

CATALYST

NEWSLETTER 2021 - 22

DEPARTMENT OF PETROCHEMICAL TECHNOLOGY



UNIVERSITY COLLEGE OF ENGINEERING
Anna University, BIT Campus
Tiruchirappalli- 620 024

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We are thrilled to present the latest edition of the Department of Petrochemical Technology Newsletter, where we celebrate the remarkable achievements of our students and share insightful articles contributed by our dedicated staff members.

In this newsletter, you'll find a wealth of inspiring stories showcasing the accomplishments of our talented students, from academic triumphs to outstanding contributions in extracurricular activities.





VISION AND MISSION OF THE INSTITUTE



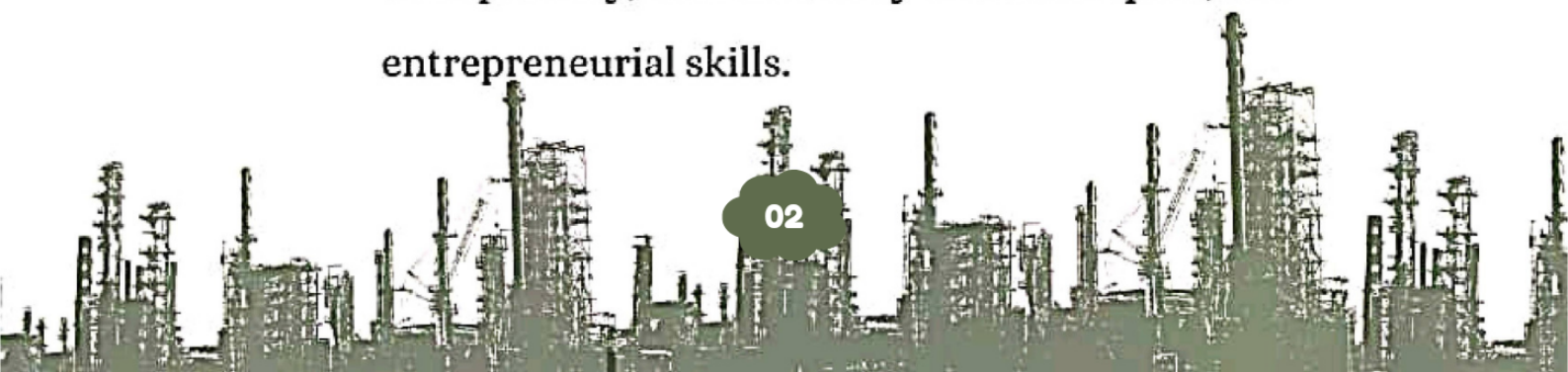
VISION:

To transform students into competent professional and responsible citizens by focusing on assimilation, analysis, synthesis, and dissemination of knowledge to meet societal needs.



MISSION:

- Impart quality education to meet the needs of the profession and society.
- Attract and develop talented and committed human resources and provide an environment conducive to innovation and research.
- Facilitate effective interactions among faculty, students, premier educational institutions, R & D laboratories, industries, alumni, and other stakeholders.
- Practice and promote high standards of professional ethics, transparency, accountability and team spirit, and entrepreneurial skills.



DEPARTMENT OF PETROCHEMICAL TECHNOLOGY



VISION:

To be a Department of Excellence in the field of Petrochemical Technology.



MISSION:

- To craft the students as potential technologists endowed with pragmatic skills.
- To produce competent engineers to identify the emerging industrial, and societal needs and address the same through innovative and eco-friendly solutions.
- To fulfill the aspirations and expectations of the future generation by designing suitable academic, research, and extension programs.



PROGRAM EDUCATIONAL OBJECTIVES:

After 4 years of graduation, our graduates will be

- Successful in their careers in the diversified sectors of Petrochemical Technology.
- A successful entrepreneur, manager or occupies higher positions.
- Pursuing higher studies and research programs in India and abroad.



PROGRAM OUTCOMES:

- The graduates of petrochemical technology will be able to apply knowledge of science and engineering to analyze petrochemical technology problems.
- The graduates of petrochemical technology will be able to understand and interpret the problems in petrochemical processes.
- The graduates of petrochemical technology will be able to design and develop appropriate solutions for the petrochemical systems.
- The graduates of petrochemical technology will be able to identify, formulate and solve complex petrochemical technology problems.
- The graduates of the petrochemical technology will be able to Use the modern engineering skills and software tools to analyze petrochemical technology problems.
- The graduates of petrochemical technology will be able to understand the global and societal impact of Petrochemical engineering practice.
- The graduates of petrochemical technology will be able to understand the impact of petrochemical technology solutions in a environmental context and adopt suitable methods for sustainable development.



- The graduates of petrochemical technology will be able to meet their professional and ethical duties.
- The graduates of petrochemical technology will function effectively as an individual and in multidisciplinary teams.
- The graduates of petrochemical technology will be able to communicate effectively both in verbal and written forms.
- The graduates of petrochemical technology will be able to apply principles of management and economics for the effective functioning of Petrochemical and Allied Industries.
- The graduates of petrochemical technology will engage in lifelong learning.



PROGRAM SPECIFIC OUTCOMES:

Graduates of Petrochemical Technology will:

- **PSO1:** Strong foundation in chemical, petroleum & petrochemical processes and effectively describe various units of modern petroleum refining and petrochemical industries.
- **PSO2:** Effectively describe, analyze, and develop appropriate solutions for chemical, petroleum & petrochemical industrial problems using innovative research & development skills with continuous learning efforts.



MESSAGE FROM HOD



Dr.S.Venkatesan
Professor and Head

**"FUELING
INNOVATION,
POWERING
PROGRESS:
PETROCHEMICAL
EXCELLENCE"**

Our department is not just a place of learning; it is a vibrant community that fosters intellectual growth, creativity, and innovation. I am delighted to witness the commitment and dedication of our students in their pursuit of knowledge. From groundbreaking research projects to stellar academic performances, our students continue to raise the bar, demonstrating a commendable passion for excellence.

Our esteemed faculty members have played a pivotal role in shaping the academic landscape of our institution. Their tireless efforts in research, teaching, and mentorship have been instrumental in guiding our students towards success. I extend my heartfelt gratitude to each faculty member for their unwavering commitment to academic excellence.





Dr.S.VENKATESAN

Professor and Head

Awards

- Life Member, Indian Society for Technical Education (ISTE) (LM 40919)
- Life Member, Indian institute of chemical Engineers (IIChe) (LAM 28264)
- Life Member, Indian Pharmaceutical Association (IPA) (TN/MDS/0273)
- Life Member, Indian Society for Surface Science and Technology (ISSST) (L/M-V-5)
- Life Member, Institutions of Engineers India (IEI) (M-1558697)
- Life Member, Indian membrane society (LM 225)
- Life Member, Indian Desalination society

Work Experience

• BOOK CHAPTER

Venkatesan, S. (2016). Emerging Trends in Petrochemical Technology. M.Arulmozhi & K. Kmaraguru (Eds.), Supported ionic liquid membranes: for wastewater treatment (pp.6.1 - 6.8). ASSVET International publishers Co., Chennai, India.(ISBN :978-93-52545-03-2).

