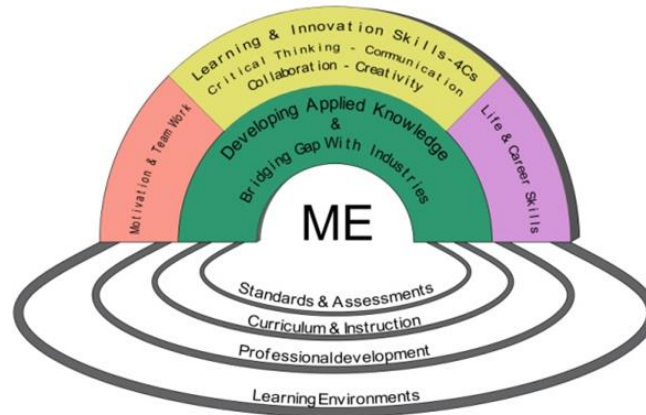


Innovative Teaching and Learning



Faculty members of Mechanical Engineering Department encourage students to attend Digital Class Room sessions to learn interactively thrust areas viz. Design, Thermal & Production Engineering through PPT, videos, animated slides, etc. A few are downloadable here. Many more will be added to this repository. Various innovative teaching-learning techniques are also cited here. These are made available for peer review and critique. Any suggestion regarding teaching-learning ideas would pave for further development to fulfil Outcome Based Education.

According to the present scenario of teaching and learning, modern techniques are adopted in the institution for better learning by student. Some of the innovative teaching techniques adopted are described below:

Pedagogical Initiatives:

Following are some pedagogical initiatives taken by the department in addition to Chalk & Talk, Lectures, Assignments, power point presentation, tutorials;

- Working model/Visual charts/ videos/power point presentation
- Analogy with live examples from industries and surroundings
- Lecture interspersed with discussions among students
- Group assignments and projects with defined individual roles
- Lab experiments beyond syllabus
- Quizzes (conventional/ Technical)
- Seminars/ presentations
- Group Discussions
- Designing and Problem solving through simulation, etc

Apart from the methods listed above, while developing and delivering the Course/Lecture objectives, the faculty considered cognitive aspects of Bloom's Taxonomy i.e. the faculty listed what they wanted the students to know-knowledge and development of intellectual skills

Seminar/Webinar:

The objective of the seminar is to give students opportunity to participate in methods of scientific analysis and research procedures.

Significance of Results:

- Improves communication skills
- Create interest in student
- Improves teacher and student interaction
- Improves Students Academic Performance
- Creates awareness about the topic
- Improve the coordination among the students

Demonstration:

Objectives:-

1. Creating of a Strong Desire: The basic aim of demonstration is to create a very strong desire in the mind of prospect to possess the product, which he wants to sell. It is demonstration that has the ability, to desire to a strong sense of possession.
2. Generation of Positive Attention towards the Product: Many a times the prospects have a state of wavering mind, as they are not fully attentive of product. Creation of positive attitude towards the product is the part and parcel of persuasion process in the game of selling.
3. Helping the Prospect to Come to Definite Decision to Buy: Mere presentation is a oral expression or description of the product. It has effect. However, the effect is not generating any positive change of attitude and action. It is demonstration that applies multi-sense approach, which definitely helps the customer or prospect to come to positive conclusion. That is, he may be deciding to buy or going for a product.

Significance of Results:-

- This strategy improves the understanding of complex skills and principles.
- Students can pay their attention and follow along with the learning process.
- Knowledge becomes permanent because this method requires different human senses.
- Students are motivated to study and gain necessary skills.
- The psychomotor objective is easily achieved through this method.
- No time is wasted because students see the process live and understand how to apply theoretical knowledge practically.

