

Department of Chemical Engineering
INNOVATIONS DONE BY THE FACULTY IN TEACHING AND LEARNING

- The Department has effective practices and teaching methods for efficient use with computer-based technology solutions and integration with conventional methods.
- As each method results distinctly in the teaching-learning process at Higher Education; therefore, we believe that the innovative teaching methods not only organize the teacher's assignment but also significantly impact the student learning towards the engineering courses.
- It becomes crucial to develop and transfer the subject information and the students' consistent assessment of acquired knowledge.
- The Integration of teaching communication and technology-based teaching methods help to define, create, and update subject matter and efficiently disseminate information from the teachers.

INSTRUCTIONAL METHODS AND PEDAGOGICAL INITIATIVES USED IN TEACHING AND LEARNING

I) Pedagogical Initiatives

- Pedagogy is a critical element in delivering course content, and its approach is tailored to the specific audience or participants. Faculty members meticulously craft comprehensive course plans, assignment questions, and quiz materials for each course.
- Similarly, they prepare course hand-outs and materials, aligning them with the lesson plan and course outcomes.
- These materials, including the course hand-out and related resources, are uploaded onto the institution's Learning Management System (LMS) intranet or ERP, ensuring accessibility for students.
- Faculty members employ a variety of pedagogical methods that include:

A. Experiential Learning Methodologies:

Students are encouraged to look for their own special answer to practical tasks when learning about real-world topics. Methodologies practiced: Industrial visits, Internships, Community Engagement etc.




- **Industrial visits** offer students a unique opportunity to observe real-world operations and gain insights into various industrial processes. These visits help bridge academic concepts with practical applications, enhancing students' understanding of industry standards and practices.
- **Community engagements** provide students with opportunities to apply their skills in real-world settings, fostering a sense of social responsibility and empathy. These experiences help students develop teamwork, problem-solving abilities, and a deeper understanding of societal challenges, encouraging them to contribute meaningfully to their communities



- **Industrial internships** for students are encouraged to engage in and complete online courses like NPTEL and Coursera, as well as actively pursue internship opportunities. During their internship, the industry training offers students valuable exposure to real-world environments, where they can apply classroom knowledge in practical settings. It enhances their technical and soft skills, such as communication, teamwork, and problem-solving, making them more adaptable to workplace dynamics.

All these experiences lead to increased knowledge and skill development, practical application of theoretical concepts, and significant improvement in students' employability and career readiness. These initiatives collectively contribute to the holistic development of students, equipping them with the knowledge and skills necessary to thrive in the dynamic realm of Chemical Engineering and its allied fields.



Industrial Visits conducted during the assessment period

S.No	Industry Visit	Month & year of visit	No. of students Participated	Visit Image	Outcome
1	Apitoria Pharma Ltd, Hyderabad	March 2024	55		The industry personnel have explained the students elaborately, some of the important unit operations & processes such as: Batch Reactors, Separators, Drying process, Agitation, Precipitation process, Sieving operation, Vacuum distillation process and Solvent recovery .

2	Hetero Labs Ltd , Hyderabad	October 2023	43		<p>The visit highlighted the importance of advanced technology, automation, and safety protocols in the pharmaceutical industry. Overall, the visit proved instrumental in broadening the understanding of students about drug production and its significance in ensuring public health and well-being.</p>
3	Prathista Industries Limited, Hyderabad	September 2023	40		<p>The industry expertise provided comprehensive explanations to the students about crucial unit operations and processes, including mixers, plate and frame filter presses, and industrial vacuum dryers. Essential tests necessary for analyzing food samples were also covered.</p>
4	CSIR-IICT, Hyderabad	July 2023.	40		<p>The visit has proven to be an invaluable source of knowledge and understanding, specifically in the realm of analytical instruments. The industry expertise, have explained the students elaborately diverse array of instruments, with special emphasis on Mass Spectrometry (MS), High-Performance Liquid Chromatography (HPLC), and Nuclear Magnetic Resonance (NMR).</p>

