



INSTITUTE OF ENGINEERING AND TECHNOLOGY

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NAAC)Hyderabad | PIN: 50006

Department of Mechanical Engineering

INNOVATIVE METHODS

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INTRODUCTION

At SREYAS we believe that, each student is unique and they have different level of grasping the concepts and knowledge. Here in our institute we believes that, students will learn and grasp concepts of any subjects if and only if he or she gets involved in activities such as make and learn, experiential learning, think and share, other group activities.

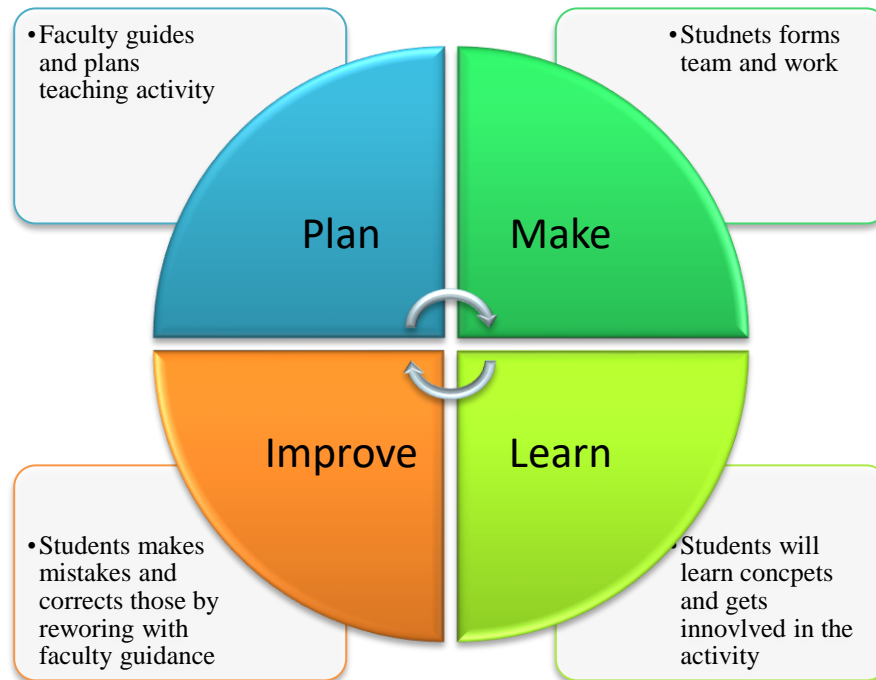
What is Special about SREYAS Teaching Methods?

- At SREYAS , we prefer and motivate students only to build their teaching models with guidance of faculty and lab technicians
- We don't like to purchase teaching models, we want to involve students in building these models

Why Students has to involve in making teaching Models?

- Firstly, it is fun for students to involve in such activity
- During building models they will face manufacturing and fabrication challenges which will trigger their minds to solve those problems.
- During building, they will understand the concept their and then only. The students who involves in work never forget those concept in his or her life.
- Students will get hand on experience of workshop technologies, manufacturing technologies and other aspects also
- It helps and motivates them to enhance their skills towards good projects in future

SREYAS Teaching and Learning Process: PMLI Approach



What is SREYAS PMLI Approach?

It's our approach developed and adapted by the department of mechanical engineering, which involved four basic steps in any activity we do. We have undergone continuous improvements in teaching and learning process over the past 6 to 7 years, and we have received great feedback from our students.

Basically PMLI Approach involves participative and experiential learning; here students will be involved in specific activities which are related to course.

Course Name: Engineering Graphics

Name of the Faculty who implemented: All Engineering Graphics faculty		
	Section: All First year	Topics : Orthographic Projections / Geometric Plane Model
Name of the activity:	Experiential learning/ Make and learn	

Objective of the Activity:

- To make a model for Students to understand the basics of projection planes such as VP,HP,LPP and RPP
- Students should be able to identify the angle of projections such as 1st angle, 2nd Angle , 3rd angle and 4th angle projection
- To prepare teaching aids for Students to understand different conic sections such as ellipse, hyperbola, parabola
- To make teaching models for the Students to identify different types of planes and solids
- Representation of Geometrical Planes for Showing Different Reference Plane From this model, the students can visualize the projection of objects in 2D and 3D
- By using these teaching models or aids, it become very much useful for faculty to deliver the lecture effectively
- Students will also understand the content and concept more clearly and in a better manner
- The same knowledge and skills they acquired in this activity will be helpful for the them in future courses and in career

Purpose of Model: To explain basics of orthographic projections

Materials: Wooden cardboards, pipes, hinge and white sheets

Method of teaching:

- Faculty explains basic projection planes using teaching model
 - Vertical Plane (VP)
 - Horizontal Plane (HP)
 - Left Profile Plane(LPP)
 - Right Profile Plane(RPP)
- Faculty shows the rotation of horizontal planes (HP) to demonstrate top view of the object to students and LPP and RPP to demonstrate side view of object

Technical Concepts Covered:

- Basics of projection planes
- Basics of Orthographic projection
- Projection of points and lines
- Projection of solids
- Projections of planes

Benefits to students:

