K.K. Wagh Education Society's
K.K. Wagh Institute of Engineering Education and Research, Nashik.
Chemical Engineering Department
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TECHNICAL NEWS LETTER

July 2024 - December 2024

The Department of Chemical Engineering was established in 1999 with the objective of creating a center of excellence in Chemical Engineering, with an annual intake of 60 students. The department has been accredited twice by the National Board of Accreditation (NBA), AICTE, New Delhi. The department boasts experienced faculty members with several years of academic expertise and veteran supporting staff with strong research interests in both conventional and emerging areas of Chemical Engineering. Emphasizing continuous knowledge enhancement, the department has been sponsoring faculty members for postgraduate and research programs in recent years. It is equipped with state-of-the-art infrastructure and laboratories designed to meet the requirements of the university syllabus. Additionally, the department has an adequate number of computers with the latest configurations and internet facilities. To support teaching and learning, the department provides advanced computational tools, including professional software such as UNISIM, DWSIM, BricsCAD, and MATLAB. It also maintains an in-house library with reference books for all subjects and a comprehensive Chemical Engineering encyclopedia.

The department has an excellent track record of academic results. Students have secured top ranks in university examinations and achieved success in competitive exams such as GATE, GRE, and others. They have also been recruited by leading national and international Chemical industries. In addition to focusing on basic sciences and engineering subjects, the department encourages students to participate in various national events such as project exhibitions, paper presentations, model-making competitions, and sports activities.

Association of Chemical Engineering Students (ACES), a student's association, functions in the department and provides strong platform for overall development of the students. The students get a chance to interact in Seminars, Workshops, Cultural Programmes, Expert Lectures on various topics like Personality Development, Preparation for Competitive Examination, study abroad etc through ACES. The department is proactive for good industry institute interaction. Department has signed MoUs with various industries for mutual benefit. Various experts from the industry are invited and industrial visits are organized every year regularly to bridge the gap between theory and practice. The department organizes internships for third-year students every year in various renowned industries and private-sector companies in the region.

Details of Faculty of Chemical Engineering

S.N.	Name of Faculty	Qualification	Area of Specialization	Designation
1.	Dr. Suyog N. Jain	Ph. D	Chemical Engg.	Associate Professor & Head of Department
2.	Prof. Vijay N. Mawal	Ph.D Pursuing	Chemical Engg.	Assistant Professor
3.	Dr. Gaurav B. Daware	Ph. D	Chemical Engg.	Assistant Professor
4.	Prof. Sandeep N. Derle	Ph.D Pursuing	Chemical Engg.	Assistant Professor
5.	Prof. Piyush P. Joshi	M. Tech	Chemical Engg.	Assistant Professor
6.	Prof. Zameer K. Deshmukh	M. Tech	Chemical Engg.	Assistant Professor
7.	Prof. Tejmal B. Mahale	M. Tech	Chemical Engg.	Assistant Professor
8.	Dr. Yennam Rajesh	Ph. D	Chemical Engg.	Assistant Professor
9.	Dr. Neha B. Gautam	Ph.D	Chemical Engg.	Assistant Professor
10.	Dr. Prashant Kumar	Ph. D	Chemical Engg.	Assistant Professor
11.	Dr. Rajsekhar Ravula	Ph. D	Chemical Engg.	Assistant Professor
12	Prof. Ritul M. Chaudhari	M. Tech	Chemical Engg.	Assistant Professor

International Workshop

Flyer for Two-Day International Workshop

The Chemical Engineering Department hosted a two-day international workshop, titled "Emerging Trends in Process Engineering and Process Design (ETPE&PD-2024)," from October 23rd to 24th, 2024. This event was designed to provide participants with advanced knowledge and insights into process engineering and design. The program featured impactful sessions on cutting-edge technologies, presented by esteemed speakers from prominent institutions, including foreign universities, IITs, and industry leaders. About 164 participants from India and around the world, including Saudi Arabia,

Canada, Sweden, the United States, Denmark, and Oman, attended the workshop, representing various fields of Chemical engineering. The event's success was made possible by the Convener, Dr. S. N. Jain, and Coordinators, Prof. V. N. Mawal and Dr. Ravula Rajasekhar, who expressed their sincere appreciation to all speakers and participants.

