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5.1 Innovations by the faculty in Teaching and learning

The use of innovative methods in teaching and learning has the potential to improve education, empower students, strengthen governance, and galvanize the effort to achieve the student's development. Innovative practices are introduced in teaching-learning to raise the curiosity of students in a wide domain to encourage the students to question the obvious and to increase the interaction in the class. All these innovative methods adopted in teaching-learning, on a long-term basis help students to build team spirit, moral principles, social responsibilities, information sharing, and develop the skill of organizing college & intercollegiate events, etc.

The evidence of the success of innovative practices is visible both qualitatively as well as quantitatively. The qualitative factor improves etiquette and desire to understand. Also, it will help to change the overall perspective towards life. The quantitative factor improves academic performance and motivates participation in co-curricular activities.

The following are the best and innovative practices undertaken by the faculty members of the Department of Mechanical Engineering, for improving teaching and learning experiences.

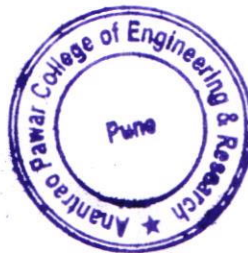
5.1.1 Online Teaching and Learning Resources

Teaching and learning at APCER, Pune continued despite the lockdown caused by the COVID-19 outbreak. There have been methodical attempts made to start and carry out online instruction/teaching. Zoom, Google Meet, Microsoft Teams were utilized for conducting teaching, webinars and other educational activities during the first stages of the lockdown. In addition, other apps including Telegram, WhatsApp, and Google Classroom were also utilized for sharing the notes and other materials.



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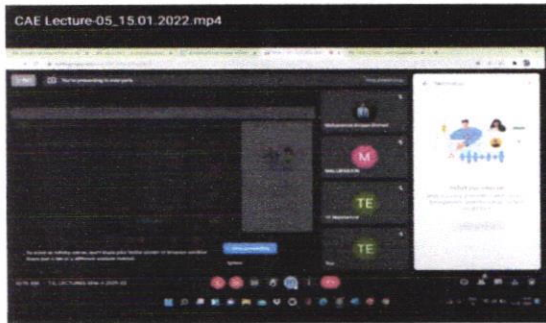


Fig. 5.5.1.A Online Lecture on Google Meet Platform

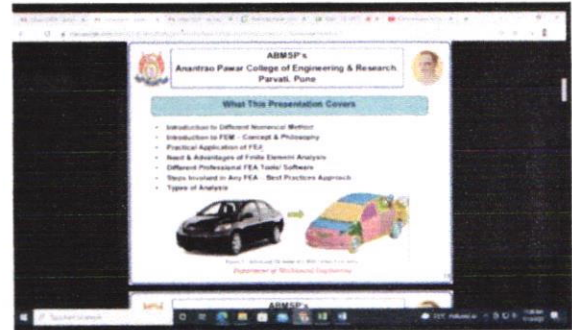


Fig. 5.5.1.B Online Lecture on Google (Subject PPT)

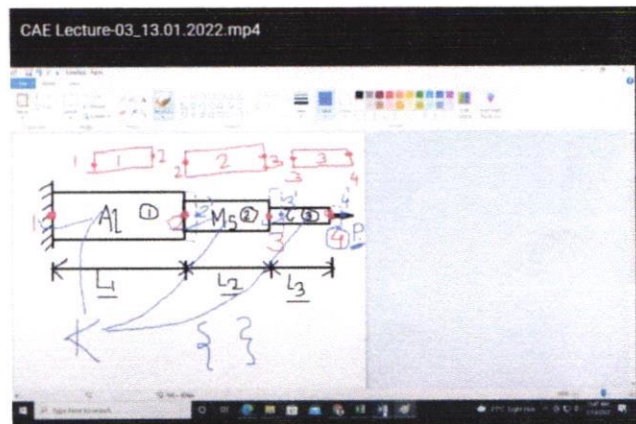


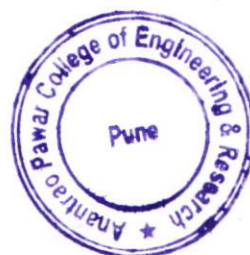
Fig. 5.5.1.C Giving Example on MS Paint through Online Lecture

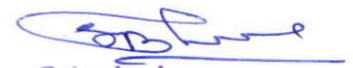
Outcome:

- During the pandemic period, this methodology has helped students to interact and learn the subjects effectively.
- The platforms helped the students to get the study material, interact with the faculty, solve and submit assignments and enhance their thinking ability through the tests as well as quiz sessions conducted by almost every faculty member.