• INTERNATIONALLY REFERRED JOURNALS

S.Pandiarajan and S.Venkatesan, "Removal of 2,4-dichlorophenol using ionic liquid [BMIM]+ [PF6]- encapsulated PVDF membrane" Journal of Indian Chemical Society, Volume 100, Year 2023, Pages 100781.

• NATIONAL JOURNALS

S.Pandiarajan and S.Venkatesan Presented a paper entitled "Studies on removal of phenolic pesticides from aqueous solution using supported liquid membrane immobilized with ionic liquid" in TEQIP II Sponsored International Conference on Trends and Innovations in Chemical and Pharmaceutical Technologies (TICPT 2017) Organized Jointly by Departments of Petrochemical Technology, Pharmaceutical Technology and Mathematics, Anna University, BIT Campus, Tiruchirappalli During 2nd - 4 th February 2017.



Dr. M. ARULMOZHI

Professor

• Overseas visit •

- Universiti Malaysia Terengganu, Malaysia for Oral Presentation in International Conference during January 2008 funded by CSIR and NITT
- Oral Presentation in American Institute of Chemical Engineers (AIChE) spring meeting at Florida, USA during Nov.2019 funded by SERB.

• Projects •

Received Tamilnadu State Council for Science and Technology (TNSCST) Project fund titled " Design of fully automated sanitizing device coupled with Nava AyushSanitizer"
(Ref: TNSCST/STP/Covid-19/2020-21/3697, dated 29.03.2021)
Rs.2,70,000/-

• Work Experience •

• BOOK CHAPTER

Green Synthesis of Nanoparticles from Agro-waste: A Sustainable Approach by K. Muthukumar, M. Jayapriya, M. Arulmozhi, T. Senthilkumar, and R. Krithikadevi for the book titled "Waste to Profit Environmental Concerns and Sustainable Development", Edited By Meera Sheriffa Begum K.M., Anand Ramanathan, Amaro Olimpio Pereira Junior, Dmitrii O. Glushkov, M. Angkayarkan Vinayakaselvi, CRC Press, Taylor and Francis Group, 1st Edition, 2023, <https://doi.org/10.1201/9781003334415>

• INTERNATIONALLY REFERRED JOURNALS

M.Arulmozhi, K.M.Meera S.Begum, N.Anantharaman and M.Thenmozhi, "Zinc (II) recovery from aqueous solution using continuous foam fractionators" Journal of Chemical and Pharmaceutical Sciences, Pg.277-281. ISSN0974-2115, March 2015

• NATIONAL JOURNALS

.M.Arulmozhi, K.M.Meera S.Begum, N.Anantharaman and M.Thenmozhi, "Zinc (II) recovery from aqueous solution using continuous foam fractionators" Journal of Chemical and Pharmaceutical Sciences, Pg.277-281. ISSN0974-2115, March 2015



Dr. K. KUMARAGURU

Associate Professor

AWARDS

- Best paper award and cash prize received in Sixth International Conference on Technology Development on Agriculture, Energy and Environmental Engineering for Green World at Vivekanantha college of engineering for women Tiruchengode 2017

Seminar

- Participated in Two days workshop on perspectives and challenges in outcome based research "University workshop on Digital India" organized by NITT Tiruchirappalli -620 015 under the aegis of MARGDHARSHAN Scheme during July 13 to 17, 2020.

Work Experience

• BOOK PUBLISHED

M.Arulmozhi, K.Kumaraguru, Introduction to Renewable Energy ASSVET International Publishers Co., Chennai, India. ISBN: 978-81-932456-8-2 2018

• BOOK CHAPTER

K.Kumaraguru, Sewage treatment, Emerging Trends in Petrochemical Technology, Publisher: ASSVET International Publishers Co., Chennai, India. Book Chapter No: 13.1-13.11, ISBN NO: 978-93-5254-503-2

• INTERNATIONALLY REFERRED JOURNALS

K. Kumaraguru, P. Saravanan, R. Rajesh kannan V. Saravanan, A systematic analysis of hexavalent chromium adsorption and elimination from aqueous environment using brown marine algae (*Turbinaria ornata*), Biomass Conversion and Biorefinery, 13-9, 2023

L. Nagarajan, K. Kumaraguru, P. Saravanan, R. Rajeshkannan, M. Rajasimman, Facile synthesis and characterization of microporous-structured activated carbon from agro waste materials and its application for CO₂ capture, Environmental Technology, 1-10, 2022



Dr.N.JAYA

Assistant Professor

Ongoing project

- Mentor - Student Projects Scheme for the project entitled "Development of cross-linked PU-PS hydrophobic coatings from castor oil" has been funded by Indian Institute of Chemical Engineers (IIChE), Kolkata - Rs. 10,000. Ref. No. AG/R&D/2022/351-357 dated 12.09.2022.

Awards

NPTEL Discipline Star in Chemical Engineering, Jan-Apr 2021.

Projects

- Mentor - Student Projects Scheme for the project entitled "Development of cross-linked PU-PS hydrophobic coatings from castor oil" has been funded by Indian Institute of Chemical Engineers (IIChE),

Work Experience

• PUBLICATIONS

K. Indirajith, N. Jaya, C. Naveen Kumar & R. Kanimozhi, Characterization and Analysis of Intelligent Eco-Friendly Coating for Porcelain Insulator Flash-Over Protection, ECS Journal of Solid State Science and Technology, 2022, 11, 113002. DOI 10.1149/2162-8777/ac9f6a

Hariharan and N. Jaya, Research on Used Transformer Oil (UTO) and Nanoparticles Application, ECS Journal of Solid State Science and Technology, January 2023, 11, 121012. DOI 10.1149/2162-8777/acaeb7

Wondwosen S Aga, Ayele N Legese, Abebe D Tolche, Negesh T Roba, S Anuradha Jabasingh, Shegaw Ahmed Mohammed, Solomon Kiros Kasaye, N Jaya, J Aravind Kumar, Rural electrification with hybrid renewable energybased off-grid technology: a case study of Adem Tuleman, Ethiopia, Energy, Ecology and Environment, July 2023, 1-19.

• BOOK CHAPTER

B. Karpanai selvan, N. Jaya, M. Chandrasekar, S. John vennison (2018), Necessity for Biodiesel Production in India, In: M. Arulmozhi & K. Kumaraguru. Introduction to Energy Engineering. Chennai: ASSVET International Publishers Co., pp. 3.1-3.40.



