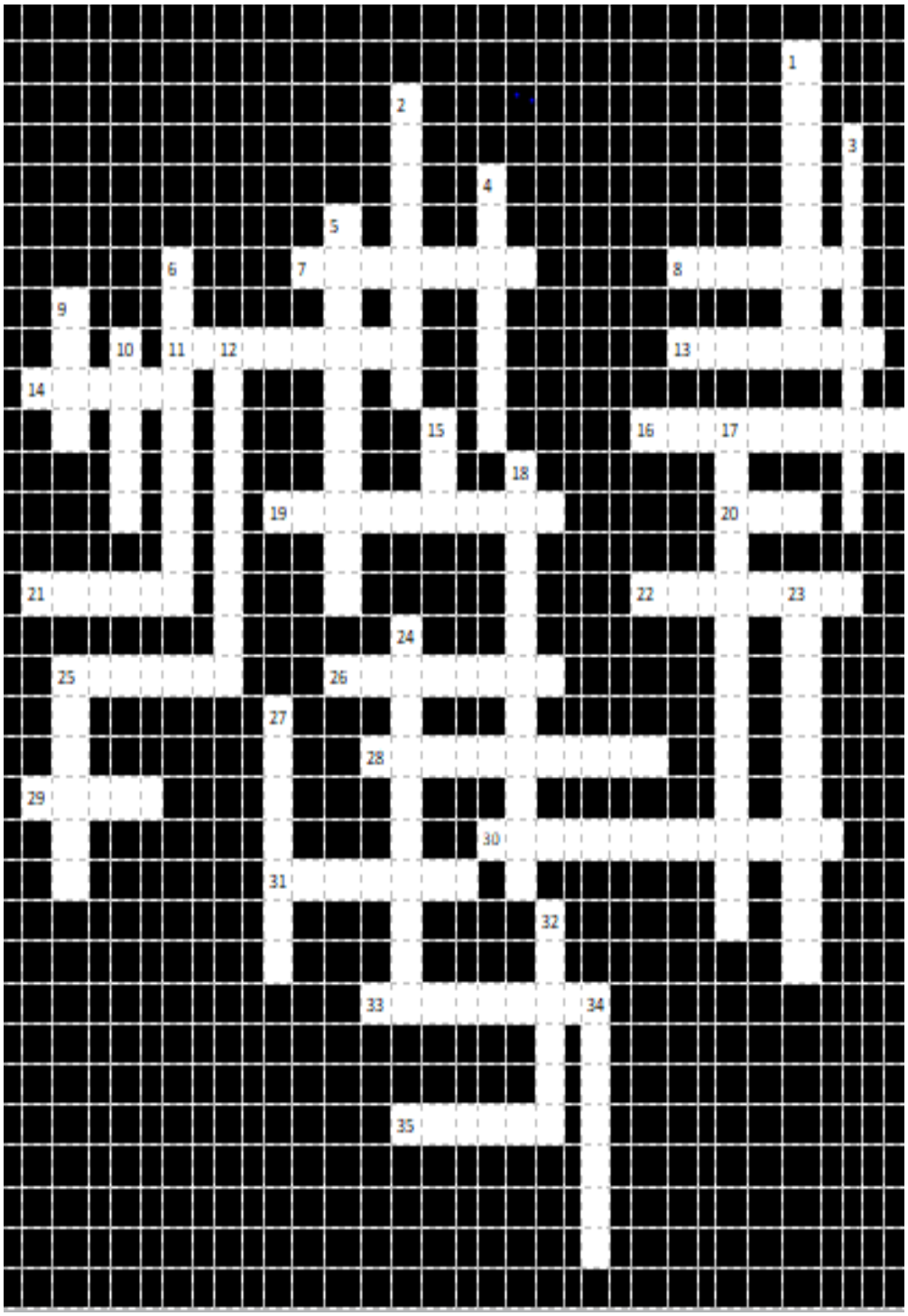
Waste? How about fuel!