Industry-Acdemia Interaction

The AICTE IDEA Lab, in collaboration with the Chemical Engineering Department organized an Industry-Institute Interaction Program on 5th October 2024in Chemical Engineering Department. Ten industry representatives from various industries, including Graphite India Ltd. Ambad, Nashik; United Heat Transfer, Nashik; Ekhande Agro Pvt. Ltd., Nashik; VIP Industries Nashik, and Dolphin Inks Pvt. Ltd., Nashik participated in the interaction. Dr. S. N. Jain, Incharge Head of the Chemical Engineering Department, provided a detailed information about the department, emphasizing its key focus areas, achievements, and research and testing facilities. Dr. G. B. Daware, (R&D Coordinator of the Chemical Engineering Department), requested continued collaboration from the industry through joint projects and regular interaction with students. Dr. R. K. Munje, Dean of R & D and AICTE IDEA Lab Coordinator, conducted a comprehensive tour of the AICTE IDEA Lab, providing representatives with an in-depth overview of the facility and its resources. Industry experts suggested equipping students with skills in AutoCAD, Microsoft Excel, and communication, while strengthening their knowledge in manufacturing processes. They also recommended focusing on safety, environmental standards, sustainability topics like Green and Blue Hydrogen, carbon capture technologies, and practical applications such as PID concepts and advanced automation tools.

Photograph of the Industry-Acdemia Interaction Program

Faculty Development Program

Chemical Engineering Department conducted Five-Day International Faculty Development Program (Online Mode) on “Emerging Technologies and Innovations: Pioneering Environmental Sustainability” from 30th September 2024 to 4th October 2024. This event aimed to equip participants with advanced knowledge and foster interdisciplinary collaboration to integrate sustainable solutions into teaching, research, and industry practices. The program featured insightful sessions on cutting-edge technologies, led by resource persons from prestigious institutions such as foreign universities, IITs, ICTs, NITs, and CSIR labs. About 153 participants from various fields and countries attended the FDP. The Convener, Dr. S. N. Jain, along with Coordinators Dr. Yennam Rajesh and Dr. Neha Gautam, extended their heartfelt gratitude to all resource persons and participants.

Flyer for Five-Day International Faculty Development Program

BricsCAD Value Added Course

The Department of Chemical Engineering organized a five-day "Hands-on Training on BricsCAD" from 22th September 2024 to 26th September 2024, for third-year B.Tech students, and from 27th September 2024 to 1st October 2024 for final-year students. The sessions were led by Mrs. Rucha Lathe from Apollo Institute, Nashik. A total of 47 third-year students and 26 final-year students participated in the course. This training provides valuable skills that enhance students' job prospects in the field of Process Design Engineering within the Chemical industry.

Photograph of BricsCAD Value-Added Course Participants and Trainer

Indian Government Design Patent

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Chemical Engineering Faculty Prof. Tejmal Balu Mahale has published a design patent titled "IoT-Enabled Apparatus for Impurity Detection Using Gas Chromatography Mass Spectroscopy." This is interdisciplinary design patent involving knowledge of Computer Science, Chemical Engineering, and Electronics. The design patent will be explored for commercialization with Perkin Elmer India, Mumbai.