QUIZ

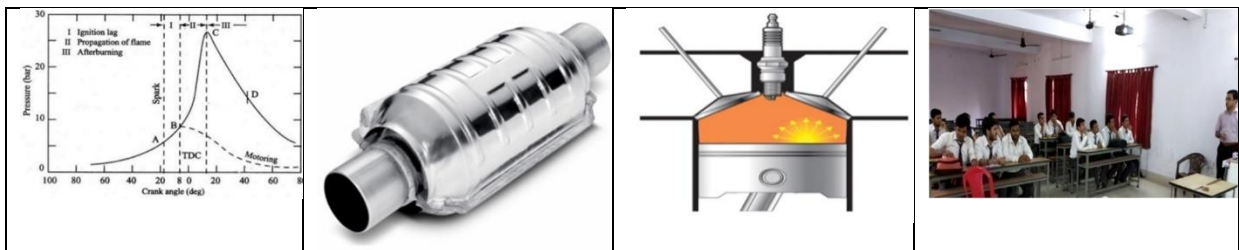
Objective:-

A quiz can function throughout a course as an informative feedback device allowing both the instructor and the students to see where they are excelling or need more focus. In order to effectively create exams and quizzes, it is important to establish and understand the learning objectives that are being measured.

Total students are divided in sub-sections. The quiz is organized for these sub-sections in different time slots, dividing these sub-sections again in groups of 3-4 students. Each quiz is conducted in four rounds/ phases:

- Working model/Visual charts/ videos/power point presentation
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These components or processes or the phenomena are discussed rigorously during the lectures. By this way the students get acquainted with a real-life engine components etc, how they actually look like, individually as well as in the system, so that when they face the actual systems in the industry, they are well aware of the things. In the quiz these knowledges are brushed up.



Use these assessment tools to test student knowledge of:

- Various effective teaching strategies
- The strategy used to help students understand the perspectives of others
- The definition of a case study

Significance of Results:

- Interactive platform: Today, quizzes are interactive platforms where students are not participating to take home a prize or get famous overnight, but to gain knowledge, seek opportunities to excel

beyond academics and secure their future. • Changes scope of learning: Since questions are based out-of-syllabus and require critical thinking and extensive research, students get into the habit of innovative learning from an early age. • Encourages team work: Students need to form teams while participating in quizzes, giving them an opportunity to hone their teamwork skills. • Bridges academia-industry gap.

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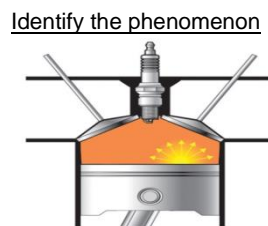
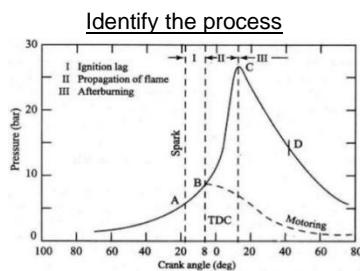
Round 1: questions from the subject taught. e.g., what is scavenging?

Round 2: identify the component- a picture of a component of IC engine or Gas Turbine is shown which is to be identified. e.g., the catalytic converters.

Round 3: identify the process: a picture/ graph or some hints is shown about a process occurring in IC engines or Gas Turbines, which is to be identified. e.g., combustion in SI engines.

Round 4: identify the phenomenon: a picture of a phenomenon, such as pre-ignition is shown, which is to be identified.

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Massive Open Online Course (MOOCs)

A massive open online course (MOOC) is an online course aimed at unlimited participation and open access via the web. In addition to traditional course materials, such as filmed lectures, readings, and problem sets, many MOOCs provide interactive courses with user forums to support community interactions among students, professors, and teaching assistants, as well as immediate feedback to quick quizzes and assignments. MOOCs are a recent and widely researched development in distance education. MOOCs were created from the idea of covering an entire university course online and thereby making it accessible to everyone in the world. The intent was to "democratize" educational content from elite universities. High-quality education should not be available to just a small group of university students in developed countries, but to everyone who is willing to learn.

Quality of laboratory experiments:

All labs are equipped with latest equipment with standard operation procedures. Students conduct experiments in group of 2-3. Each student prepares a lab record which is assessed by the teacher immediately after the completion of the experiment or before commencement of the next practical. Each student in the practical record indicates the collection of data and analysis along with the conclusion. The students wherever applicable submit the developed product.