5	Nuclear fuel Complex, Hyderabad in	April 2023	40		<p>The industry experts have explained the students elaborately, some of the important unit operations & processes such as: Jaw crushing of zirconium sponge, Calcination process, Precipitation process, Sieving operations, Vacuum distillation process and chlorination process.</p>
6	Central Institute of Petrochemicals Engineering & Technology	March, 2023	50		<p>Students gained first hand insights into the petrochemical industry, including advanced manufacturing processes, polymer testing techniques, and quality standards in materials engineering. The experience enhanced their understanding of polymer technology applications, research methodologies, and industry-specific tools.</p>




Community Engagement visits conducted during the assessment period

S.No	Visit details	Month & year of visit	No. of students Participated	Visit Image	Outcome
1	Devuni Erravelly Village	October 2023	45		<p>The visit provided valuable real-world experience and also contributed to social awareness and development. To understand the community's needs and challenges, the students explored the village in groups and interacted with the villagers on various aspects like Education, Health, Sanitation, Agriculture, and Infra-structure in an excellent way.</p>
2	Kanapur Village	February 2023	45		<p>By working closely with the villagers, students gained a deeper appreciation of rural challenges and the importance of community-driven solutions. The experience underscored the impact of small, meaningful actions in improving community well-being.</p>

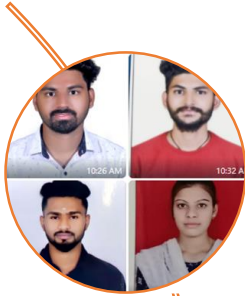
B. Participative Learning Methodologies:

Students are encouraged to take part in group activities such as Hackathons/ Ideathons, Workshops etc.

- Hackathons and Ideathons are valuable platforms for student learning, providing opportunities to apply theoretical knowledge to real-world problems in a collaborative and time-bound environment.
- Workshops are held with a focus on either emerging fields or in alignment with industry demands to enhance students' employability. These workshops offer hands-on learning experiences for students.

		
<p align="center">Ideathon/Hackathon – 2023-24</p>	<p align="center">Ideathon/Hackathon – 2023-24</p>	<p align="center">Ideathon/Hackathon – 2023-24</p>
<p>Second year students, Ms. Sathwika and Mr. Abhilash have participated and won first prizes in Idea Presentation and Business Plan competitions at Technosmania-2024 and BVRIT-2024, respectively. (Mentor: Dr. P. V. Naga Prapura)</p>	<p>Second year student, Ms. Vaishnavi won 1st prize in ACE-EPIC Idea Exploration 3.0. (Mentor: Dr. P. V. Naga Prapura)</p>	<p>Final year student Mr. Udesh received the Community Innovation Fellowship by NITI Aayog – ACIC-CBIT for 2024-25 underscoring their proactive involvement in innovation (Mentor: Prof. M. Mukunda Vani)</p>

Ideathon/Hackathon – 2022-23



ACIC-CBIT Ideathon 2023 winners, **Mr. Chandrakanth, Mr. Anil, Mr. Niteesh & Ms. Rajitha** under the supervision of Dr. Mukunda Vani & Dr. R. Prasanna Rani have won **Rs. 75,000/-** as pre-incubation support for the project titled: Liquid Fertilizer from Human Hair, May 2023.



ACIC-CBIT Ideathon 2023 winners, **Ms. T. Chendana & Ms. V. Anvitha Raj** under the supervision of Dr. B V S Praveen & Dr. P. Madhuri have won **Rs. 50,000/-** as pre-incubation support for the project titled: Bioplastic Synthesis from waste materials using fish scales as a plasticizer, May 2023.



ACIC-CBIT Ideathon 2023 winners, **Ms. E. Sneegdha & Ms. Rithvika** under the supervision of & Dr. P. Madhuri & Dr. B V S Praveen have won **Rs. 25,000/-** as pre-incubation support for the project titled: Printing & Packaging grade paper making from Dry leaves, May 2023.

Ideathon/Hackathon – 2022-23

- ❖ Mr. Yashraj and Mr. Sai Mani Yogesh won Invesco Hack to Hire - Jan 2023 Hackathon with a cash prize Rs. 50,000/-

- ❖ 2 teams won Agri-Aavishkar I2P Ideathon conducted by ACIC-CBIT with a seed grant of Rs. 15000/- each – July 2022.