Expert Lectures and Career Guidance Sessions Organized:

- Expert talk on "Scope of Chemical Engineering in Reliance Industries and How to Face an Interview" was delivered by A. Vijaya Sai, Reliance Industries on 16th November 2024.
- Expert talk on "Guidance to BE students for placement in Galaxy Surfactants Ltd." was delivered by Mr. Sumedh Devi, Senior Officer in Process Safety, Galaxy Surfactants Ltd., Mumbai on 7th November 2024.
- Expert talk on "Understanding Harmony in Nature" was delivered by Mrs. R.Y. Thombare, Assistant Professor, KKW Polytechnic College on 21st October 2024.
- Expert talk on "Guidance on UPSC Exam Preparation" was delivered by Mr. Avishkar Derle (Selected in Indian Revenue Service) on 10th October 2024.
- Expert talk on "Insights and Experience on Nanomaterials, Biomaterials, and Bioprocesses" was delivered by Sharly Mehta, Associate Improvement Manager, Dowanol Plant, Germany on 8th October 2024.
- Expert lecture on "Career Guidance to TY and SY students" was delivered by Mr. Rahul Patil, Process Design Engineer, Catapharma Pvt. Ltd., Nashik on 26th September 2024.
- Expert lecture on "Sulphur Recovery Unit" was delivered by Prof. V. V. Mahajani, Ex-Professor, ICT Mumbai on 20th September 2024.
- Panel discussion on "Scope and Career Opportunities in Chemical Engineering" was held on 10th August 2024. The event featured notable alumni, including Mr. Sandeep Shukla, Mr. Saurabh Todi, Ms. Bhagyashree Shelke, and Mrs. Swapnali Wagh, who provided valuable guidance to admission-aspirant students.
- Expert lecture on "Career Opportunities in Chemical Engineering" was delivered by Mr. Rahul Patil, Process Design Engineer, Catapharma Pvt. Ltd., Nashik on 31st August 2024.
- Expert lecture on "Chemical Engineers' Roles in Software Fields" was delivered by Mrs. Anjali Patil, Process Engineer, TCS ,Mumbai on 24th August 2024.
- Expert lecture on "Universal Human Values" was delivered by Er. Dattatraya Dada Aher, Ex-Principal, Government ITI on 21st August 2024.
- Expert lecture on "Career Guidance for Higher/Abroad Education" was delivered by Ms. Shalini Menon, Consultant, UEMS, Mumbai on 13th August 2024.
- Expert lecture on "Industries and Scope for Chemical Engineering" was delivered by Mr. C. R. Mohikar, Consultant, NRG Infra Academy on 8th August 2024.
- Expert lecture on "Higher Study and Career Opportunities after PG" was delivered by Ms. Vaishnavi Khetal, Trainee-R&D, Keva Fragrance PVT. Ltd, Mumbai on 5th August 2024.
- Guidance Session on "Various Roles of Chemical Engineer in Chemical Industries" was delivered by Mr. Ganesh Sapariya, Emerson Measurements SSP Ltd., Nashik on 29th July 2024.
- Guidance Session on "Gate Preparation" was delivered by alumna Sushant Shelke (Pursuing M.Tech at IIT Bombay) on 23rd July 2024.
- Expert lecture on "IPR: Patent Law and Procedure" was delivered by Mr. Santosh Sangle, Co-Founder and Partner, Legismith Partners LLP, Pune on 20th July 2024.
- Expert lecture on "Counseling Session for S.Y. B. Tech Students" was delivered by Dr. Pratibha Chandak, Counsellor, K. K. Wagh Institute of Engineering Education and Research, Nashik on 20th July 2024.
- Expert Lecture on "Design of Distillation Column" was delivered by Mr. Ketan More, General Manager - Sales & Marketing, SVI Carbon Pvt Ltd, MIDC Satpur, Nashik on 18th July 2024.
- Expert Lecture on "Overview of Chemical Process Industries" was delivered by Mr. Girase Tajas, Val Organics Pvt. Ltd., Gujarat, India on 15th July 2024.