Dr. M. RENGASAMY

Assistant Professor

AWARDS

- NPTEL Domain Scholar in "Energy and Environment (Chemical Engineering)" in the period April 2021.
- Topper (TOP 2%) and Silver Medal in NPTEL Online Certification course on "Biomass Conversion and Biorefinery", January - April 2021

PROJECTS

5. Mentor - Student Projects Funded by Centre for Sponsored Research and Consultancy (CSRC), Anna University, Chennai - Rs. 25,000. "Design and Fabrication of Portable Fuel Extractor from a Used Masks and PPE Kits of Covid-19", Proceedings No: P-2122S4509/CSRC, Dt: 18.07.2022. (Mr. Mohamed Yasir. M and Mr. Siva Sati Kumar. S)

6. Mentor - Student Projects Funded by Centre for Sponsored Research and Consultancy (CSRC), Anna University, Chennai - Rs. 25,000. "Design and Fabrication of Suction Pump for Removal of Oil Spills from Sea Water", Proceedings No: P-2122S4487/CSRC Dt: 18.07.2022. (Miss. Enayah Dastagir, Miss. T. Subhashini)

PUBLICATIONS

BOOK PUBLISHED

G, Venkatesan, M. Rengasamy and P. Saravanan, "Waste Water Treatment", Published by Lakshmi Publications, Chennai, 2022, ISBN (Online) : 978-981-5039-92-4; ISBN (Print) : 978-981-5039-9

BOOK CHAPTER

Attended FOUR weeks Faculty Induction/Orientation Programme for "Faculty in Universities/Colleges/Institutes of Higher Education", organized by Teaching Learning Centre, Ramanujan College, University of Delhi, from 22 March - 20 April, 2023.

Attended TWO weeks Professional Training Programme on "Chemical Process Engineering - ASPEN HYSYS", organized by Institute of ChemE Design and Development (ICDD), Coimbatore, from 03.07.2023 to 17.07.2023..

INTERNATIONALLY REFERRED JOURNALS

J.Vijayaraghavan, R.Jeevakkumar, G.Venkatesan, M.Rengasamy, J.Thivya, "Influence of kaolin and dolomite as filler on bond strength of polyurethane coated reinforcement concrete", Construction and Building Materials. Volume 325, 28 March 2022

K Indirajith, N Jaya, M Rengasamy, N Manikandan, Exploration of High-voltage Outdoor Insulations-A Review Based on Field Study, Solid State Technology, 64(2) 2021. PP. 1779-1799.



Dr.E.GOMATHI

Assistant Professor

Awards

- NPTEL Motivated Learner in Chemical Engineering, Jan-Apr 2021.
- NPTEL Domain Scholar in Energy and Environment (Chemical Engineering) in the period April 2021
- Best paper presentation - First prize on National Conference on "Futuristic Trends in Biotechnology and computational Biology" VIT University, Vellore, Tamilnadu. 2016.

Work Experience

• BOOK CHAPTER

E. Gomathi (2016), "Steam Power Plant", In: M. Arulmozhi & K. Kumaraguru. Emerging Trends in Petrochemical Technology. Chennai: ASSVET International Publishers Co., pp. 16.1-16.8 (ISBN: 978-93-52545-03-2)

• INTERNATIONALLY REFERRED JOURNALS

1.E. Gomathi, P. Maharaja, Hanumant Singh Rathore, R. Boopathy, Rames C. Panda, T. Senthivelan & Maruthapillai Arthanareeswari , "Treatment of textile dye consortium through photo-electro-fenton process using graphiteTi electrode system and toxicity studies", Carbon Letters, 2023., (Impact 3 Factor 3.1).

2. E. Gomathi, Sowmya B, Rajesh Kannan R , Venkatkumar S," Experimental Study of Photo Electro- Fenton method for the removal of Reactive Yellow 186: Influence of operational parameters" , Environmental Progress & Sustainable Energy, 2022., (Impact Factor 2.8).

• NATIONAL JOURNALS

.1. E.Gomathi*, Boobalan.V and Leela.P, "Review on Electrochemical Oxidation for Degradation of Dye Effluents", Elixir Renewable Energy 102 (2017), pp 44160 - 44161, ISSN NO: 2229-712X.



Dr.N.STALIN

Assistant Professor

• Overseas visit •

Received and Awarded Certificate of Appreciation for producing 100% results in Process Equipment

Design I , Design II and NGE, Process Economics, ECM, PUP subjects in the year 2020-2021.

Received and Awarded Certificate of Appreciation for producing 100% results in CFD & PUP subjects in the year 2018-2019.

Received FIRST PRIZE IN BEST PRESENTATION AND PARTICIPATION in the AICTE FDP

Conducted by PSG College of Technology, Dec 2017, Coimbatore.

Received BEST PAPER Award in the international conference conducted by Pondicherry Engineering Engineering college (Jan 2007), Pondicherry.

Received Best Teacher Award 2008.

• Work Experience •

• BOOK CHAPTER

Dr. N. Stalin, March 12-13, 2021G." Design and Performance Evaluation of Shell and Tube Heat Exchanger in Automotive Engine Waste Heat Recovery System" International Conference on Recent Technologies and Advanced Materials for Green Energy and Sustainable Environment (RTAMGESEOnline), NIT, Trichy. March 12-13, 2021G.

• INTERNATIONALLY REFERRED JOURNALS

Vivekanadan.R,Dr.Stalin N," Optimization Of Design Parameters In Shell And Tube Heat Exchanger using Aspen HYSYS" International journal of advanced research in science, communication and technology (IJARSCT),IF = 7.30 , DOI: 10.48175/IJARSCT-10982 Available online Volume 3, Issue 16, May 2023

• NATIONAL JOURNALS

N. Shobanadevi¹, V. Krishnamurthy and N. Stalin, 2016, "PISB Control of Single Phase Quasi Impedance Source DC-DC Converter" Indian Journal of Science and Technology, Vol 8(13), 55446, July 2015. ISSN (Online) : 0974-5645. Scopus, IF= 0.97.



Dr. ANBARASI

Assistant Professor

Awards

Awarded and appreciated for 100% results in Mass Transfer-I, Total Quality Management, Water Treatment & Management, Instrumentation and Instrumental Analysis Theory during the academic year 2020-2021

Chaired A Session in National Conference On " Department of Petrochemical Technology, BIT Campus, Anna University, Tiruchirappalli During February 2022

Awarded and appreciated for 100% results in Mechanical operation Theory during the academic year 2018 - 2019

Reviewer - Iranian Journal of Chemistry and Chemical Engineering (IJCCE)

Work Experience

• BOOK CHAPTER

A Karunanithi, S Gopal and J Senrayan, 2023, "A holistic Valorization of food waste for sustainable biofuel production" in Valorization of Wastes for Sustainable Development, ISBN: 978-0-323-95417-4, pp 160, Elsevier

Anbarasi Karunanithi and Dhanaraja Dhanapal, 2022 " Composting of fruit wastes - An efficient and alternation option for solid waste management" in Sustainability studies - Environmental and Energy management by Bentham science Publishers Pvt. Ltd. ISBN (Online): 978-981-5039-92-4, ISBN (Print): 978-981-5039-93-1, ISBN (Paperback): 978-981-5039-94-8



Dr. P. SARAVANAN

Assistant Professor

Awards

Elite certificate (Technologies for clean and renewable energy production)
2019- NPTEL

Elite certificate (Waste to Energy Conversion)
2019- NPTEL

Elite certificate (Ecology and Environment)
2020- NPTEL

Elite certificate (Biomass Conversion and Biorefinery)
2021 - NPTEL

Elsevier reviewer recognition award
2021-Environmental Research

Work Experience

• BOOK CHAPTER

P.Saravanan, R.Muthuvelayudham "Enhancing the Bioproduction of Cellulase by *Aspergillus Nidulan* via Medium Optimization" *Biotechnology and Biochemical Engineering* 65- 71(Springer)

• PATENT

P.SARAVANAN, et al., 2020 - Internet of Things based Smart Water Testing Drone System for Sewage Testing Process

• PUBLICATIONS

P Lokesh, R Shobika, SN Omer, M Reddy, Panchamoorthy Saravanan, R Rajeshkannan Bioremediation of plastics by the help of microbial tool: A way for control of plastic pollution. *Sustainable Chemistry for the Environment*, 100027, 2023. <https://doi.org/10.1016/j.scenv.2023.100027>.