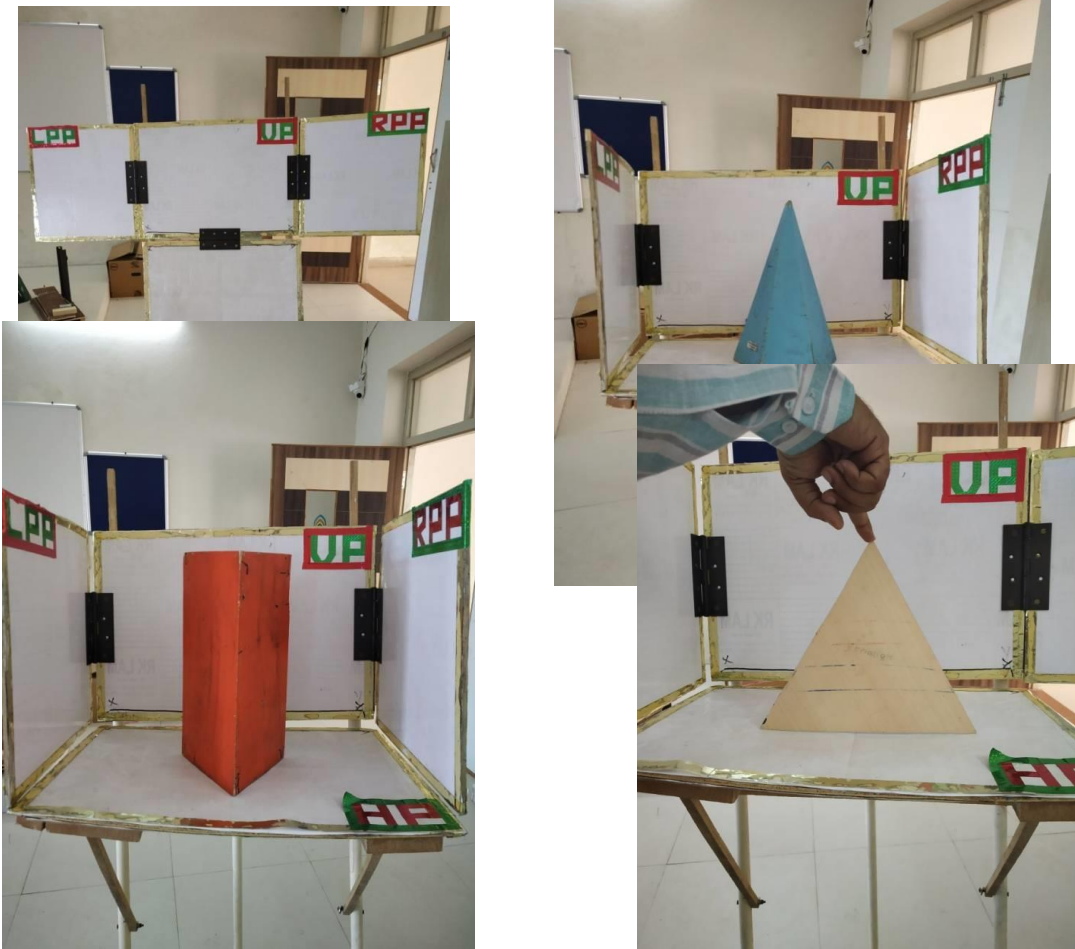
- Students will understand the concept of geometrical planes and orthographic projections clearly
- This builds strong foundation to understand engineering drawing of various components , which is the most fundamental skill for an engineer

- Ambiguities and confusion in understanding of projections will not occur

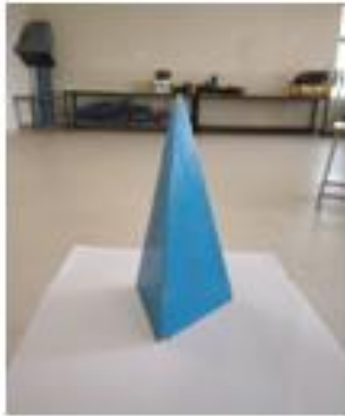
How we planned our teaching Learning Activity?

- First, faculty forms the team of students, and gives the task of preparing the models
- In the process of making they understand the concepts of conic section and basics of engineering graphics etc
- Then, the final models are used by teaching faculty to deliver the classes

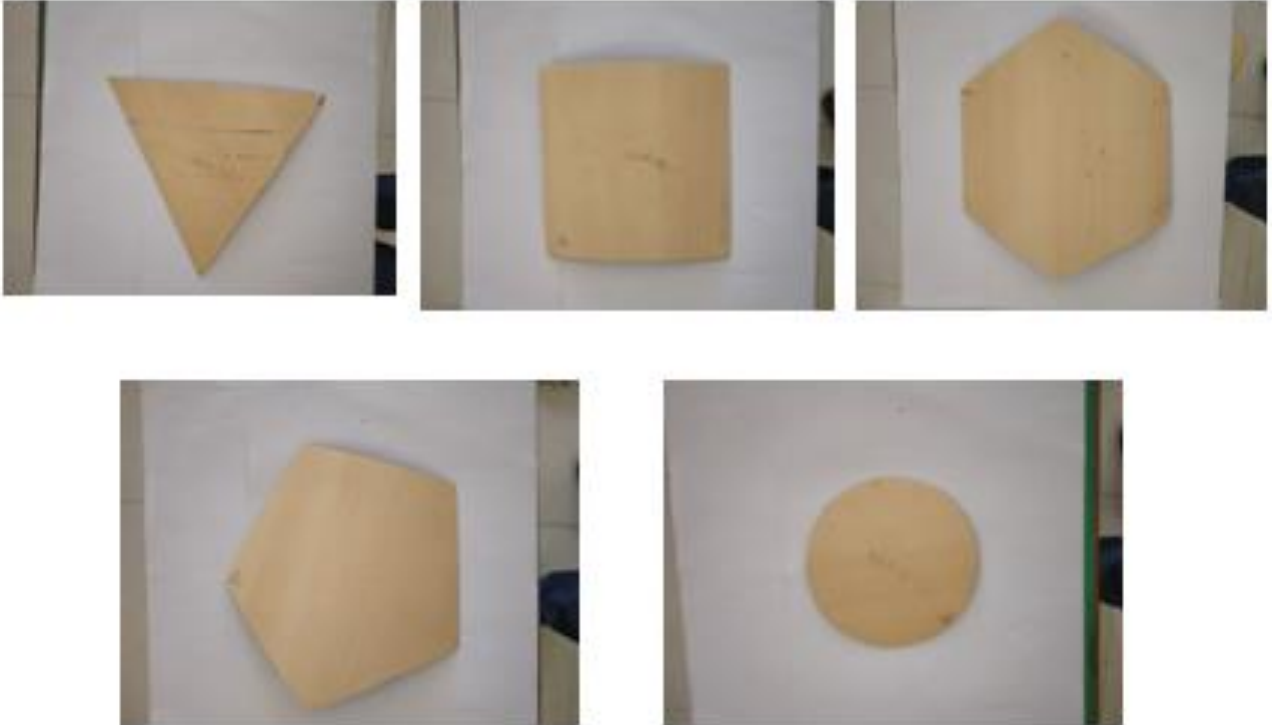
Photographs of the teaching models prepared by students for teaching engineering graphics course