Training and Placements:

Sr. No.	Name of Student	Name of Industry	Package Offered
1.	Ms. Chaudhari Himani Manohar	Technip Energies, Noida	6,50,000/-
2.	Mr. Kolhe Chetan Balasaheb	Inox Air Products Pvt. Ltd., Mumbai	4,00,000/-
3.	Mr. Mali Bhushan Rohidas	Inox Air Products Pvt. Ltd., Mumbai	4,00,000/-
4.	Mr. Dhuri Nikhil Nilesh	Inox Air Products Pvt. Ltd., Mumbai	4,00,000/-
5.	Mr. Meshram Pralay Kaiwaldas	Galaxy Surfactants Ltd., Mumbai	5,00,004/-

Industrial Visits

Sr. No.	Class	Name of Industry	Date
1	TY B. Tech	United Heat Transfer Ltd. Dindori.	04/10/2024
2	SY B. Tech	Hydrology Project Sub Division, Nashik	23/09/2024
3	SY B. Tech	Sewage Treatment Plant, Tapovan, Nashik	04/09/2024
4	TY B. Tech	VIP Industries, Satpur, MIDC, Nashik	20/08/2024
5	BE Chemical	CataPharma Pvt., Ltd., Sinnar	17/08/2024
6	BE Chemical	VSCL Pvt. Ltd., Vadivarhe	07/08/2024

FDP/ Workshop/STTP attended by Faculty:

- Dr. G. B. Daware and Prof. P.P. Joshi successfully completed one-week online Faculty Development Program on "Chemical Process Safety" from 16th to 20th December 2024 organized by Department of Chemical Engineering, Sinhgad College of Engineering, Pune.
- Dr. Prashant Kumar successfully completed a one-week Faculty Development Program on "Green Technologies for Sustainable Development" from 2nd to 6th December 2024, organized by National Technical Teachers Training and Research Bhopal at Pune Extension Centre, Pune.

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- Dr. S. N. Jain and Prof. P. P. Joshi successfully completed a two-day Faculty Development Program on "Innovative Teaching Methods" from 13th to 14th September 2024, organized by Department of Mechanical Engineering and ISTE Staff Chapter, Shri Hiralal Hastimal Jain Brothers Jalgaon Polytechnic, Chandwad.
- Dr. N. B. Gautam successfully completed a one-week Faculty Development Program on "NEP 2020 Orientation & Sensitization" from 5th to 13th August 2024, organized by UGC - Malaviya Mission Teacher Training Centre, SPPU, Pune.
- Dr. Yennam Rajesh successfully completed a one-week Faculty Development Program on "Advances in Renewable Energy Technologies for Sustainable Development" from 29th July to 2nd August 2024, organized by Bhivapurkar Vithalrao College of Engineering, Navi Mumbai.
- Dr. Yennam Rajesh successfully completed a one-week Faculty Development Program on "Advances in Material Characterization and Data Processing (AMCDP-2024)" from 15th to 20th July 2024, organized by Anurag University, Hyderabad, Telangana.

Papers Presented in Conference by Staff and students:

Title of Paper : Sustainable Adsorbent Development: Activated Carbon from *Kigelia Africana* Fruit Shells for Acid Blue (AB158) Dye Removal

Name of Conference : Sustainable Science and Technology for Tomorrow

Names of Authors : Yennam Rajesh*, Khushi Gupta, Rutuja Ghotekar, Aditi Gawali, Prerna Gurav

Abstract : This project focuses on the synthesis of activated carbon using Kigelia Africana Fruit shells as a precursor. These fruit shells, available as waste in the Western Ghats region, Contribute to environmental and water pollution. Kigelia Africana, naturally abundant fruit rich in cellulose and carbon with low ash content, is a toxic plant that serves as an ideal precursor for producing low-cost activated carbon. This project explores the potential of converting Kigelia Africana fruit shell waste into value-added chemicals like activated carbon adsorbents, which can be used in industrial effluents and wastewater treatment. Activated carbon is synthesized by using chemical activation with various chemicals such as KOH, NaOH, H_3PO_4, and $ZnCl_2$, respectively. The current project optimizes several parameters, including impregnation ratios of 1:1, 1:2, 1:3, activation time (120 min), Temperature (400-500 OC). The surface properties of the final adsorbent are characterized using FT-IR, BET surface area and SEM analysis. Batch adsorption studies have been conducted to remove Acid Blue 158 dye using various combinations like synthetic dye solution concentrations (50-1000 mg/L), adsorbent dosage (10-90 mg/L), contact time (10-310 min), and pH (2-12), respectively. The highest adsorption removal efficiency of 93.07% was achieved with the synthetic AB 158 dye solution. The experimental data validate with theoretical models like Isotherm and Kinetic models, respectively.

