Innovations by the Faculty in Teaching and Learning

INNOVATIONS IN DELIVERY METHODS

***Summary*:**

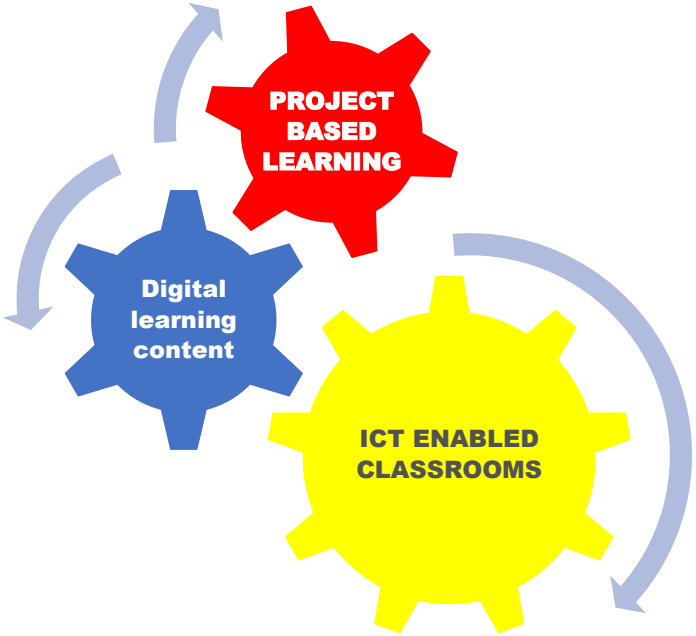
At **NSS College of Engineering, Palakkad (NSSCE)**, the **Teaching and Learning Process (TLP)** is at the heart of academic life. The college is committed to delivering quality education through structured planning, academic autonomy, and innovation. Recognizing students as key stakeholders, NSSCE ensures that its pedagogical practices are designed to equip learners with both technical proficiency and lifelong learning skills.

A comprehensive **academic calendar** is prepared and shared prior to each semester, allowing departments to plan instructional activities efficiently and systematically. This facilitates the smooth execution of curriculum delivery and enables faculty to align their teaching with institutional and academic goals. Furthermore, NSSCE has adopted a **holistic approach** to education by independently curating its own **technical programs**, tailored to meet industry trends, technological developments, and student aspirations.

Responsibility for planning and monitoring the TLP at the departmental level lies with the **course instructors, who ensure that teaching strategies are relevant, adaptable, and outcome-driven**. The institution actively encourages the use of **innovative teaching methodologies**, such as interactive learning, flipped classrooms, project-based instruction, and blended learning environments. These approaches make learning more engaging and empower students to take active ownership of their academic development.

NSSCE also places a strong emphasis on fostering **critical thinking, analytical reasoning, and independent learning**. Through thoughtful pedagogical design, students are encouraged to question, explore, and contribute meaningfully to the learning process. This focus on intellectual autonomy and initiative equips graduates with the adaptability and mindset required to thrive in a rapidly evolving professional landscape.