MODELS OF SOLIDS



MODELS OF PLANES



CONIC SECTIONS



Course Name: Engineering Mechanics

Name of the Faculty who implemented: All Engineering Mechanics faculty		
	Section: All First year	Topics : Lame's Theorem Model / Friction Demo Model
Name of the activity:	Experiential learning / Participative Learning	

1. Lame's Theorem Model:

Course: Engineering Mechanics

Purpose of Model: To demonstrate parallelogram law of forces and Lame's Theorem

Materials: Wood, Pulleys, Strings and Weights

Method of teaching:

- Students are divide to a groups each consists of 2 to 3 members
- Each group conducts experiments to understand the working principle
- Faculty ask questions to judge their understanding of concept
- Faculty explains the concept again to students
- Faculty encourages students to ask any further question on concepts
- Students are asked to solve problems on their own
- Finally teaching faculties summarize and explain the application of the concept in real world.

Technical Concepts Covered:

- Parallelogram Law of Forces
- Lamis Theorem
- Types of forces
- Equilibrium of forces

Benefits to students:

- Students will gain interest in learning technical concepts
- Students will directly involve in conduction of experiments
- Students will come forward to give their suggestion or ask their questions.
- Mainly they understand concept or law clearly so that they can understand and apply in upcoming chapters/courses as well.

Sample Picture of Model:**2. Friction Demo Model****Course: Engineering Mechanics****Purpose of Model:** To explain concept of friction**Materials:** Wooden cardboards, hinges, protractors, blocks, pulley, weights, strings and different surfaces**Method of teaching:**

-
- Faculty explains parts of the model
 - Faculty can call any students to come and perform some random experiments; other students will observe the demo with interest.
 - Faculty gives chance to other students to come and perform
 - After this exercise faculty explains concepts of friction such as angle of repose, coefficient of friction and laws of frictions with some simple demo examples
 - Faculty encourages to students to try for new things on existing teaching models
 - Students are divided into groups and asked to perform small experiment and to write note on what they learnt.
 - Faculty the solves some problems on friction, which makes students comfortable and interesting
 - Faculty now gives medium and application level problems to students to test their understanding and applying skills to solve real world problem
 - Students are asked to solve previous year question papers.

Technical Concepts Covered:

- Basics of Friction
- Laws of friction
- Angle of repose
- Coefficient of friction
- Simple friction problem

Sample Picture of Model:

Course Name: Robotics

Name of the Faculty who implemented: Mr. Praveen B Ronad		
	Section: IV Mech A&B	Topics : Building of an Robot
Name of the activity:	Experiential learning / Participative Learning	

Objective of the Activity:

- Students should be able to understand basic components of the industrial robotic arm
- Students need to design and model a robotics parts in 3D CAD Software's
- Students should be able to understand assembly issues and working of a robotic arm
- Students need to understand the working of Motor Drives and its Control

How we planned our teaching Learning Activity?

- 1. Plan:** Here faculty will provide simple tasks to team of students, Students follow following process in order to learn the concepts



2. **Execution Phase:** A team of students will work on their allotted task and consult the concerned faculty if they encounter any difficulties, if required the industry support also be provided by calling experts and taking their advices.
3. **Evaluation Phase:** Here the parts are assembled and robotic arm is tested for its working.
4. **Improvement Phase:** Students will be asked to apply the skills leant in this activity to other fields.

Outcome of the activity:

By adapting this teaching and learning process, following outcomes were achieved

- Students got hands on experience and training on design and development of robotic arm. In this process they got the knowledge of CAD Model, Drivers, Design and Manufacturing Aspects such as 3D Printing.
- Students understood and worked in a team work.
- Students worked on assembly of the robotic parts such as base, arm, and end effectors
- Based on the skills obtained in this activity, no they can apply the skills in their future careers and development works

Department of mechanical Engineering has signed MoU with Innovatio Drop Pvt LTD, to establish robotics research center and provide robotics training to our students