Invesco Hack to Hire Winners



Team 1: Aravind, Satwika, Dr. Prasanna - working on Value added products from Floral waste

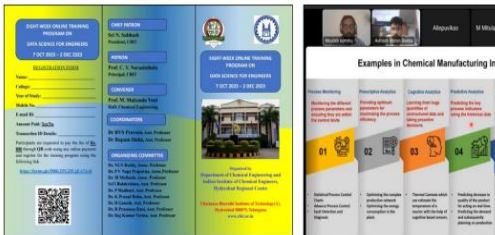



Agri-Aavishkar 2022- Winners



Team 2: Amay, Rupesh, Dhanush - working on Bioplastics from Agri-Residues
Mentor: Dr. R Prasanna Rani

Workshops

S. No.	Topic	Resource Person	Month & year of visit	Image	Outcome
1	Data Science for Chemical Engineers	Mr B Sai Hithesh, Data Scientist, Ingenero, Thane, Maharashtra Mr K Moulish, Aero & Thermal Engineer, Alstom, Hyderabad	7th October 2023 to 2nd December 2023		Students have gained hands-on experience with popular data science tools such as MATLAB, equipping them to handle real-world data. This workshop have equiped students with data skills that are increasingly essential in the industry, preparing them for roles that demand interdisciplinary knowledge in chemical engineering and data science.
2	Quantitative process analysis: a MATLAB and ASPEN PLUS approach	Mr Hari Babu, Assistant Manager, BITS-Pilani Hyderabad Campus Mrs D Srujana, Assistant Professor, Department of Chemical Engineering, RGUKT (IIT Basara), Telangana	16th Oct 2024 to 16th Nov 2024		Students learnt how to model, analyze, and optimize chemical processes quantitatively, essential for designing efficient and sustainable industrial processes.

C. Problem solving methodologies:





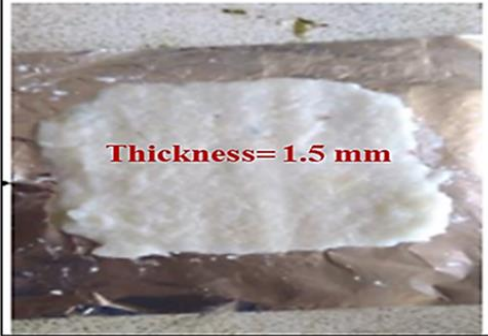

Students are engaged in various problem-solving activities that enable them to apply their knowledge to solve real world problems through Major Projects, Group Assignments, Collaborative lab sessions etc.

- Major Projects: The department adheres to established procedures to ensure that students undertake high-quality projects. Students have the flexibility to choose projects aligned with their areas of interest, and they are encouraged to tackle real-world problems. Engaging in project work enables students to analyze, synthesize, and integrate their knowledge, bridging the gap between theory and practice, and showcasing a holistic achievement.



Students executing their project work by utilizing the department laboratory facilities

Products developed by students during the project work under faculty supervision

	 <p>Biodiesel</p> <p>Glycerine</p>	
<p>Organic dyes from discarded floral waste</p>	<p>Biodiesel production using non-edible oils</p>	<p>Bioplastic film from agrowaste</p>
	 <p>Thickness= 1.5 mm</p>	 <p>Thickness= 2mm</p>
<p>Synthesis of adsorbent from dry leaves</p>	<p>Bleached pulp from dry leaves</p>	<p>Bioplastic sheet from food waste</p>

Group Assignments:

- Students learn through group discussion or asked to deliver short presentations on a topic.
- Students share knowledge or discuss topics in small groups or in peer mode.
- Students are assigned problems to solve and discuss collaboratively.



Collaborative Learning in Action: Group Discussions, Peer Presentations, and Problem-Solving Activities

Collaborative lab sessions:

- In lab settings, students are encouraged to interact with one another, often working in teams to complete experiments.
- These collaborative lab sessions promote teamwork, where students not only perform the experiments but also discuss their approaches and findings.
- The concept of "Learning by Doing" is emphasized throughout these activities, wherein students apply theoretical concepts to practical exercises.
- This participative learning model ensures that students cultivate both academic excellence and practical competency.