Innovative Teaching–Learning Ecosystem Workflow



ICT ENABLED CLASSROOMS

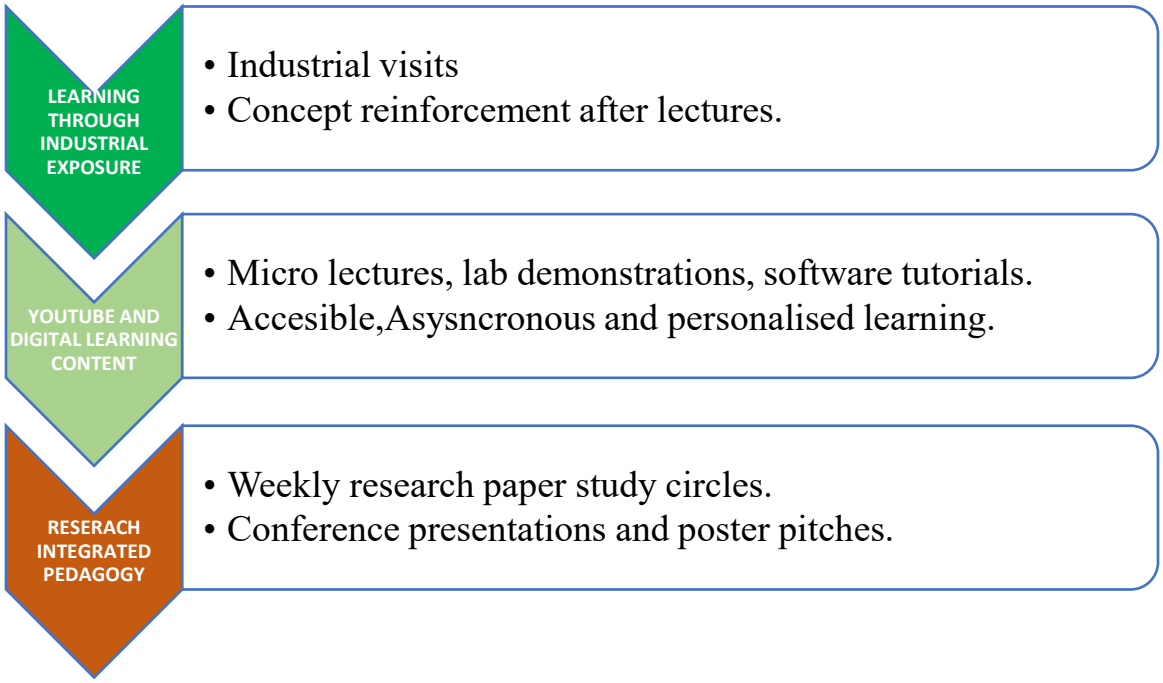
- Digital boards and LCD projectors.
- NPTEL and multimedia content analysis.

PROJECT BASED LEARNING

- Semester wise mini projects.
- Analysis of previous projects and learn concepts.

LABORATORY IMMERSION

- Exposure to 3D models
- CNC simulators,CAD/CAM experiments

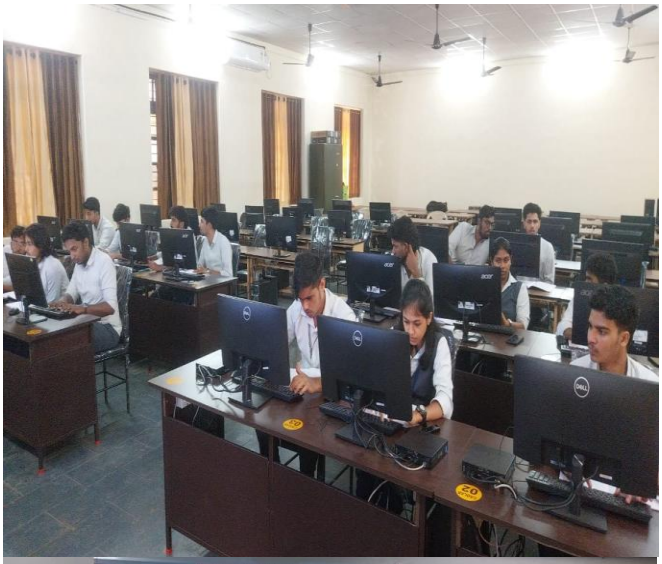


1.ICT-Led Classrooms & Project-Based Learning

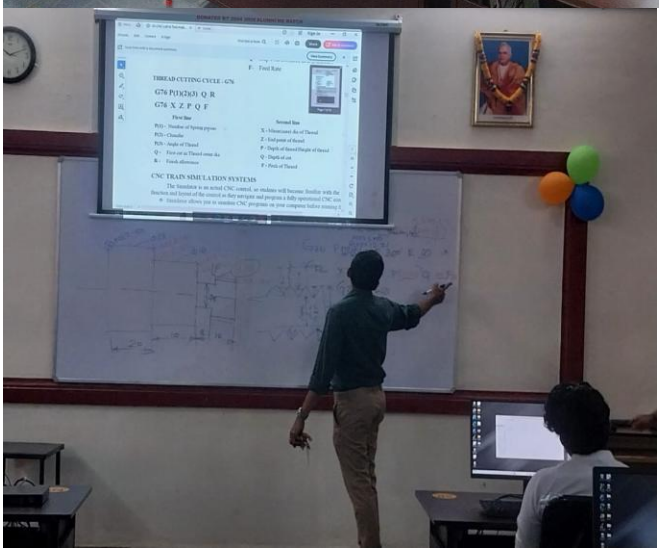
NSSCE's Mechanical Engineering classrooms are built around **ICT-enabled delivery**. Faculty augment chalk-and-talk with digital boards, PowerPoint decks, high-resolution animations and short video demonstrations, all projected through LCD systems. Students have seamless access to these materials - PPTs, PDF hand-outs and curated video clips, via the department's learning portal (etlab), while a **digital library** stocked with NPTEL lectures and peer-reviewed e-journals supports self-paced study.