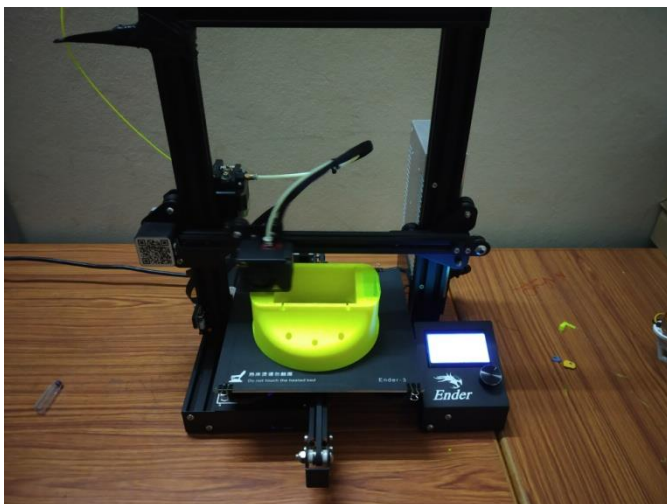
Photographs of the activity:

Making of Serving Robot Body



Making of Robot Body using Sheet Metal

Making of Industrial Robotic Arm:



3D Printing of Robotic Base



Industrial Robotics Arm 3D Printed Parts



Internal Review was conducted by concerned faculty and experts from industry

Feedback from students:

Students felt very happy and they expressed their satisfaction over these activities. They informed us that, they will look forward to use these skills for upcoming works

Course Name: Material Science and metallurgy (MSM)

Name of the Faculty who implemented: Dr. A C Umamaheswar Rao		
	Section: II Mech A&B	Topics : Iron-Carbide Diagram, Isothermal Transformations
Name of the activity:	Muddiest point	

INTRODUCTION:

Muddiest point combines an active learning technique with a classroom assessment technique, and as such is a great formative assessment tool which you can use to determine what your students may be struggling with. Students make note at the end of a class period (or lesson or module) which topics students would like additional help with. These topics are then summarized, the summary presented to the class, and the points discussed.

BENEFITS:

Muddiest point gives students an opportunity to disclose their “struggles” in a relatively safe manner, via a note to the teacher (or a post to a forum in an online class). Once feel safe sharing which pieces of information/knowledge that they are having trouble with, students may be willing to participate more in the classroom as well.

WHEN TO USE:

- To assess level of clarity on a unit/module before beginning a new one
- At the end of class to determine level of understanding
- In an online class, anytime the student has a question about content

METHOD:**Face to face:**

1. At the end of a class/unit/module, the students are asked to jot down on slips of paper which point was the “muddiest” (least clear). Students turn in the slips to the instructor.
2. Later that day, sort the slips into piles based on their content
3. Make note of any unclear points for perhaps adjusting future lectures/presentations
4. Determine which points were brought up the most often – perhaps the top 2 or 3
5. The next day, summarize your findings for the class. For example, “Half of you thought X was the muddiest point, while 25 percent each thought Y or Z was the muddiest point. Let’s review all three, in that order.”

NOTE: Summarizing the findings is a piece that is often missed using this technique. Sharing the results with the class “closes the loop” on assessment. It connects the teacher to the students, and thus teaching to learning.


Online:

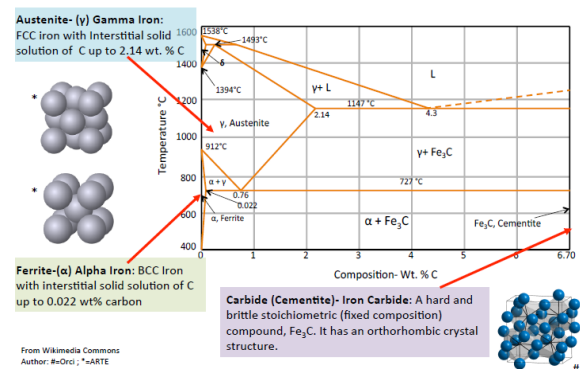
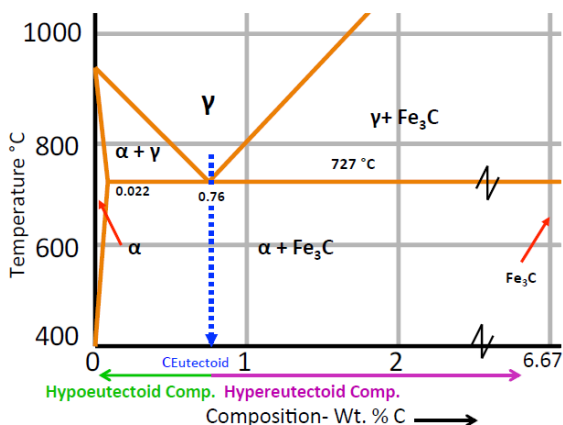
1. The instructor creates a discussion group called “muddiest point forum”, allowing posts and replies.
2. Students are introduced to the forum in the course orientation documents.
3. Students may post questions that they have about course content.
4. The instructor answers the questions in the forum. As an option, students may also be given the opportunity to reply to each other as well.

Muddiest Points

Phase Diagrams III: Fe – Fe₃C Phase Diagrams

Muddiest Points:

- 
- “What is the difference between eutectoid, hypoeutectoid, and hypereutectoid?”
 - “What are ferrite, austenite, and cementite?”
 - “Reading the phase diagram was very tough.”
 - “I don’t know what 1020, 1060, or 10100 steel means.”
 - “What does each phase represent? What is gamma?”