B Sowmya, Panchamoorthy Saravanan, R Rajeshkannan, M Rajasimman Facile verdant approach on zirconia-doped zinc oxide nanoparticles (Zr-ZnO NPs) using Citrus medica fruit: antibacterial and anti-inflammatory activity. *Biomass Conversion and Biorefinery*, 1-9, 2023. <https://doi.org/10.1007/s13399-023-04652-5>. (Impact factor: 4.1)

IOT IN CHEMICAL INDUSTRIES: TRANSFORMING OPERATIONS & INSIGHTS

Chemical industries are core of economy in any country. They have to adopt newer technologies to increase productivity and profit. The integration of IoT can greatly benefit the chemical sector by enhancing operational efficiency and yielding better outcomes. IoT in chemical industry is a big part of transformative change which is bringing a significant shift in the manufacturing process.

The Internet of Things (IoT) has become a popular tool in the chemical/petrochemical/refining industries for remote monitoring of processes and operations. This technology allows companies to monitor their plants and equipment from anywhere in the world, which can help to reduce the risk of accidents and improve efficiency. IoT sensors can be used to monitor the condition of assets, such as pumps, valves, and reactors in real time. This data can be used to identify potential problems before they cause an accident or a breakdown.



Dr.S. Venkatesan
Petrochemical Technology

IoT is used for monitoring gas levels in plants. This can help to prevent gas leaks and poisonings. Sensors can also be used to create smart tags that can be worn by workers. These tags can alert workers to the presence of dangerous substances, which can help to prevent exposure. IoT is a powerful tool that can help to improve safety, efficiency, and productivity in the chemical industry. As technology continues to develop, there will be more innovative ways to use IoT to improve the safety of chemical plants.

At chemical plants, IoT plays a crucial role in monitoring the availability of safety equipment and tools in real-time. By utilising sensors to gather data on equipment such as leak detectors, fans, and pumps, companies can proactively identify issues before they arise. This proactive approach reduces costs, minimises operational downtime, and ultimately enhances productivity for manufacturers.

Chemical companies generate vast amounts of data during the manufacturing process, yet only a fraction of it is utilised to improve decision-making and add value. By integrating and analysing all available data in real-time and consolidating the results for intelligent decision-making, businesses can enhance operational, safety, and environmental performance. Modern Refineries contains catalytic crackers, reformers & hydrotreaters which can be integrated with embedded software and analytics to assess their condition. These assets communicate signals about their performance and health which facilitates the prediction of potential malfunctions and maintenance requirements. Augmented reality, which offers 3D visualisation of assets in a spatial context enhances the maintenance practices from the perspective of services.

With such great advantages, undoubtedly IoT brings a massive digital transformation in chemical industry.

Design and Optimization of Microbial Degradation of treated Microplastics

MICROPLASTICS

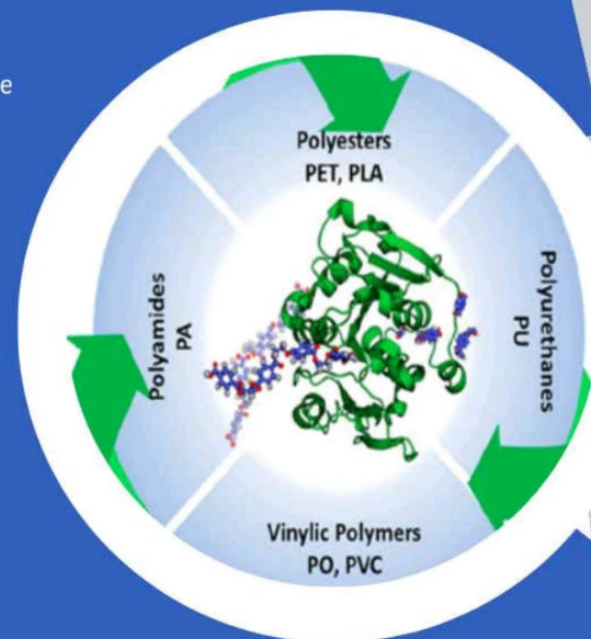
By Dr.M.Arulmozhi Professor,
Petrochemical Technology.

Microplastics (MP) are plastic particles with a diameter < 5 mm that result from breakdown of larger plastics and commercially designed for cosmetic use and textile purpose.¹ Globally, only 18% of plastics waste are recycled and 24% are incinerated. The remaining 58% are either landfilled or enter the natural environment, where plastics accumulate and persist for a long period of time. As microplastics have polluted most of our aquatic ecosystems, food chain, affects the earthworm's growth and mild health issues in human. Degradation or recycling of microplastics are performed through abiotic and biotic methods. Abiotic methods are high cost, need heavy external temperature and pressure, requires building infrastructures/plants and release toxicants etc., our study go through the biotic degradation techniques that is biodegradation of microplastics by plastic degrading microorganisms which utilize the plastics as nutrient source and release CO₂ and bioproducts.

The workplan of our study is to select the ideal bacterial consortia and biofilm forming fungus and optimizing their growth conditions. MPs will be pretreated with UV radiation or nitric acid treatment which will ease the degradation process by making it consumable by microorganisms. After that MPs were treated with bacterial consortia and fungus. The initial screening method is clear zone method to identify which organisms have the capacity to degrade polymers. The weight loss of MPs will be studied by gravimetric determination. The FTIR spectra give details about the chemical functional groups present. Microbial colonization and consequential surface degradation by changes in the physical aspects of the polymer surface will be studied by SEM. The survival and enzymatic activity of microorganism will be detected by pH variation during the degradation process. ADP/ATP ratio is extremely sensitive and quantitative, showing the energetic status of cells in the presence of different polymers. Finally comparative studies done using the data obtained.

Process: The use of bacterial consortia for the biodegradation of MPs may provide a better solution to widespread planetary plastics accumulation. The biofilm forming fungus plays important role in biodegradation because of its multiple enzyme activities on single organism. Pretreatment with UV radiation causes the formation of cavities and erosion on MPs surface and Nitric acid pretreatment also form several functional groups on the polymer chain which will increase biodegradability. The study on synthetic MPs and bioplastics MPs provides the merits of biodegradation and increase the production of bioplastics.