Building on this visual foundation, the department embeds **Project-Based Learning (PBL)** across every year of study. In line with Goal (ii) of its teaching blueprint - "to guide students to do simple projects each semester" - faculty require learners to translate classroom theory into tangible artefacts. First-year teams fabricate elementary mechanisms (e.g., Geneva wheels), while third-year cohorts tackle open-ended design challenges such as automated coconut-scraping machines or control-moment-gyroscope stabilizers; several of these prototypes have matured into patent-backed or product-development outcomes at the college's research center.

Laboratory immersion reinforces PBL. Students handle **3-D cut-away models and working rigs**—from Wankel engines to CNC simulation software, immediately after theoretical exposition, cementing concept visualization with hands-on exploration. Faculty assess projects using rubrics that weight innovation, functional validation and reflective journals; completed artefacts are exhibited during the annual "MECH-EXPO", nurturing a culture of peer benchmarking and continuous improvement.



1-CNC LAB- Power Point Based Learning



1.1-CNC LAB- Power Point Based Learning

2. Experiential Learning through Industrial Interfaces & Digital Outreach

To widen professional horizons, the department orchestrates **structured industrial visits** each semester. Recent itineraries include the Fluid Control Research Institute (FCRI) on 18 Nov 2023, Hailstone Ltd. crushing-plant works on 28 May 2022, and Steel-and-Forging foundries in Kanjikode on 16 Jul 2022. These visits are scaffolded by pre-visit briefing sheets (company profile, key processes mapped to course outcomes) and post-visit reflection reports that feed into the course-file portfolio. Where logistics prevent physical travel, faculty arrange live factory walk-throughs via video link or invite plant managers for on-campus **mini-clinics and design reviews**.

Parallel to field immersion, NSSCE maintains an active asynchronous learning process via ETLAB. Leveraging the same multimedia culture highlighted in the ICT toolkit, faculty record micro-lectures, laboratory demonstrations and software tutorials, then publish them in playlists aligned with syllabus modules; students reference these clips during peer-group study and exam revision. Every upload is tagged with Bloom-level indicators and outcome codes so that learners can track competence acquisition. Analytics from the channel (watch time, re-watch peaks) inform weekly tutorial emphasis, ensuring teaching focus mirrors student pain-points in real time.

The college further amplifies experiential exposure through **guest webinars and workshops**, for example, a self-driving-car R&D talk by a Mercedes-Benz engineer (11 Jun 2023) and hands-on Fusion 360 sessions during Skill-Development Week 2022. Such interfaces sharpen industry relevance and seed internship pipelines.

Details of video lectures from the department (Sample lectures included)

Subject Name	Video Lecture Link	Name of Faculty Engaged
Laboratory session	https://youtu.be/0e75rrX9beU?si=eJwnRL4alzjZngFd	**Mr. Sreekumar TP**
Engineering Graphics	https://www.youtube.com/watch?v=Uhb78jL0CAs&list=PLn8sCRn-6HsEFo0KlgL_1hB96kpZW8w5Z	**Prof.Sijo MS**
MET206-Fluid Machinery	https://www.youtube.com/watch?v=sMZn1a0FBk0&list=PLn8sCRn-6HsEtcqkZfwy1tPnz_RxHCp1K	**Prof. Sijo MS**
MET203-Fluid Mechanics	https://www.youtube.com/watch?v=FBNfO2qKwFY&list=PLn8sCRn-6HsGoHQZU2ILqh4AaY1xZZzZl	**Prof. Sijo MS**
University Questions	https://www.youtube.com/watch?v=eNdE_P6WQbw&list=PLn8sCRn-6HsHb6hbeKopqon3q0pyfwTyN	**Prof.Sijo MS**
Study Materials	https://bit.ly/MechStudyMaterials	**UG scholar: Aditya MS**