What Are Characteristics of Important Phases on Fe – Fe₃C Diagram?Fe-Fe₃C Phase Diagram Eutectoid Reaction- Steel

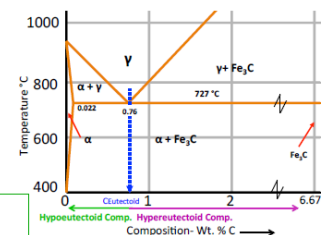
Steel Terminology & Phase Properties

General Properties:

- Ferrite: α - BCC Fe 0.022 wt% C max. Ductile.
- Austenite: γ - FCC Fe 2.14% C max. Ductile.
- Cementite: Fe₃C – Stoichiometric. Hard and brittle ceramic.

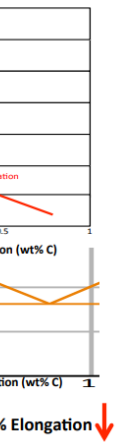
SAE-AISI Terminology: YY XXX Carbon Steel

- First 2 or 3 digits give steel **alloy type**
 - 10xx is plain carbon steel (no alloy elements)
 - 41xx is a common alloy steel (Cr 0.5-0.95%; Mo 0.12-0.30%)
- See <http://www.keymetals.com/page.aspx?ID=CheckArticle&site=kts&NM=333> for more information
- Second 2 or 3 digits give %C content x 100
 - YY80 has 0.80 wt% C
 - YY100 has 1.0 wt% C



Classification	% Carbon
Low Carbon	<0.30% C
Medium Carbon	0.30%-0.60%
High Carbon	0.60%-1.00%
Ultrahigh Carbon	1.25% -2.00%

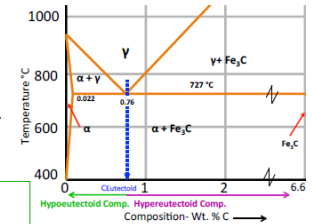
al Properties?



Steel Terminology & Phase Properties

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- See <http://www.keymetals.com/page.aspx?ID=CheckArticle&site=mts&NM=333> for more information
- Second 2 or 3 digits give %C content x 100
 - YY80 has 0.80 wt% C
 - YY100 has 1.0 wt% C

AISI Carbon Steel Classification Chart	
Classification	% Carbon
Low Carbon	<0.30% C
Medium Carbon	0.30%-0.60%
High Carbon	0.60%-1.00%
Ultrahigh Carbon	1.25%- 2.00%

PPT used for explaining Iron Carbide diagram using Muddiest Point activity

Course Name: Kinematics of machinery (KOM)

Name of the Faculty who implemented: Mr. Praveen B Ronad		
	Section: II Mech A&B	Topics : Mechanisms
Name of the activity:	Experimental Learning and Participative Learning	

What is the Necessity to innovate teaching methods in KOM?

Kinematics of Machinery is a one of the most fundamental course for mechanical engineering students; they should learn and understand construction features of various mechanisms. Student will understand working principal any mechanism if and only if he makes a sample mechanisms

on his own. In the process of making one, he learns by participative learning by rectifying mistakes in the process.

How do we adopt the method of participative learning and Experiential Learning?

1. **Plan:** First our teaching faculty forms a team of students and mentors them to create working mechanisms. Here students will work in a team and they need to produce the working mechanisms. Students will search for the available information from the internet and other sources such as animations, by this they will get a brief idea of what they want to do. Students will collect the materials they need in order to make mechanisms
2. **Design:** They draw the mechanisms with all dimensions and get approvals from respective teaching faculty; here faculty will correct any mistakes done by the students. Sometimes it's better to let students make mistakes.
3. **Make:** Students will be allotted technicians to help them in making mechanisms, once mechanisms are made, students will check the working conditions.

4. **Exhibit:** At the end, the Faculty will organize an exhibition of all mechanisms in front of eminent persons from the industry and academia, their feedback will be taken and all suggestions will be taken into consideration.



Process flow of Experiential Learning

So, we have followed the above process and organized a mechanism day, students were really happy and confident and they expressed their satisfaction in their learning process. So, it's one of the examples of how we use different innovative teaching and learning methods. We strive continuously and keep on developing new teaching and learning methods in order to make the teaching and learning process more interesting and effective.

Preparation of Mechanisms



Exhibition of mechanisms



Course Name: Additive Manufacturing Technologies (AMT)

Name of the Faculty who implemented: Mr. Praveen B Ronad		
	Section: IV Mech A&B	Topics : 3D Printing of Sample Parts
Name of the activity:	Experimental Learning and Participative Learning	

Objective of the Activity:

- Students should be able to Produce 3D Printed parts
- Students should be able to understand working of 3D Printers and Materials used
- Students should be able to identify and solve issues in Additive Manufacturing

How we planned our teaching Learning Activity

1. Planning Phase: Faculty Forms team of students and gives them a group task

For Example: To Design and 3D print Simple Parts

2. Execution Phase: Each team may have 3 to 4 Students and one team leader, Team leader assigns the particular tasks to his members. Such as

- Preparation of CAD Model
- Testing of 3D Printer
- Printing the Parts
- Testing the parts

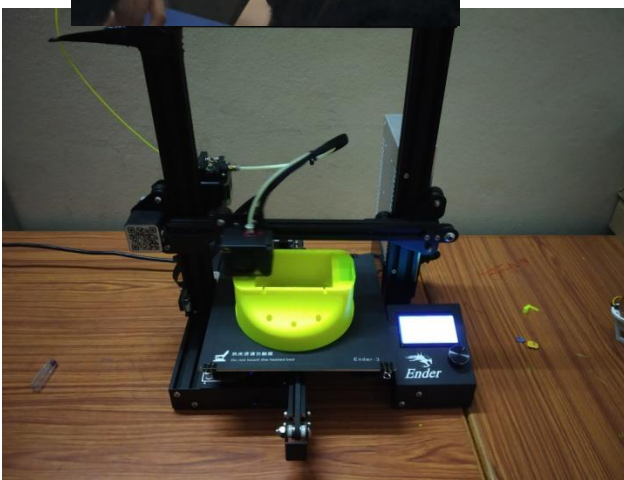
3. Evaluation Phase: Here, Students Will Show their 3D Printed Parts to Faculty. Faculty will verify and gives suggestions and feed back