The use of bacterial consortia for the biodegradation of MPs may provide a better solution to widespread planetary plastics accumulation. The biofilm forming fungus plays important role in biodegradation because of its multiple enzyme activities on single organism. Pretreatment with UV radiation causes the formation of cavities and erosion on MPs surface and Nitric acid pretreatment also form several functional groups on the polymer chain which will increase biodegradability.



NANO CATALYST SYNTHESIS

Catalysts have been a driving force behind many scientific and industrial breakthroughs, facilitating chemical reactions that would otherwise be slow or energetically unfavorable. Among the latest innovations in catalyst research, the synthesis of nano catalysts has garnered significant attention.

Nano catalysts, typically with particle sizes below 100 nanometers, exhibit extraordinary catalytic properties due to their high surface area, enhanced reactivity, and unique electronic structure. In this article, we will explore the fascinating world of nano catalyst synthesis and its potential to revolutionize various fields, from energy production to environmental remediation.

Nano catalysts, also known as nanocatalysts, are catalysts in which the active catalytic sites are located on nanoscale structures. These tiny particles can be composed of metals, metal oxides, metal alloys, or even non-metallic materials, such as carbon-based nanomaterials.



Methods of Nano Catalyst Synthesis

A variety of methods are employed to synthesize nano catalysts, each offering precise control over particle size, shape, and composition. Here are some commonly used techniques:

1. **Chemical Reduction:** This method involves the reduction of metal salts in the presence of a reducing agent. It enables the synthesis of noble metal nano catalysts like platinum, gold, and silver, which are crucial in catalyzing reactions in fuel cells and hydrogen production.
2. **Sol-Gel Method:** Sol-gel chemistry allows for the preparation of metal oxide nano catalysts. It involves the hydrolysis and condensation of metal alkoxides to form a gel, which can then be processed to create nanostructured materials with controlled porosity.
3. **Hydrothermal and Solvothermal Synthesis:** These methods involve the use of high-temperature and high-pressure conditions to produce nano catalysts with unique properties. They are often employed in the synthesis of metal sulfides, metal phosphides, and other complex materials.

- 1.4 **Microemulsion Method:** In this technique, a microemulsion system is utilized to control the size and shape of nano catalysts. It is particularly effective in producing nanoparticles of various metals and metal oxides.

Applications of Nano Catalysts

Nano catalysts are finding applications across a wide range of fields:

1. **Energy Production:** They play a crucial role in catalytic processes for renewable energy sources, such as hydrogen production via water electrolysis, and in fuel cell technology for clean energy conversion.
2. **Environmental Remediation:** Nano catalysts can be used to degrade pollutants in water and air through advanced oxidation processes. They are instrumental in addressing environmental challenges like water purification and air pollution control.
3. **Chemical Industry:** Nano catalysts enhance the efficiency of chemical reactions in the production of chemicals, petrochemicals, and pharmaceuticals, leading to reduced energy consumption and waste generation..



What is natural gas

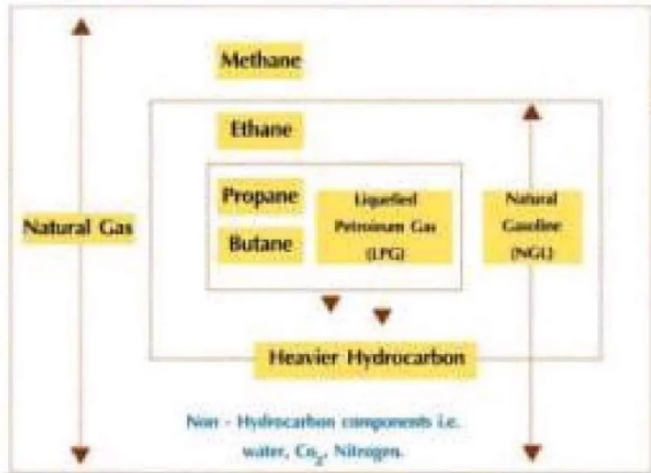
Over the past 150 years, natural gas has secured its vital role in every aspect of the world development, particularly its role to replace coal and oil. Due to its different characteristics from other types of petroleum, natural gas has been well accepted as the energy for the world of today and tomorrow. Nowadays, the public do not only need the energy for their livings but most of all, they also want a better choice for environment.

Natural gas is the fuel giving both heat and light. It can be used as fuel in many sectors as; transportation, industrial, agricultural, and a raw material for petrochemical industry. Furthermore, natural gas can be used in a cooling system.



Dr.N.Jaya

Natural Gas Components



Natural gas is a mixture of various hydrocarbon gas known in scientific names i.e. methane, ethane, propane, and butane. Over 70% of natural gas is formed by methane, the major component. To maximize its use, natural gas must be extracted. In addition to hydrocarbon, other components, for instance, carbon dioxide, hydrogen sulfide, nitrogen and water can also be found. The composites can be separated from the gas through the natural gas processing at the gas separation plants. Each of them has a wide variety of uses.

Physical Properties of Natural Gas



- It is a fossil fuel formed from plant and animal remains millions of years ago.
- It is hydrocarbon component with methane as a major component.
- It is colorless and odorless. For security during transportation or processing, a commercial odorant is added to allow users to detect the gas for safety.
- It is lighter than air with a specific gravity of about 0.6-0.8. If leaks, it disperses upward and dissipates into the air quickly.
- It is inflamed during a range of 5-15% by volume of gas in air. The self-ignition temperature of natural gas is 537-540 celsius degrees.
- As it is a clean fuel with cleaner burning nature, natural gas has lower environmental impact when compared with other types of fuel.

Different Forms of Natural Gas

- **Pipe Natural Gas** or natural gas that transport via pipeline, it is known in commercial term as Sale Gas. Sale Gas is mainly composed of methane. It is transmitted to customers to be used as fuel at the power generation and industrial plants.
- **Natural Gas for Vehicles (NGV)** is the form of natural gas used as fuel for vehicles. NGV is primarily composed of methane and transported through the pipeline to the gas stations. At the gas stations, low pressure gas will be compressed and stored at high pressure of 3000-3600 pound per square inch (psi) and can be then filled up the gas tanks.
- **Liquefied Natural Gas (LNG)** conventionally, the gas is transmitted through the pipeline from production fields to users. If the distance is over 2,000 kilometers, it requires a considerable amount of money to lay a pipeline. Therefore, LNG solves thus limitation. The gas is liquefied by lower temperature to minus 160 degrees Celsius and becomes 600 times smaller in volume, then stored at atmospheric pressure in designed vessels and transport to users. The cost of waterway transport is less than transportation through pipeline.



The Use of Natural Gas

There are two basic uses of natural gas.

1. Fuel We can directly use natural gas as fuel for power generation and in factories e.g. ceramic, sanitary ware as well as in the cogeneration system. And it can be used as fuel for Cogeneration system and for vehicles as known as Natural Gas for Vehicles (NGV).

2. Produce various products through gas separation process. As natural gas is made up from many beneficial compositions, at the gas separation plants, those compositions can be extracted for a number of products as follows:

Methane (C1) is used as fuel for power generation known as Sales Gas. If compressed in high-pressure cylinder, the product derived is called compressed natural gas or as known as natural gas for vehicles or NGV used as fuel for cars.