Learning Through Industrial Visits, CIPET, Lakkidi

ALUMNI INTERACTION PROGRAM BY MR. ANUROOP (2008 ALUMNI) HELD ON 30/09/2024
ORGANIZED BY
DEPARTMENT OF MECHANICAL ENGINEERING

TALK ON ADDITIVE MANUFACTURING FOR AEROSPACE APPLICATION HELD ON 05/10/2024 BY
DR. KESAVAN D(IIT PALAKKAD)

Another significant pedagogical initiative is the emphasis on **laboratory experiment-based learning**. Students are encouraged to derive theoretical insights directly from hands-on lab work. Every concept taught in the classroom is further reinforced through experimentation, allowing learners to visualize and internalize engineering principles. Teachers guide these sessions with careful supervision, and regular evaluations are conducted to assess concept retention and practical competency

Learning Through Experimentations-Thermal Engineering Lab

Learning Through Experiments-Mechanical Engineering Lab

3. Research-Integrated Pedagogy & Continuous Improvement

From second year onward, students engage in **guided research-paper study circles**. Faculty assign seminal or cutting-edge articles, drawn from the department's SCOPUS-indexed publication list on topics ranging from heat-pipe nanofluids to composite machining, and coach learners through critical appraisal, literature-gap mapping and presentation. This routine not only demystifies scholarly writing but also feeds capstone ideation; a recent outcome is the "Kitchen Sahay" portable coconut-scraper, patented in January 2024.

Research literacy is underpinned by robust **laboratory infrastructure**: CNC machining centers, CAD-CAM suites, multi-fuel engine test rigs and renewable-energy diagnostics kits for solar studies. Students apply Design-of-Experiments methods, run ANSYS simulations and validate findings on physical prototypes, producing conference papers at the in-house ICIEM series and national symposia.

Integrated Impact

By weaving ICT-rich instruction, project-based creation, real-world industrial immersion, faculty-curated e-content and research-anchored scholarship into a single continuum, NSSCE transforms students from passive listeners into **confident innovators and analytical problem-solvers**, fully prepared for the demands of Industry 5.0 and lifelong learning.

The Department of Mechanical Engineering at NSS College of Engineering, Palakkad, is deeply committed to enhancing the learning experience of its students through innovative and interactive teaching methodologies. One of the key strategies adopted is the integration of **project-based learning (PBL)** into theory subjects. This approach not only bridges the gap between theoretical knowledge and practical application but also cultivates curiosity and innovation among students. Inspired by successful projects undertaken by former students, current learners are encouraged to explore real-world problems through structured guidance from faculty. These projects help develop technical proficiency, teamwork, and problem-solving skills, qualities essential for future engineers.

MOTORIZED WHEEL CHAIR CUM BED

Mentor: Dr. Vinod V

- **Adithya S**
- **Afrad Hussian**
- **Ajay A**
- **Aswin R Nath**
- **Dhananjay PS**

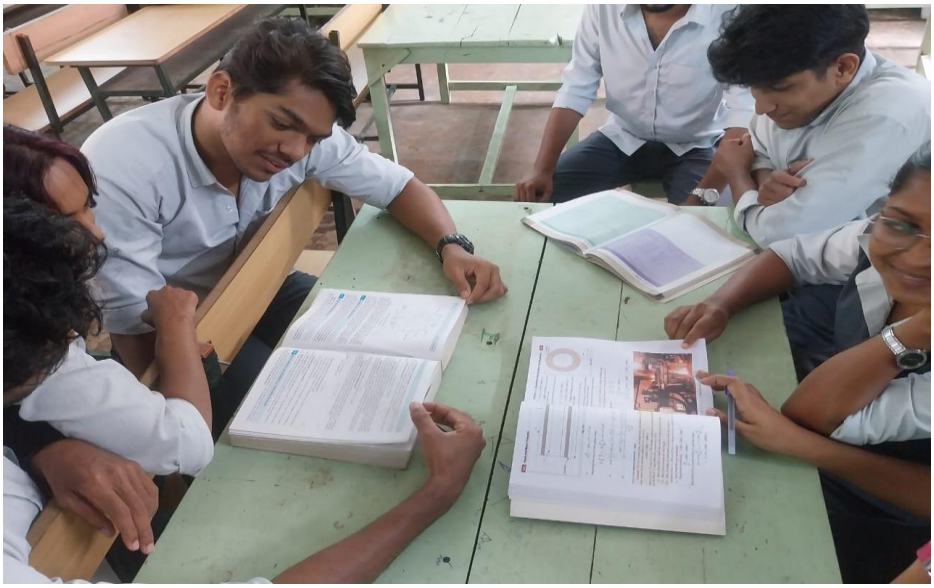
KERALA STARTUP MISSION IDEA GRANT 2023_2024 WINNERS