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5.1.2 Prepared 3D & Cut Sectional Model

Design of Machine Elements: The development of imagination is a crucial step in the learning process. 3D models and its demonstration make it easy to understand and visualize which helps in developing thinking ability during drawing views of the objects. In a class review, students have suggested that interaction with such a method led to a better understanding of the engineering drawing in orthographic projection and Isometric views.

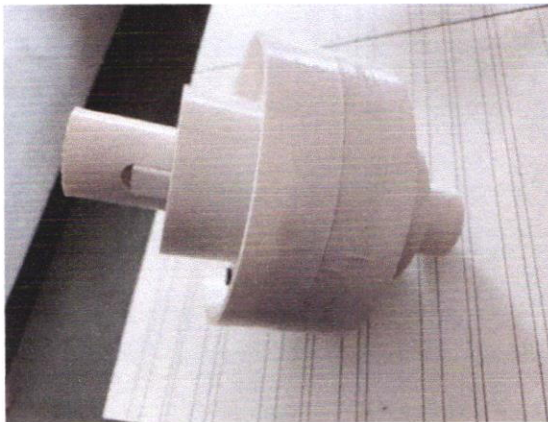


Fig. 5.5.2.A Assemble Model of Flange Coupling

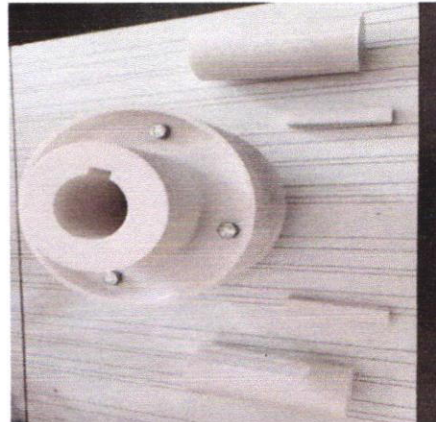


Fig. 5.5.2.B Disassemble Model of Flange Coupling

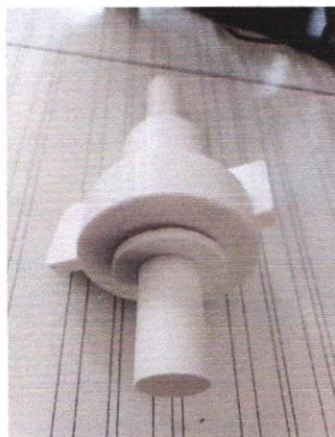


Fig. 5.5.2.C Assemble Model of Cotter Joint

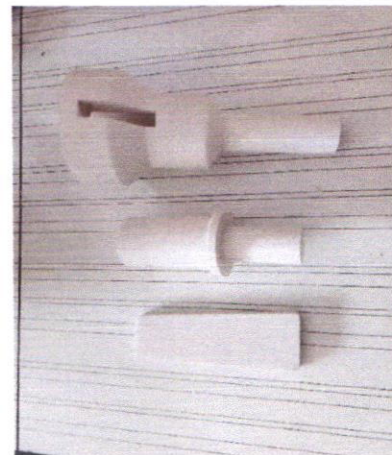


Fig. 5.5.2.D Disassemble Model of Cotter Joint





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5.1.3 Use of Working models/Animations/ Miniprojects/PPTs/Charts/ CASE studies

In many relevant subjects, faculty encourage the students to make miniature working models of mechanisms and machine components. The faculty members also make use of cut sections as well as working models to enhance interest and level of learning.

The department also has cut section of the engine parts which helps students to understand the concept in a better way. Some faculty members develop models as well as mini projects with the help of students. All the classrooms are well-equipped with high quality projectors ready for use any time.

Each faculty has prepared PowerPoint presentations which were extensively used in pandemic period for online teaching and learning. The extensive use of charts, animations and Case studies help the students to understand the concepts in easier way.

Outcome:

- Working models and mini-projects enhances systems thinking abilities of the students. Models and model development are useful for helping students learn quantitative skills such as working, graphical analysis, visualization; and computational skills.
- Animations, Charts and Case studies help students to understand and grasp the concept easily.