Students working in teams to complete the assigned experiment



Demonstration of experiment



Students engaged in result analysis

Instructional Methods adapted by faculty for effective presentation

S.N	Name of the Faculty	Use of appropriate methods and effective presentation
1)	Dr. M. Mukunda Vani	<ol style="list-style-type: none"> 1. Innovative Teaching Methods - classroom teaching ppts were appended with E-Resources, NPTEL course links, working mechanism GIFs, YouTube links, Reference e-links representing latest developments in the field, (Video Lectures, Laboratory Manual, Handouts, Course Instructional Material etc.) Every individual has to claim and not on sharing basis 2. Alumni interactions and expert talks were organized along with HoD and other faculty, as a team, to facilitate students learning experience on topics beyond curriculum. 3. Industrial visit was organized along with HoD and other faculty, as a team, for practical learning of course fundamentals.
2)	Dr. P.V. Naga Prapurna	<ol style="list-style-type: none"> 1. Innovative Teaching Methods - classroom teaching ppts were appended with E-Resources, NPTEL course links, working mechanism GIFs, YouTube links, Reference e-links representing latest developments in the field, (Video Lectures, Laboratory Manual, Handouts, Course Instructional Material etc.) Every individual has to claim and not on sharing basis 2. Active Learning Strategies – activities beyond curriculum: Safety and Hazards Management (open elective) students as part of the course have attended Guest lecture organised by their department on “Health-care for all an Overview on Pharmaceutical Industry and its Dynamics”, by Dr V. Prasada Raju, on 25-11-2023. 3. Alumni interactions and expert talks were organized along with HoD and other faculty, as a team, to facilitate students learning experience on topics beyond curriculum. 4. Industrial visit was organized along with HoD and other faculty, as a team, for practical learning of course fundamentals. 5. Community Outreach Program was organized along with HoD and other faculty, as a team, for sem-1 chemical engg students as part of curriculum 6. Inter-college competitions under CBIT – IChE student chapter were organized along with HoD and other faculty, as a team
3)	Dr. Mekala Mallaiah	<ol style="list-style-type: none"> 1. Innovative Teaching Methods - classroom teaching ppts were appended with E-Resources, NPTEL course links, working mechanism GIFs, YouTube links, Reference e-links representing latest developments in the field, (Video Lectures, Laboratory Manual, Handouts, Course Instructional Material etc.) Every individual has to claim and not on sharing basis
4)	Dr. N. L. N. Reddy	<ol style="list-style-type: none"> 1. Innovative Teaching Methods - classroom teaching ppts were appended with E-Resources, NPTEL course links, working mechanism GIFs, YouTube links, Reference e-links representing latest developments in the field, (Video Lectures, Laboratory Manual, Handouts, Course Instructional Material etc.) Every individual has to claim and not on sharing basis

5)	Sri. I. Balakrishna	1. Innovative Teaching Methods - classroom teaching ppts were appended with E-Resources, NPTEL course links, working mechanism GIFs, YouTube links, Reference e-links representing latest developments in the field, (Video Lectures, Laboratory Manual, Handouts, Course Instructional Material etc.) Every individual has to claim and not on sharing basis
6)	Dr. P. Madhuri	1. Facilitated interactive and group discussions encompassing topics such as the significance, practical applications, recent developments, and challenges pertaining to the subjects handled in odd & even semesters. 2. Course material , Question bank preparation & upgradation of subject content for all theory courses handled. [Prepared and circulated notes through LMS & via Email for all the topics in the syllabus 3. Trained 4th yr project students in identifying problem statement and provided expertise (i.e designing the experimental procedure, identifying & performance of characterization techniques, result analysis etc) in carrying out live experimental work in the department using the available lab facilities.
7)	Dr. K. Prasad Babu	1. Use of PPT based interactive teaching methodology 2. Course material , Question bank preparation & upgradation of subject content for all theory courses handled. [Prepared and circulated notes through LMS & via Email for all the topics in the syllabus
8)	Dr. B. Ganesh	1. Innovative Teaching Methods/ Active Learning Strategies 2. Project-based Learning (PBL) 3. Use the Design-thinking Process 4. Using AI in Education 5. Content Development (Video Lectures, Laboratory Manual, Handouts, Course Instructional Material
9)	Dr R. Prasanna Rani	1. Power point slides with GIFs, YouTube, links and NPTEL course links. This is incorporated for all the courses which I teach. Example MUO course: Numerical problems are solved in MS-Excel in class and taught students the effective application Excel solvers for problem solving. Data analysis through various graphical approaches were also taught. 2. Inquiry-Based Learning : This is applied for Community engagement course - focuses on posing questions to the rural community, and work on finding solutions to the problems. Students actively explore and seek solutions, fostering curiosity and a deeper understanding of the subject matter. 3. Flipped Classroom : This is applied for some topics in PCT and SE courses. In a flipped classroom, traditional teaching methods are reversed. Students engage with instructional content (videos, readings, etc.) at home and then come to class to work on assignments, or problem-solving with the guidance of the teacher. 4. Project-Based Learning (PBL) : This is incorporated for PCT course. PBL involves students working on a project over an extended period, investigating and responding to a complex question or problem. This method fosters collaboration, critical thinking, and problem-solving skills. 5. Collaborative Learning : This is incorporated for Project part-1 and Community engagement courses. Encouraging collaboration among students can enhance their communication and teamwork skills. Group projects,