- Faculty members provide quality study materials to enrich students. The course files are distributed among the students by the subject teacher well in advance of the commencement of the class.
- Faculty shares the study materials among the students via e-mail, hand-outs etc.

- The biggest resource for self-learning is obviously the college library. The college library not only possesses plenty of books to meet the students' syllabus-oriented needs, but it also houses numerous books by eminent national and international authors on a variety of topics which students may regularly access to sharpen and broaden their knowledge. The library also possesses a number of magazines and periodicals related to different branches of science and technology which the students may readily access.
- The library also subscribes to a host of online and printed journals which are also made readily available to the students.
- The library also includes a computer room with internet access which is often used by students to access various forms of e-materials for their self-development.

Web based learning:

The internet is an open information system from where the students can obtain various kinds of information, media and materials as texts, images, video sequences which can help them in a diverse way for generating self-learning environments. Due to its interactivity, learners can gather information which is important in learning and helpful in accomplishing their learning objectives. Hence, the potential of the internet self learning mode is considered to be very high. Therefore, the Institute provides internet facility in both the academic and hostel campuses for 24 hr. The availability of internet facility allows them to learn and to gather the information from worldwide network without any interruptions.

Students are encouraged to visit NPTEL lectures, browse different internet sites to increase their knowledge base about the subject. Moreover, through these activities students acquire relevant knowledge which is beyond the syllabus as per the university curriculum.

- This apart, students are also endowed with various resource materials by the teachers for their self-development and they are also encouraged by them to participate in various competitions of technical innovations for which again they have to participate in innovative thinking and experimentations.

- The **Tech-Fest** organized by the college also serves to create opportunities for students' self-development based on extra-syllabus technological knowhow.

Collaborative learning

Collaborative learning is a method of instruction that basically involves grouping students to work together towards a common academic goal. The method is based on the theory that knowledge is a social construct that educational experiences that involve interaction and social exchange, that are contextually relevant and engaging and are student-centered, lead to deeper learning. Experts in collaborative learning claim that the active exchange of ideas within groups of students promotes critical thinking and there seems to be quite persuasive evidence that teams engaged in cooperative learning achieve at higher levels of thought and retain information longer than students who work solely as individuals. Collaborative learning creates a role shift between learners and teachers. The

responsibility for the process is placed on the learner, in the role of researcher of his/her field of study. By engaging in discussion and taking responsibility for their learning, students further develop their critical thinking.

Real life Example

Case analysis can help students develop their understanding of concepts and theory and how they are applied, refine their analytical and decision making skills, provide opportunities to synthesize learning in a variety of areas and ultimately build their confidence to deal with complex organizational situations.

Objective:-

The purpose or objective of doing Case Study is to allow students with real expertise and understanding, as well as judgement to excel.

Significance of results of case studies in class

A major advantage of teaching with case studies is that the students are actively engaged in figuring out the principles by abstracting from the examples. This develops their skills in:

1. Problem solving
2. Analytical tools, quantitative and/or qualitative, depending on the case
3. Decision making in complex situations
4. Coping with ambiguities

Peer Teaching:

Objectives:-

1. To provide a safe space and learning environment for young people without fear of judgment, misunderstanding, harassment or abuse. 2. To increase social connectedness and create a sense of belonging within supportive peer networks. 3. To provide positive role models, positive peer influences and opportunities which help young people to develop a positive self concept, self acceptance and high self esteem. 4. To prevent the onset or further development of mental health problems including depression, anxiety, self harm and suicidal ideation. 5. To increase confidence and to develop and enhance communication and social skills. 6. To empower young people to build personal resilience and improved help-seeking behaviour through increased knowledge of available support, reduced stigma associated with mental health difficulties and help-seeking, the development of positive coping strategies and the development of skills needed to access help. 7. To foster future thinking and optimism and to widen young people's understanding and beliefs of the opportunities available to them.

Significance of Results:-

- Students receive more time for individualized learning.
- Direct interaction between students promotes active learning.
- Peer teachers reinforce their own learning by instructing others.
- Students feel more comfortable and open when interacting with a peer.
- Peers and

students share a similar discourse, allowing for greater understanding. • Teachers receive more time to focus on the next lesson.