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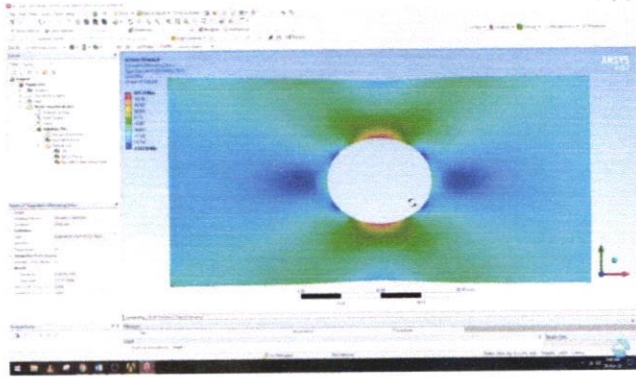


Fig. 5.5.3.A Online Learning Through YouTube

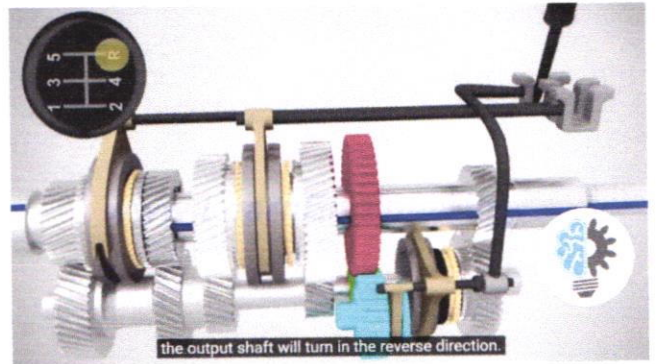


Fig. 5.5.3.B Animation Video on Transmission System

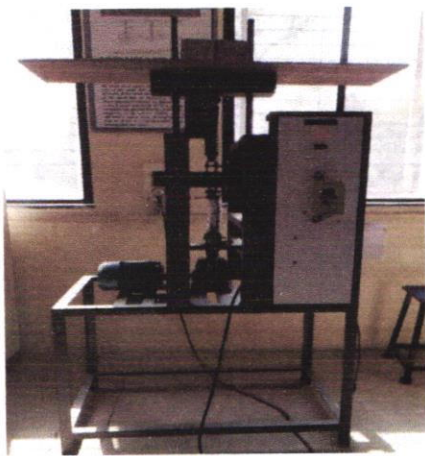


Fig. 5.5.3.C Shock Absorber Test Rig Model (2DOF)

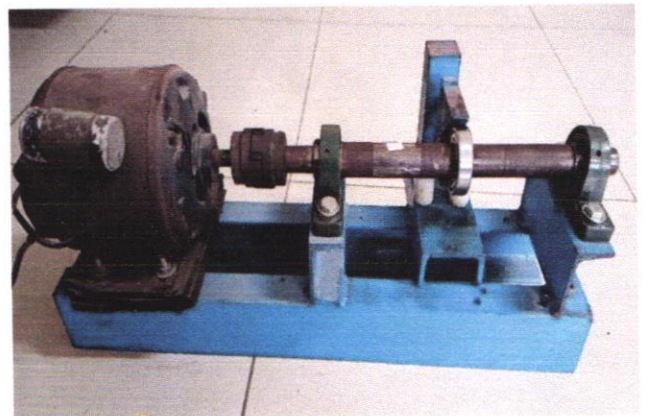


Fig. 5.5.3.D Bearing Testing Model (Healthy & Faulty)





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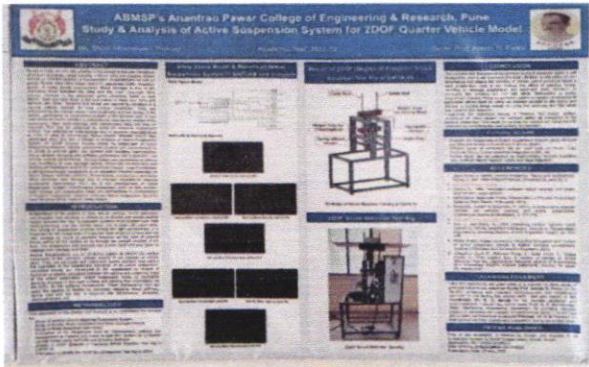


Fig. 5.5.3.E Chart of Project of 2DOF Vibration Test Rig Facility (Passive Suspension)