		discussions, and peer-to-peer learning activities promote a sense of community in the classroom. For every course, after each assessment, like CT-1, CT-2 and overall, the students who secured top marks will be rewarded with a small gift as a token of encouragement.
10)	Dr. Raj Kumar Verma	<ol style="list-style-type: none"> 1. Facilitated interactive and group discussions encompassing topics such as the significance, practical applications, recent developments, and challenges pertaining to the subjects handled in odd & even semesters. 2. Course material, Question bank preparation & upgradation of subject content for all theory courses handled. Prepared and circulated notes through LMS & via Email for all the topics in the syllabus 3. Trained 4th yr project students in identifying problem statement and provided expertise (i.e designing the experimental procedure, identifying & performance of characterization techniques, result analysis etc) in carrying out live experimental work in the department using the available lab facilities

- 1) The students are assigned to a faculty mentor who guides them through personal interaction and monitors their learning abilities. Parents are also involved in counselling their wards for successfully completing their degree.
- 2) Faculty mentors encourage the students to complete NPTEL courses on value added topics. This helps them to choose a suitable career path.
- 3) Faculty encourage the students to take up internships during summer and winter breaks. The leaning outcomes are assessed through institute evaluation process.
- 4) Faculty are encouraged to guide students from their second year of the four-year degree program through mini project ideas, participate in ideathons, present technical papers at inter-college technical fests.
- 5) The e-Content developed by individual faculty is uploaded and made available on institute AWS Cloud by the respective department. The content of all the programs shall be witnessed through the public link d2n36fr2627nzy.cloudfront.net
- 6) Faculty prepares course pack that contains a detailed lesson plan and articulation matrix for mapping course outcomes with program outcomes.
- 7) The course evaluation process is explained to the students at the beginning of the semester.
- 8) The course instruction method adapts an interactive learning process where the students can ask questions during the class.

- 9) The faculty are encouraged to share the course material/ notes/ solved assignments/ key for slip tests/ key for class tests/ key for previous year semester end exams/ of their respective courses as E-Content. The students can refer even beyond class room hours.
- 10) Faculty use ICT tools for class room teaching like: LCD Projector enabled lecture ppts, short videos for explaining the working mechanisms, e-resources like NPTEL and Coursera links.
- 11) The institute has CBIT-NDLI Club, an initiative to engage of NDLI's vast online resources. The URL is are given below.
<https://ndl.iitkgp.ac.in/> (<https://ndl.iitkgp.ac.in/>)
- 12) If the same course is handled by different faculty, the e-Content of the course developed by different faculty are also uploaded and made available on institute AWS Cloud by the respective department.
- The practice of sharing e-Content (video lectures) has been initiated from the academic year 2020-21. The recorded class room video lectures are shared to the respective students through <https://learning.cbit.org.in/>.
 - For the academic year 2020-21, the details of all the video lectures of UG, PG programs are also made available through the URL/link https://www.cbit.ac.in/library_post/e-library-online-video-recordings/
 - Students of the institute can access video content accessing above link through their individual credentials.
 - Students of the institute can access e-Content through public access link d2n36fr2627nzy.cloudfront.net
 - or institute domain link <https://learning.cbit.org.in/>