1-Project Based Learning

1.1-Project Based Learning

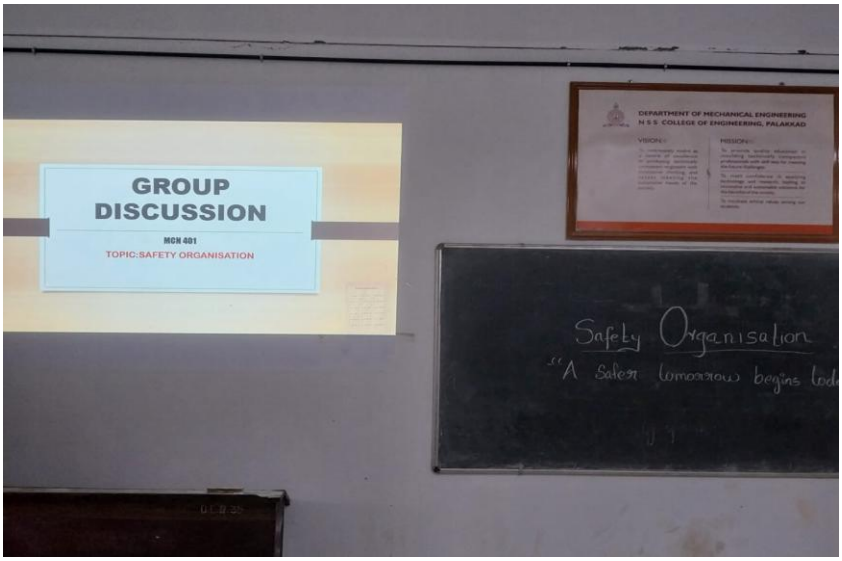
1.2- Project Based Learning

To reinforce collaborative learning, the department actively promotes **peer group study sessions**. These sessions serve as a platform for students to engage in mutual learning, clarify doubts, and explain concepts to one another, which significantly strengthens their understanding. Peer-assisted learning nurtures leadership, communication, and academic confidence, thereby creating a supportive academic ecosystem. Senior faculty members and mentors routinely monitor these sessions to ensure effectiveness and intervene when necessary, providing valuable academic support.



Peer Group Study

Additionally, **group discussions** are held at regular intervals to enhance communication skills and deepen conceptual understanding. These discussions often revolve around recent technological developments, core subject matter, and interdisciplinary topics. With constant encouragement and input from the Head of the Department and senior faculty members, students are trained to think critically and express their ideas clearly. Regular monitoring and feedback mechanisms ensure that all these initiatives contribute meaningfully to student development.



Group Discussion

The Department of Mechanical Engineering, NSS College of Engineering, Palakkad, conducted an outreach programme for local schools with the aim of introducing students to modern engineering concepts, recent developments in the field, and the importance of innovation in everyday life. Faculty members, along with selected undergraduate students, visited schools in the surrounding area and engaged students through interactive sessions, live demonstrations, and hands-on activities. The sessions covered emerging topics such as robotics and automation, 3D printing, renewable energy technologies, smart materials, and electric vehicles, all explained in a simplified manner to match the school-level understanding. Real-life applications, success stories of innovators, and videos of engineering marvels were showcased to inspire curiosity and highlight the possibilities within the engineering profession.

In addition to presentations, the outreach team conducted small group activities, including paper bridge challenges, balloon-powered car races, and mini wind turbine models, encouraging creativity, teamwork, and problem-solving skills. The initiative successfully fostered enthusiasm among students, provided practical exposure to the role of engineers in shaping the future, and motivated them to explore engineering as a potential career path. The programme also strengthened the connection between the college and the local community, fulfilling NSS College's commitment to promoting technical education and innovation awareness among younger generations.

Drone workshop for school students, conducted in 3 schools