Ethane (C2) is used as feedstock for upstream petrochemical industry which will be used to produce plastic pellets and fibers for other synthetic products.

Propane (C3) and Butane (C4) are used as feedstock for upstream petrochemical industry as well. The compressed mixture of propane and butane at different proportions stored in a cylinder is called liquefied petroleum gas (LPG) or cooking gas. It is used as fuel for household, vehicles, metal welding, as well as in some industries.

Heavier hydrocarbons are in a liquid form at atmospheric temperature and pressure. They can be removed and separated from hydrocarbon gas during production process. Condensate is removed at the production platform and transported via vessels and pipe to be refined as finished oil.

Natural Gasoline (NGL) is in a liquid form. Though condensate is already removed from the production process at the production platform, some liquid hydrocarbons are still mixed with hydrocarbon gas. These liquid hydrocarbons or natural gasoline can be separated at the gas separation plants and will be sent to the oil refinery to be mixed with finished oil like condensate. It can be used as solvent in some types of industries.

Carbon dioxide After extracted from the natural gas, carbon dioxide will be condensed to a solid which is called dry ice for food preservation industries, soft drink and beer industries, preserving food during transportation, artificial rain enhancement and production of artificial fog in entertainment industry e.g. concert and movie production.

Useful Software in the Field of Petrochemical technology



Dr. M. Rengasamy Assistant Professor, Petrochemical Technology

Introduction:

In the fast-evolving field of Petrochemical Engineering, the integration of advanced software tools has become indispensable. These applications aid engineers in designing, analyzing, and optimizing chemical processes, ensuring efficiency, safety, and sustainability. This article explores some of the most essential software used in the field of Petrochemical Engineering field

1. ASPEN PLUS



ASPEN PLUS is a widely recognized process simulation software used for modeling, simulating, and optimizing chemical processes. It enables engineers to design, analyze, and troubleshoot a wide range of processes, from petrochemicals to pharmaceuticals. Aspen Plus is particularly adept at handling complex systems with multiple unit operations.

COMSOL is a powerful multiphysics simulation software that allows engineers to model and simulate various physical phenomena, including fluid flow, heat transfer, chemical reactions, and more. It is particularly useful in situations where multiple interacting physical effects are at play, such as in reactor design or heat exchanger analysis.

2. COMSOL Multiphysics

COMSOL
MULTIPHYSICS®



3. HYSYS



HYSYS, developed by AspenTech, is another widely used process simulation software. It is known for its user-friendly interface and powerful capabilities in simulating steady-state and dynamic processes. HYSYS is commonly employed in industries ranging from oil and gas to chemicals and pharmaceuticals.

5. MATLAB



MATLAB is a versatile programming and numerical computing platform used extensively in Chemical Engineering. It facilitates data analysis, mathematical modeling, and algorithm development. Engineers use MATLAB for tasks like optimization, control system design, and advanced data analysis.

CHEMCAD is a comprehensive suite of chemical process simulation tools used in various industries, including petrochemicals, pharmaceuticals, and food processing. It offers a wide range of modules for simulating unit operations, reaction kinetics, and

5. CHEMCAD



6. ANSYS FLUENT



ANSYS FLUENT is a computational fluid dynamics (CFD) software used to simulate fluid flow and heat transfer in complex geometries. In Chemical Engineering, it is employed for tasks like reactor design, heat exchanger analysis, and optimization of mixing processes.

CHEMDRAW is a specialized drawing tool used by chemists and chemical engineers for creating chemical structures and diagrams. It is indispensable for tasks like documenting reactions, creating process flow diagrams, and illustrating chemical processes.

7. CHEMDRAW



Conclusion: Each of the mentioned software applications plays a crucial role in different stages of chemical process development, from conceptual design to economic evaluation.

LIST OF NPTEL COURSES AVAILABLE FOR CHEMICAL ENGINEERS	
12 WEEK COURSE	8 WEEK COURSE
<ul style="list-style-type: none">• Advanced Thermodynamics• Aspen Plus Simulation Software - A Basic Course For Beginners• Biomass Conversion And Biorefinery• Transport Phenomena• Waste To Energy Conversion• Chemical Process Safety• Chemical Process Instrumentation and so on.	<ul style="list-style-type: none">• Atomic And Molecular Absorption Spectrometry For Pollution Monitoring• Colloids And Surfaces• Chemical Process Control• Electrochemical Technology In Pollution Control• MATLAB Programming For Numerical Computation• Multiphase Microfluidics and so on.

PINCH TECHNOLOGY

Pinch technology is the most common method, which is aimed at minimizing the requirement of utilities by maximizing the process to process heat transfer. Pinch technology is mainly used in major chemical manufacturing plants or oil refineries where heating or cooling of feed streams is required. Pinch analysis uses the hot streams to heat the cold streams and vice versa, thus saving the hot or the cold utility loads which obviously helps in energy and cost savings. Pinch technology, initially proposed as a thermodynamics-based approach to energy conservation, has evolved over the years to become a powerful tool for process integration and resource optimization. The tools of pinch technology are extended to target the minimum HTF flow rate.

These techniques have developed to encompass combined heat and power (CHP) systems, heat pump placement, and separation processes in addition to heat exchanger network (HEN) analysis to save the energy usage and to reduce the emissions of greenhouse gases. Pinch Technology has four principal functions are Energy versus capital targeting and optimization, design of optimum heat exchange networks, optimization of the use of utilities and revamping of existing networks.



For maximum energy recovery (MER), energy should not be transferred across the pinch. The network is separated into hot and cold regions, above and below the pinch respectively. In the hot region, streams are matched so that heat is transferred from the coolest possible source. Below the pinch, the opposite occurs. This yields the minimum utility requirement solution to the heat exchanger network. Minimum utility requirement is not necessarily the optimum solution, however, the solution with the lowest overall cost is. Minimizing the size and quantity of heat exchangers plays a large role in decreasing capital costs. There is a trade-off between operational and capital costs. In some cases transfer across the pinch is necessary to produce the optimal network.

PLUG FLOW FOLLOWED BY MIXED FLOW NATURAL CIRCULATION BIOREACTOR FOR BIOFUEL PRODUCTION – A SYSTEM APPROACHES TO BIOGAS PRODUCTION

In order to achieve this, a tube of diameter roughly about one third of the digester diameter and volume equal to 10.7% of total volume is fitted at the center of digester. It is filled with washed and broken burnt bricks. The bricks act as an adsorbent, immobilizing microbes. In addition, the bricks acting as bio filters increase the gas generation by 60%. Therefore the combined effect of circulation and immobilization on bio filters is expected to improve the performance considerably. Broken burned brick size about 2 to 5 cm used in the reactor serves two purpose. The broken burned brick used as carrier matrix for immobilization of bacterial consortia present in the animal

waste or food waste, and the immobilized bacteria degrade the organic compounds of cattle waste at a faster rate. Bricks also serve as a carrier matrix for the storage of methane and hydrogen, released during anaerobic metabolism of cattle waste.