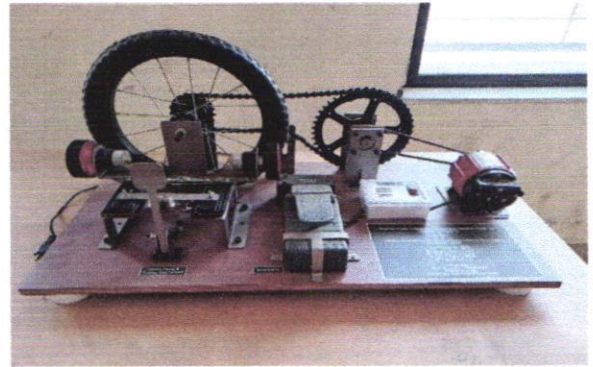


Fig. 5.5.3.F Working Model of Regenerative Braking System

5.1.4 Project-Based Learning Excellence in Department

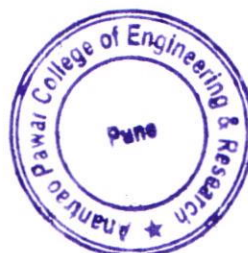
The aim of these activities is to expand technical understanding by actively engaging the students in real-world and personally meaningful projects. PBL has been introduced with the goal of motivating students to learn by working cooperatively in groups to solve a problem. PBL is a student-centered pedagogy that employs a dynamic classroom approach in which students are believed to gain a deeper understanding through active exploration of real-world challenges and problems. Problem-based learning will also alter the role of the teacher as a mentor in the learning process. The projected difficulty levels are decided to be moderate for SE students and are limited to working prototype. The students explore their work further for their BE project. Students are involved in these research projects to learn excellence.

Projects running under Department as a Excellence in Department as follows-

1. Gantry System & Agrowbot (Smart Polyhouse)
2. EV Hand Cart
3. EV Campus Vehicle
4. Self-Retaining Surgical Retractor for Medical Application
5. Unmanned Arial Vehicle (Drone)



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Fig. 5.5.4.A External Image of Polyhouse Structure

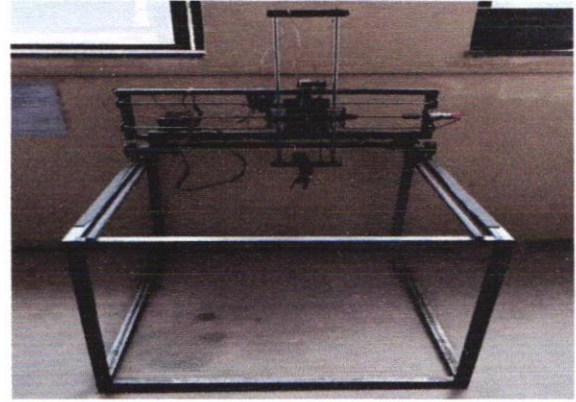


Fig. 5.5.4.B Gantry System with Agrowbot Prototype Model

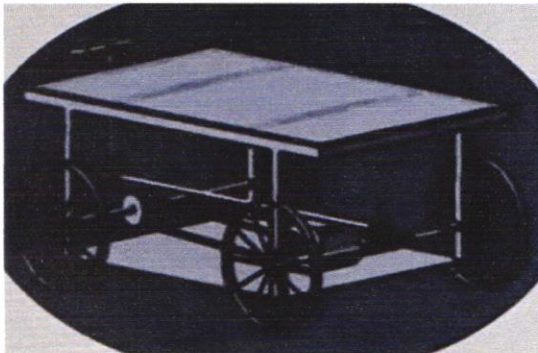
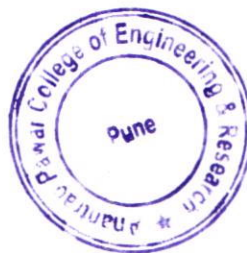


Fig. 5.5.4.C CAD Model of EV Hand Cart



Fig. 5.5.4.D Concept Model of EV Campus Vehicle





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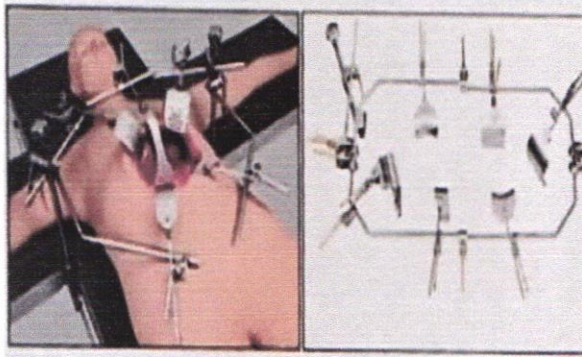