Papers Published by Staff/Students in SCI/Scopus Journal

1. Title of Paper : Adsorptive Separation of Acid Red 33 by Groundnut Shell Based Activated Carbon

Name of Journal : Biomass Conversion and Biorefinery (Springer)

ISSN Number : 2190-6815

Names of Authors : Dr. S. N. Jain, Mr. Om Korade, Ms. Mitisha Parmar, Dr. G. B. Daware, Dr. N. B. Gautam

Abstract : The adsorptive separation of Acid Red 33 (AR33) dye by groundnut shell-based adsorbent obtained using phosphoric acid as an activating agent was investigated. The adsorbent characteristics were determined by Breuner-Emett-Teller (BET), Scanning Electron Micrograph (SEM), and Fourier Transformed Infrared Spectroscopy (FTIR) analysis. Thermo Chemical activation yielded a significant enhancement in surface area from 1.971 to 1150.252 m^2/g. The effects of pH (2–10), adsorbent loading (1–5 g/L), concentration (50–200 mg/L), temperature (288–318 K), and time (15–270 min) were investigated on the extent of adsorption. Isotherm and kinetic analysis of adsorption trials revealed best fitting of experimental data by Langmuir isotherm and pseudo-second-order models. Maximum Acid Red 33 uptake by modified adsorbent was obtained as 107.53 ± 0.91 mg/g at dose of 3.5 g/L and pH of 2 in 180 min. Thermodynamic characteristics demonstrated spontaneous and endothermic adsorption. The reusability study implied the drop in the removal efficiency from 98.26 ± 0.97% at first cycle to 79.57 ± 1.04% to the third cycle. These results demonstrated the reusability potential up to three cycles. The presented research demonstrated that physio Chemically activated groundnut shell powder is a promising sorbent for adsorptive separation of Acid Red 33.

2. Title of Paper: Design of Microbial Fuel Cell for Power Generation Using Milk and Lactobacillus Bacteria

Name of Journal : Indian Journal of Chemical Technology

ISSN Number : 0975-0991

Names of Authors : Suyog N. Jain, Saurabh Kulkarni, Rohit Fulzele, Yennam Rajesh, Priyanka Shivde

Abstract : This study investigates the use of milk as a substrate in a Microbial Fuel Cell (MFC) for power generation with Lactobacillus bacteria. In place of a semipermeable membrane separating the anodic and cathodic chamber in MFC, salt bridge made from agar-agar gel was used as a conducting medium. $KMnO_4$ was used as an oxidizer in the cathodic chamber in MFC and open circuit voltage (OCV) was observed for various systems by changing anodic and cathodic chamber volume, bacterial concentration. Maximum

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OCV of 2.01 V was obtained with 300 million Lactobacillus sporogenes added to anode of 600 ml working volume containing 100 ml milk and 500 ml water mixture. Novel approach was used to design a new structure of salt bridge which can act as conducting medium and also as a cathode. This system achieved a maximum OCV of 1.13 V. Sodium hypochlorite (0.6 w/v%) was evaluated as an alternative oxidant to potassium permanganate, achieving a maximum OCV of 1.66 V. The obtained results depicted that the milk as a substrate in MFC along with Lactobacillus has considerable power generation scope which can be further improvised.