The research group headed by Dr. Abhishek Sharma is working in the area of "Waste Valorization". One research project available with the group is sponsored by BEIL Gujarat is for treatment of Municipal Solid Waste. Additional funding is given under Endowment Grant Scheme by University for conversion of agricultural residues into valuable products. Developed research facilities are used to produce energy, fuel and value added chemicals from solid wastes such as agricultural residues, urban waste and forestry residues. A drop tube furnace is required to understand the kinetics of product formation by thermo-chemical degradation of solid wastes, which is then utilized for scale up of this technology. Auger (continuous process; 1-5 kg/hr flowrate) and rotary kiln pyrolyser assembly (semi-batch process; 50 kg/day capacity) is utilized to convert wastes into liquid, gaseous and solid products. The liquid product finds application as furnace/engine fuel depending on composition and physio-chemical properties. The liquid product can also be used to recover value added chemicals such as alcohols, aldehydes, ketones and acids formed during the process with fractional condensation and downstream processing operations. The solid product finds application as soil conditioner for agricultural purpose and as an adsorbent for waste water treatment. The gaseous stream is utilized for providing heat energy to the process for making this technology self-sustainable in nature. Currently, another funding of around 47 lacs has been proposed to Marico Industries for conversion of coconut shells to value added products. These technologies will be displayed to other government agencies such as Rajasthan Pollution Control Board, Biofuel Authority Rajasthan and industries working in similar areas of waste valorization.

- Dr. Abhishek Sharma

HoD Chemical Engineering

CROSSWORD



Across

7. heat transfer rate per unit area

8. Liquid entrainment in evaporators is due to

11. Process in which heat transfer is zero

13. Movement is prominent in particle size of 2- 3 microns in case of settling

14. Pressure is measured by static tube

16. Heat transfer in laminar sublayer is mostly by

19. Equilibrium constant of chemical reactions in the presence of catalyst

20. chart is useful In design of distillation column

21. Tray spacing in a distillation column of dia 10-12 ft used in refinery in inches is

22. enhances the catalyst activity

25. Plug flow reactor is characterised by what type of mixing

26. The unit of fugacity is same as that of

28. Ratio of moles of reactant converted to the desired product to that converted into undesired product

29. Dimensionless number that plays an important role in simultaneous mass and heat transfer

30. catalyst poisoning is

31. Plot of entropy vs enthalpy

33. reactions with high activation energy are temperature

35. columns are used when high liquid hold up is required in a reactor for gas liq-

Down

1. Rise of liquid in capillary tube is due to adhesion and

2. Predicts the rate of reaction

3. At this point fluid flow velocity is zero

4. Pumps are most suitable or pressures above 1500 barg.

5. Gas pressure drop is least for such columns

6. Stefan boltzmann law is applied to

9. Most suitable reactor for carrying out an autothermal reaction is

10. engine has the lowest efficiency

12. If Pr=1, Prandtl (Pr) and Reynolds (Re) analogies are

15. Lewis number for air water vapor system is

17. steam distillation is used to avoid

18. Fluidized bed reactor is characterised by uniform'

23. Linde Gas liquefaction process employs cooling

24. catalyst coking is

25. Temperature profile in a steady state heat transfer is

27. reactor is same as ideal stirred tank reactor

32. at this point all the three phases exist

34. Thermodynamic property of a system

Submit your entries to us at

chemenggdesign@gmail.com

Student Achievements

EDITORIAL BOARD

Faculty Advisor(s)

Dr. Manisha Sharma, Assistant Professor

Dr. Gaurav A. Bhaduri, Assistant Professor

Team Members

Team Leaders

Harsh Gupta (IV Year)
Ojasvi Talwar (IV Year)

Student Members

Akriti Agarwal (III Year)

Akshay Shrivastava (II Year)

Gopika Madhava Menon (III Year)

Sahil Agarwal (II Year)

Mukund Sai Teja PB (II Year)

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