Secondary motion is created with SCBP resulting in the improved mixing of biofilm with cattle waste slurry Broken burned bricks are prepared in the laboratory. Once the bricks are manufactured, it is taken to the laboratory for sizing and wetting. Initially the brick materials allow reducing its size from 2 to 5 cm. Chemical composition and physical properties are determined for the brick materials. This bricks possess micro and mesoporous structure. The surface area, pore volume and pore size distribution in bricks are measured using nitrogen isotherm at 77 K.

The plug flow reactor is a rectangular nonfully mixed reactor. A high concentration of solid or semisolid fermentation raw material enters from one end of the feed inlet and then will be discharged from the other end after supplementation. Baffles are set in half of the reactor at a set inclinate, so that the material flow relies on gravity and therefore flows slowly.



Dr.N.Stalin

NATURAL PESTICIDE FROM ANNONA SQUAMOSA SEED

Pesticides are the most essential part of agriculture which plays a major role in destroying and preventing crops from insects, weeds, and rodents. Manufacture of pesticides can be derived from various sources which may be natural or synthetic in nature. Synthetic pesticides cause a range of harmful health effects in humans, including cancer, injury to the nervous system, lung damage, and possible dysfunction of the immune systems. Thus only the safe and best alternative is to use natural pesticides. Natural pesticides are a cheap and safer alternative for the products as well as human being who always exposed to pesticides during use. *Annona squamosa* seeds commonly known as custard apple seeds are abundantly available from the nature. Oil extracted from it can be used as pesticide against a number of common pests like white mealy bug, aphid, termite, etc. *Annona Squamosa* (Custard apple) seeds acts one of the natural source of pesticide.



Synthetic pesticides which are commonly used are known to leave certain amount of residue on the crop surface during harvesting and may cause a range of harmful health effects in humans, including cancer, injury to the nervous system, lung damage, reproductive dysfunction, and possible dysfunction of immune systems. Thus only the safe and best alternative is to use natural pesticides. Natural pesticides are a cheap and safer alternative for the products as well as human being who always exposed to pesticides during use. It is found that *Annona squamosa* seeds acts one of the natural sources of pesticide.

Bio-pesticide extracted from custard apple seed, 0.75% is enough to eradicate the white mealy bugs from the guava leaf surface within 2 days. This bio-pesticide is eco-friendly and will not cause water or air pollution. It has problem in spray of any quantity. It is biodegradable. Also, It does not deplete earthworm and maintain the soil fertility. In India with increase in population, environmental pollution is increasing day by day. They come from industry, automobile and also due to the synthetic pesticide used in the field for crop protection against the pests. Now-a-days these synthetic pesticide residues are found in almost all food ingredients. Hence, it is high time to replace all the synthetic pesticide by bio pesticide.

RECENT ADVANCEMENTS IN PETROCHEMICAL ENGINEERING: A CLOSER LOOK



INTRODUCTION

Petrochemical engineering, a branch of chemical engineering, is at the forefront of innovation and technological advancement. This dynamic field plays a pivotal role in the production of various chemicals, plastics, and fuels that are essential to our daily lives. Recent years have seen significant breakthroughs in petrochemical engineering, driven by the need for more sustainable, efficient, and environmentally friendly processes. In this article, we will gather the facts about some of the most noteworthy advancements in this field.

1. SUSTAINABLE FEEDSTOCK

One of the most critical challenges in petrochemical engineering is the sourcing of sustainable feedstock. Traditional petrochemicals are derived from fossil fuels, which are finite and contribute to greenhouse gas emissions. Researchers and engineers have been exploring alternative feedstocks such as biomass, algae, and waste materials. For instance, the conversion of non-food biomass into bio-based chemicals has gained traction as a sustainable alternative.

2. CATALYST

Catalysis is at the heart of petrochemical processes, and recent advancements in catalytic materials have led to more efficient and selective reactions. Researchers are developing catalysts with improved activity and selectivity, enabling the production of high-value chemicals with fewer byproducts. Moreover, catalysts are being designed to work at lower temperatures and pressures, reducing energy consumption and environmental impact.



2. PROCESS INTENSIFICATION

Process intensification involves making chemical processes more compact, energy-efficient, and environmentally friendly. Techniques like microreactors, continuous-flow processes, and advanced separation technologies are gaining popularity in petrochemical engineering. These innovations not only reduce the footprint of petrochemical plants but also enhance product quality and yield.

4. CARBON CAPTURE AND UTILIZATION

Addressing climate change concerns, petrochemical engineers are actively researching carbon capture and utilization technologies. CCU involves capturing carbon dioxide emissions from industrial processes and converting them into valuable products, such as chemicals and fuels. This not only reduces carbon emissions but also adds value to waste streams.

ASPEN HYSYS WORKSHOP



**National level
workshop on
chemical process
simulation
software - Aspen
HYSYS
DATE : 05/04/2023
& 06/04/2023**



To provide students with a hands-on experience and a deeper understanding of Aspen HYSYS process simulation software, our Department hosted an Aspen HYSYS workshop . There were nearly 150 participants from other colleges and the students were enriched with software's capabilities and its significance.



>>> NEWSLETTER <<<

INDUSTRIAL VISIT

THE JOURNEY OF COLLEGE LIFE



TOP NEWS OF THE MONTH

Mangalore Refinery and Petrochemicals Limited (MRPL)

>>> READ MORE

Mangalore Refinery and Petrochemicals Limited (MRPL) is Category 1 schedule 'A' Miniratna, Central Public Sector Enterprise (CPSE) under the Ministry of Petroleum & Natural Gas. MRPL is located in a beautiful hilly terrain, north of Mangaluru city, in Dakshina Kannada District of Karnataka State (India). The 15 Million Metric Tonne Refinery has got a versatile design with complex secondary processing units and a high flexibility to process Crudes of various API, delivering a variety of quality products.

READ MORE <<<

Objectives of industrial visit is to provide students an insight regarding internal working of companies. We know, theoretical knowledge is not enough for making a good professional career. With an aim to go beyond academics, industrial visit provides student a practical perspective on the world of work.

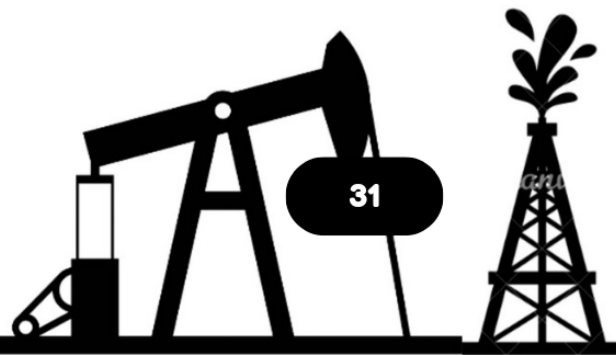
Opportunity to interact with Industry Experts



SCHEMCON 22



Students of Final year and Third year participated in Schemcon 22 held at NIT Warangal on 23rd September . Selva Visagan , Kavin Karthikeyan, Praveen from final year won 2nd prize . Their project title was Production of Bio-ethanol from elephant grass.