3. Title of Paper : Mordenite's mineralogical study and application as an efficient adsorbent for heavy metal detection from waste water

Name of Journal : Journal of the Indian Chemical Society

ISSN Number : 2667-2847

Names of Authors : Yennam Rajesh

Abstract : Mordenite zeolite sample were collected from the Deccan Belt region of Maharashtra for this study for the current study. X-ray fluorescence (XRF), Fourier transform infrared (FTIR) spectroscopy, X-ray diffraction (XRD), thermogravimetric analysis (TGA), differential scanning calorimetery (DSC), scanning electron microscopy (SEM), energy dispersive X-ray (EDAX) and Brunauer–Emmett–Teller (BET) were used to characterise the obtained zeolites. The result confirms that mordenite, like zeolite, has a similar structure. Mordenite compounds were tested as an adsorbent for removing ions from heavy metal ion solutions. The investigation's findings revealed that the residual amounts of lead, cadmium, and nickel ions in aqueous solution were 45 ± 5 %. Additionally, by varying the treatments of zeolite samples, the degree of metal ion removal from industrial wastewater can be enhanced. Adsorption was increases with both adsorbent concentration and temperature. The pseudo-second-order model describes the adsorption kinetics well for Pb ion, fairly for Cd ion, and moderately for Ni ion. The kinetic study depict the pseudo-second-order kinetic adsorption model for Pb, Cd, and Ni metal ions, with regression coefficients (R^2) of 0.9632, 0.9113, and 0.8825, respectively.

4. Title of Paper : Onsite arsenic detection with a low cost portable microvolume kit

Name of Journal : Indian Journal of Chemical Technology

ISSN Number : 0975-0991

Names of Authors : Ravula Rajasekhar, Gaurav Daware, Yennam Rajesh

Abstract : Arsenic, a harmful contaminant, has a WHO limit of 10 µg/L in drinking water. This work is aimed to develop an on-site detection method for arsenic in micro-volume samples, achieving rapid detection at ~8 µg/L in potable water. The Molybdenum Blue method has been modified to provide rapid and exact total arsenic readings in aqueous samples with concentrations below 10 g/L. Optimizing reagents allowed micro-volume detection, tolerating up to 200 ppb of phosphate interference. The reaction produces a unique blue colour, indicating the formation of a complex called arsenomolybdate, which confirms the presence of arsenic in the sample. The colour intensity exhibited variations corresponding to arsenic concentration, providing a visual indicator of its presence. An easiest qualitative based sensor has been created utilizing porous materials to assess the concentration range of arsenic in the sample by using Low Cost Portable Microvolume (P-µV) Kit. The device exhibited an impressive response time of approximately 1 min for checking arsenic concentrations in samples, with a limit of detection (LOD) at 8 µg/L. Furthermore, the device yielded satisfactory results when checking to field samples. Its versatility allowed for both qualitative assessments and alignment with atomic absorption spectrometry results.

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Title of Copyright : Utilization of AI modeling and simulations on industrial wastewater to predict future behavior and minimize the environmental impact

Name of Authors : Dr. G. B. Daware and Dr. S. N. Jain

Abstract : The present study deals with working towards integrating pollutant concentration data with state of artificial intelligence machine learning and data science modeling and simulation techniques. Artificial intelligence-driven modeling and simulation, The Present Study deals with advanced methods that will help in understanding the behavior of contaminants and microorganisms on the environmental bodies. The application of the project extends to predicting and refining wastewater treatment procedures, as well as evaluating potential ecological consequences. Modeling and simulation with data, adaptable management approaches are enabled. This involves artificial intelligence updating predictions, furnishing insights to optimize wastewater treatment, and reducing the environmental pollution impact.

Achievements

- Sambhav Sharma, a final-year student of Chemical Engineering, secured the First Runner-Up position in the "Climate Champion Hackathon" organized by InnoHEALTH in Delhi, India, from 15th to 16th November 2024.
- Sparsh Gongale, a first-year student of Chemical Engineering, secured the consolation prize in the Essay Writing Competition on the topic "Ethics of AI," organized by the ISTE Students' Chapter of K. K. Wagh Institute of Engineering Education and Research, Nashik.

Dr. S. N. Jain
I/C Head,
Chemical Engg. Dept.

Prof. Dr. K. N. Nandurkar
Director