Outcome of the Activity:

- Here, By participation in the said activity , students will get hands on practice of 3D Printing of simple objects
- Students shows interest and enthusiasm in learning the course
- They will realize the potential applications of additive manufacturing technologies
- Students Can create Robot parts using 3D Printing for their Projects

Feedback from students:

Students felt really happy and they expressed satisfaction regarding the learning experience

Photographs of the activity:

3D Printed Part

3D Printing of part in Action

ICT enabled tools for effective teaching-learning process

CONTENTS

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1. Introduction

It is only through education and the integration of ICT in education that one can teach students to be participants in the growth process in this era of rapid change . ICT make education system more productive, interesting, give more powerful instruction and also able to extent the educational opportunities to masses and creating information –rich learning environment.

To ensure that students play an active role in the learning process, Faculty make use of Information and communication technologies (ICT)in teaching-learning process.

- All our classrooms and laboratories are equipped with LCD Projectors.
- The teachers are encouraged to use modern teaching pedagogy, in addition to conventional classroom teaching practices. Faculty applies teaching methods such as group discussions, seminars, student presentation for better understanding of concepts/ technologies using ICT.

The Teaching-Learning Process is supported with Regular Practical Sessions, access to Digital Library, Online Courses (MOOCS, NPTEL etc.), online journals, Use of LCD projectors for seminars and

workshops, productive use of educational videos, Communication skills training facility make the students to acquire proficiency in listening, speaking, reading and writing.

- The college has a central library well equipped with books & e-books, technical magazines, journals & e-journals and access to NPTEL lecture videos in the library, which serves as a knowledge resource.

The students and faculty are motivated to register for online NPTEL Certificate courses and additional online courses like CODE NINJA, EDUREKA etc.

Various Teaching and Learning Pedagogies used

Course Delivery Methods	Justification
Whiteboard and marker (Lecture Method)	<ul style="list-style-type: none"> • To convey basics, critical information, history, background, theories and equations. • To expose the students to contemporary issues • Quick way to reach large numbers of students for exchange of useful information
Blended Teaching	<ul style="list-style-type: none"> • Usage of Teaching aid Techniques such as Video Lectures, Power point presentations. • Implementation of Active learning strategies such as Collaborative and individual Learning activities.
Laboratory Demonstration	<ul style="list-style-type: none"> • Theory verified by practical approach using various data acquisition systems in the analysis. • Students learn to work in teams and understand the importance of Multi-disciplinary courses in real world applications.
Course Handout	<ul style="list-style-type: none"> • Course handout consists of Video lectures, Lecture Notes, Assignment questions, Tutorial questions and answers a model question papers.

2. Facilities Available

S. No	Facility	Total Number
1	ICT Enabled Class Rooms	13
2	Tutorial Rooms	03
3	Laboratories	13
4	Seminar halls	01
7	Research and Development Lab	01
8	Computer Center	02
9	Auditorium	01

Details of ICT Enabled Class Rooms:

S.No	Block	Room Number/Class	Floor	Area (sq. m)	Department
1	A	IB-101 / CSE –III A	First	69	Computer Science and Engineering
2	A	IB-102 / CSE –III B	First	83	
3	A	IB-103 / CSE –III C	First	69	
4	A	IB-104 / CSE – M.Tech	First	34	
5	A	IB-106 / CSE –II A	First	69	
6	A	IB-108 / CSE –II B	First	70	
7	A	IB-109 / CSE –II C	First	70	
8	A	IB-110 / CSE –II D	First	70	
9	B	IB-113 / CSE –III D	First	69	
10	B	IB-115 / CSE –IV A	First	69	
11	B	IB-117 / CSE –IV B	First	69	
12	A	IB-303 / CSE –IV C	Third	69	
13	B	IB-121 / CSE –IV D	First	69	

Details of Tutorial Rooms:

S.No	Block	Room Number	Floor	Area (sq. m)	Department
1	A	IB-111	First	69	Computer Science and Engineering
2	A	IB-112	First	34	
3	A	IB-302	Third	84	

Details of Laboratories:

S.No	Block	Room Number	Floor	Area (sq. m)	Description
1	AB	AB-101	First	122.6	CSE Lab – I
2	AB	AB-102	First	122.6	CSE Lab – II
3	AB	AB-201	Second	123	CSE Lab – III
4	AB	AB-202	Second	123	CSE Lab – IV
5	AB	AB-301A	Third	123	CSE Lab – V: R&D / PROJECT Lab
6	AB	AB-301B	Third		CSE Lab –VI
7	AB	AB-302A	Third	123	CSE Lab – VII
8	AB	AB-302B	Third		CSE Lab – VIII
9	AB	AB-305	Third	123	CSE Lab – IX
10	A	IB-002	Ground	83	CSE Lab X
11	B	IB-118	First	69	CSE Lab XI
12	B	IB-119	First	140	CSE Lab XII
13	B	IB-120	First		CSE Lab XIII

Details of Seminar Halls :

S.No	Block	Room Number	Floor	Area (sq. m)	Department
1	A	IB-308 IB-309	Third	138	Computer Science and Engineering