A DAIRY DELIGHT

Industrial visit to
Co-milkat Viralimalai



In the realm of education learning extends far beyond the four walls of classroom. To provide student with the practical glimpse into the dynamic world of dairy production and processing our college organised an eye- opening industrial visit to the CO MILK company in Viralimalai on 12.05.2023. This excursion was valuable opportunity for students pursuing various fields of study to witness first-hand the intricacies of the dairy industry and gain insight into the companies operation

FAREWELL



WE SAID OUR ADIEUS

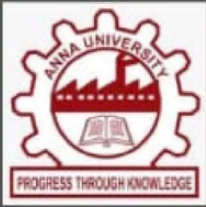


BATCH
2019-2023



"WE ALL THESE DAYS
REMINDED TOGETHER WITH
BOUND MEMORIES TO
CHERISH.... MORE
MEMORY WE WILL
GATHER, TO SHARE AGAIN
BEFORE WE PERISH...."
"MAY THIS GOODBYE BE
ONLY MOMENTARY. AND
MAY THE COMING DAY
BRING YOU ALL THE
SUCCESS BOTH
PERSONALLY AND
PROFESSIONALLY. HOPE
TO MEET YOU SOON!"





UNIVERSITY COLLEGE OF ENGINEERING AND TECHNOLOGY ANNA UNIVERSITY BIT CAMPUS

SPORTS ZONE

THE ANNA UNIVERSITY SPORTS BOARD ENSURING THE SMOOTH AND EFFICIENT CONDUCT OF ZONAL / INTER-ZONAL TOURNAMENTS INVOLVING ALL THE INSTITUTIONS UNDER ANNA UNIVERSITY, THE ANNA UNIVERSITY SPORTS BOARD IS CONSTITUTED WITH THE VICE-CHANCELLOR AS PRESIDENT. THE MEMBERS OF THE BOARD INCLUDE DEANS / PRINCIPALS OF CONSTITUENT AND AFFILIATED COLLEGES, FACULTY MEMBERS, PHYSICAL DIRECTORS AND EMINENT SPORTS PERSONS, AS PER THE NORMS APPROVED BY THE SYNDICATE OF THE UNIVERSITY.

KING OF KABADDI



WON 3RD IN ZONAL

ZONE 2



**WON 1ST PLACE
IN ZONAL**



KHOKHO

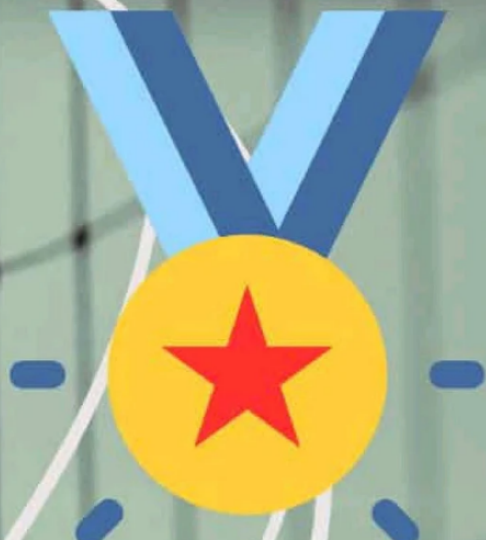
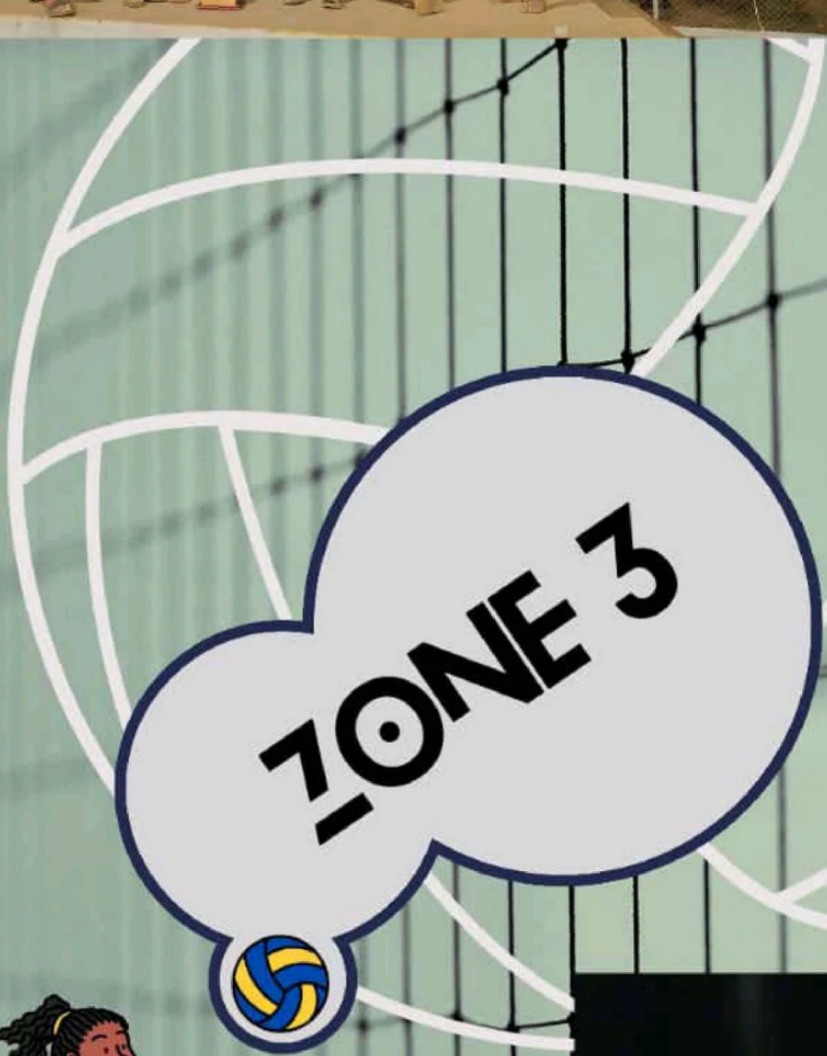
**VICTORY BELONGS TO THE TEAM WITH THE MOST
SYNCHRONIZED MOVEMENTS."**



VOLLEY BALL



IF YOU CAN BANG YOU CAN HANG.



WON 1ST PLACE IN ZONAL





UNIVERSITY COLLEGE OF ENGINEERING AND TECHNOLOGY

ANNA UNIVERSITY BIT CAMPUS, TRICHY

CULTURAL FEST



SHOUT OUT LOUD



MIMICRY



“Listen, then repeat. Listen, then repeat. That was all it took to pretend well. What was a person’s self but carefully articulated mimicry?”

— Rivers Solomon,

DANCE ON THE FLOOR

“Dance is the hidden language of the soul.”



The earthquack that held on

FARE WELL



QUESTION AND ANSWER

CONDUCT



What is Heat Transfer?

Heat Transfer is the movement of heat from a body at a higher temperature to a body at a lower temperature.

Conduction



Modes of Heat Transfer

Warmer water rises



Cooler water descends



Convection

Radiation



- Conduction
- Convection
- Radiation

NEWS LETTER MEMBERS



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