Brain storming session:

Objective:-

The Objective of the brainstorming session is to generate many creative ideas to answer a specific goal. It is best to express the goal as a question.

Significance of Results:-

Encourages Critical Thinking Which makes sense since brainstorming is meant to solve problems. Gets You Out of Your Head As Joe Master noted, we all walk into meetings with our own ideas, but the act of brainstorming forces us to consider and examine other people's ideas. Brainstorming Builds Teams Since brainstorming is a collaborative experience, no one person walks out of the meeting taking ownership of the results, thus it an absolute team effort.

Soft skill classes for personality development:

Understanding the need of one's personality that enables an individual to act more genuinely and effectively in a team environment, students are encouraged to deliver presentations in the class which help them to develop ability to gather information, make decisions and interact with others. Softskill classes empower students with confidence, boldness, expressiveness etc. Also the students' personality is overall developed

The Department of Humanities regularly organizes Soft Skill classes for various departments, based on availability and requirement, to enhance the students' communication skills, grooming and body language to equip them for the professional world.

Weak student support strategy:

Teachers attempt to enhance the performance of weak student as follows:

- Regular counselling and providing moral support to them by mentor teacher. For each teacher around 15 students are allotted for mentoring.
- Constant monitoring their performance in internal tests.
- Extra classes arranged for backlog subjects.
- Formation of study group with one or two bright students are kept as group mentor
- Encouraging them for regular attendance.

Bright student support strategy:

Faculty members make efforts to boost up the performance of bright students by;

- Encouraging them to score good percentile in their final examination for that teachers provide special and challenging assignments.
- Encouraging them to participate in seminars/conferences in different institutes.
- Students are encouraged to publish papers in various journals.

- Encouraging them to guide their weak classmates. Teaching others make them more perfect.

➤ **Develop lifelong learning attitude:**

Focus is given on developing abilities/ skills which are central to the discipline and help prepare the student on what is important to the discipline and also developing lifelong learning skills. This ability developed by giving specific assignments that help students learn/ unlearn/ relearn and adapt new technology/ knowledge as the field evolves.

Guidance for Technical Interview:

Objective:

To prepare students for technical interview;

Significance:

Interview proves important because it connects both the employers as well as job seekers. It assists employers in selecting a right person for a right job. It also helps job seekers to present their job skills and acquire a desired position on merit.

Provides employment opportunity - An interview provides an employment opportunity to the students. It helps an applicant to present and communicate his views, opinions and ideas to the employer. If a candidate performs well at the interview and meets employer's expectations, then he has a good chance of getting selected for a desired post.

Develop confidence in candidates - Fresh students, generally get nervous during their first few job interviews. However, after attending (facing) multiple interviews, they automatically develop a confidence in themselves. As experience builds up, they subconsciously develop skills to tackle a variety of interviews. Thus, routine interviews develop a confidence in the job-seeking candidates and boost their morale.

Guidance for Higher Studies:

Objective:

To prepare students for competitive examinations (e.g. GATE) as well as written tests/screening tests for placement activities.

Significance:

A higher education trains students (aspirant for higher studies) in their chosen field, but it also teaches them to understand complex subjects, think analytically, and communicate ideas effectively. A student also learns important skills, such as organization, self-discipline, and how to see a task from start to finish. A higher education helps become more professional and gives many work-related skills.

Study materials:

SI No	Broad Area	Download
1	Design Engineering	(i) Axial Loading (ii) Pure Bending (iii) Torsion of Circular shaft (iv) Vibrations (SDOF) (v) Rolling Contact Bearing (vi) Pressure Vessels (vii) Kinematics of Mechanisms (viii) Sliding Contact Bearing (ix) Theories of Failures (x) Gears (xi) Bearings
2	Thermal Engineering	(i) Thermodynamics
3	Production Engineering	(i) Geometry of Single Point Cutting Tool (ii) Pattern Allowance
4	Advanced/Emerging areas	(i) Introduction to Robotics (ii) Basics of CNC