Details of Research & Development Labs:

S.No	Block	Room Number	Floor	Area (sq. m)	Department
1	AB	AB-301A	Third	62.73	Computer Science and Engineering

Details of Common Computer Centre:

S.No	Block	Room Number	Floor	Area (sq. m)	Department
1	AB	AB-306	Third	181.2	Computer Science and Engineering
2	AB	AB-305	Third		

3. Geo Tagged Photographs

3.1 ICT enabled Class Rooms

Department of Computer Science and Engineering

III CSE A Class Room



III CSE B Class Room



III CSE C Class Room



M.TECH CSE Class Room



II CSE A Class Room



II CSE B Class Room



II CSE C Class Room



II CSE D Class Room



CSE Tutorial Room



III CSE D Class Room



IV CSE A Class Room



IV CSE B Class Room



IV CSE C Class Room



IV CSE D Class Room



3.2 ICT Enabled Laboratories

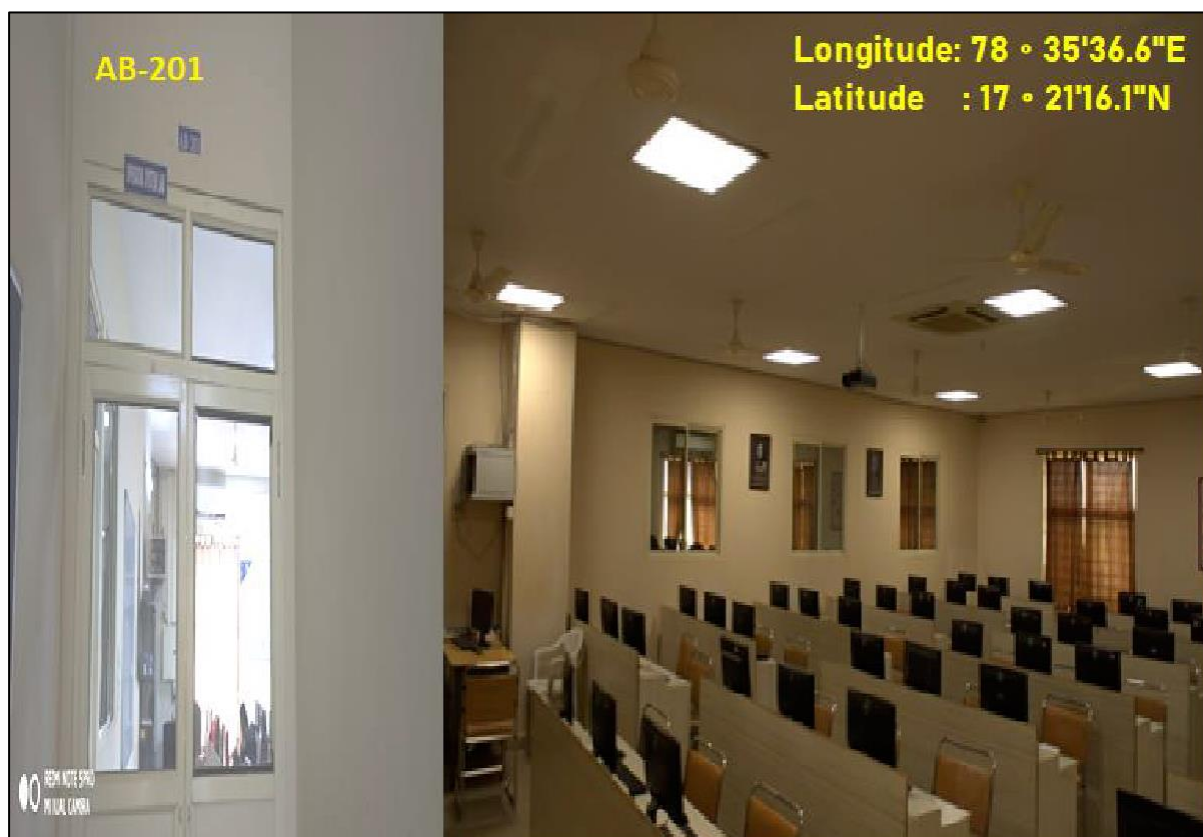
CSE LAB: AB-101



CSE LAB:AB-102



CSE LAB:AB-201



CSE LAB:AB-202



CSE LAB:AB-301A



CSE LAB:AB-301B



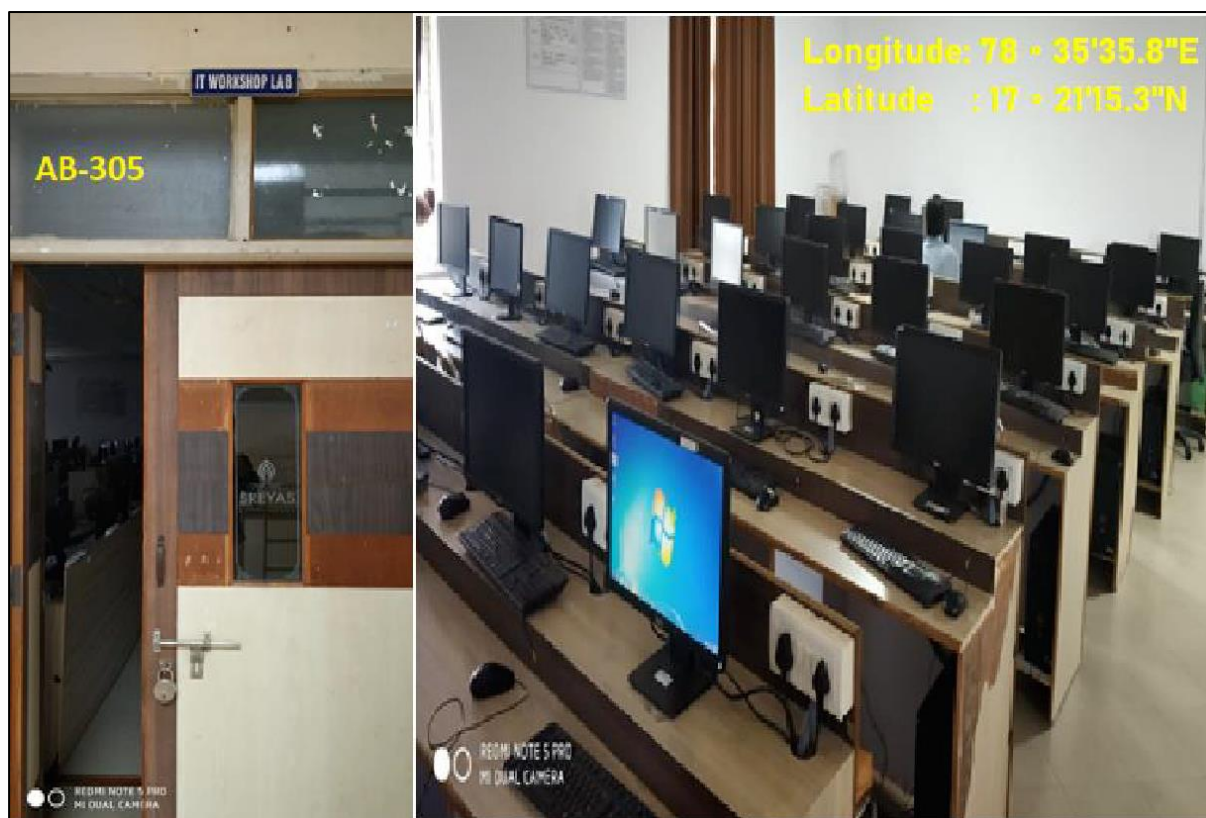
CSE LAB:AB-302A



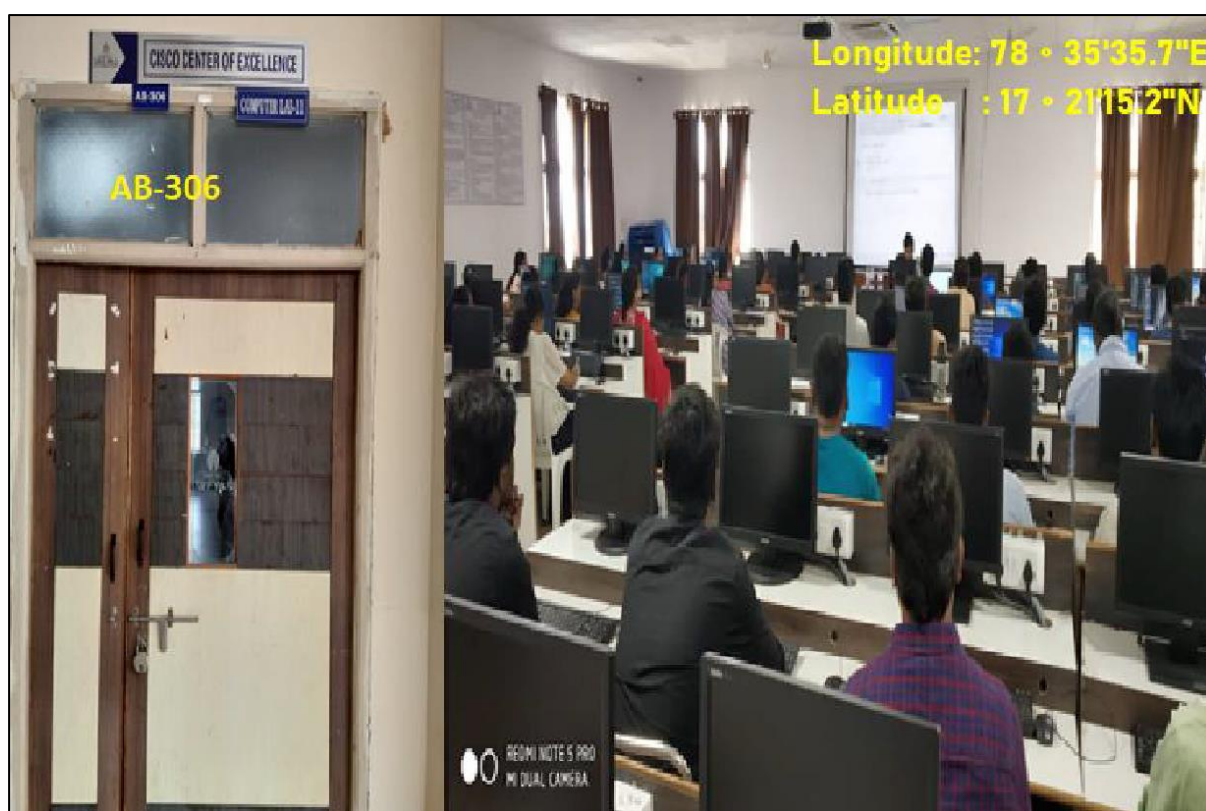
CSE LAB : AB-302B



CSE LAB : AB-305



CSE LAB : AB-306





Using ICT facility in Laboratory

3.3 ICT Enabled Auditorium



Using ICT facility in Auditorium