Fig. 5.5.4.E Concept Model of Surgical Retractor



Fig. 5.5.4.F Unmanned Arial Vehicle (Drone) explained to Dr. Amit Dutta (Director-AICTE)

Outcome:

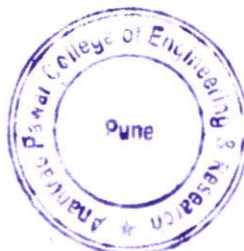
- Such projects encourage students to develop a balanced, diverse approach to solving real-world problems, both on their own and in a team.

5.1.5 Group Activity of Topic Preparation and Presentation

This method of teaching and learning is used to make students aware of reference books and quality publications from well-known authors in the respective domain and also improves the reading habits of the students for quality books and literature review. The group collectively summaries the topic and delivers the presentation in the class.





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5.1.6 Quiz Contest


A quiz contest is a fun and effective way to ensure that students actively participate to maximize knowledge. These competitions motivate and engage teachers and students to put their best foot forward. It also builds confidence in students. Students become more pro-active by undertaking these activities.

5.1.7 Activity-Based Teaching


The objective behind the activity-based teaching is to give a platform to share knowledge among the students. It helps to showcase their creativity and hard work by constructing a model/poster work. Further, the interaction of weak and average students with fast learner fellow students will give them exposure to various concepts and help them to understand in depth.





Fig. 5.5.7 Project/Mini Project Exhibition explained to Guest (Expert) by Students


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5.1.8 Hands-on practice for Diagrams / Sketch

The method of hands-on practice sessions of drawing sketched on the various subject of engineering, where drawing a neat sketch is more important for convincing the working of a particular mechanism or concept. Department of Mechanical Engineering, faculty on regular basis explain how to draw a schematic diagram and it's working and at the end of the lecture (after cleaning the board) ask to draw and submit as an assignment for evaluation.

5.1.9 On Job Teaching

This innovative teaching method, using the actual tools, equipment, or materials give a better understanding and real work experience. This helps students to learn things for life long. Faculty, especially for the IC engine topic uses this method to demonstrate and explain actual assembly and working. Also, daily maintenance or minor setting could be carried out on their own.

5.1.10 Flipped Classroom

A flipped classroom is an instructional strategy and a type of blended learning focused on student engagement and active learning, giving the instructor a better opportunity to deal with mixed levels, student difficulties, and differentiated learning preferences during the in-class time. Faculties of the Department of Mechanical Engineering, adopt this practice for improving the interaction between the students, to make it a joyful teaching-learning experience.

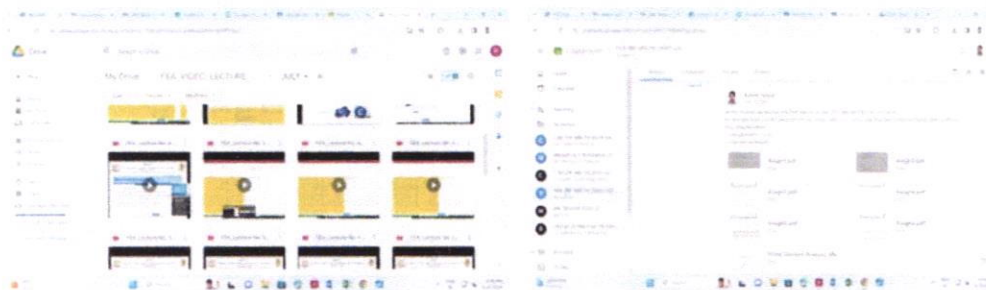
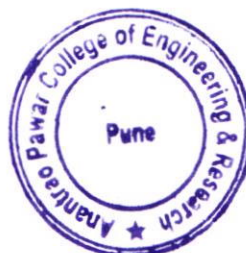


Fig. 5.5.10 Video Lectures in Drive shared with students with Assignments (before coming to lecture)





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5.1.11 Hands-On Training Workshops

Department of Mechanical Engineering organizes workshops on a specific subject to bridge the gap between industry and academia. The objective of such a workshop is to provide hands-on exposure to the students. These workshops are also used to cover the curriculum gap.

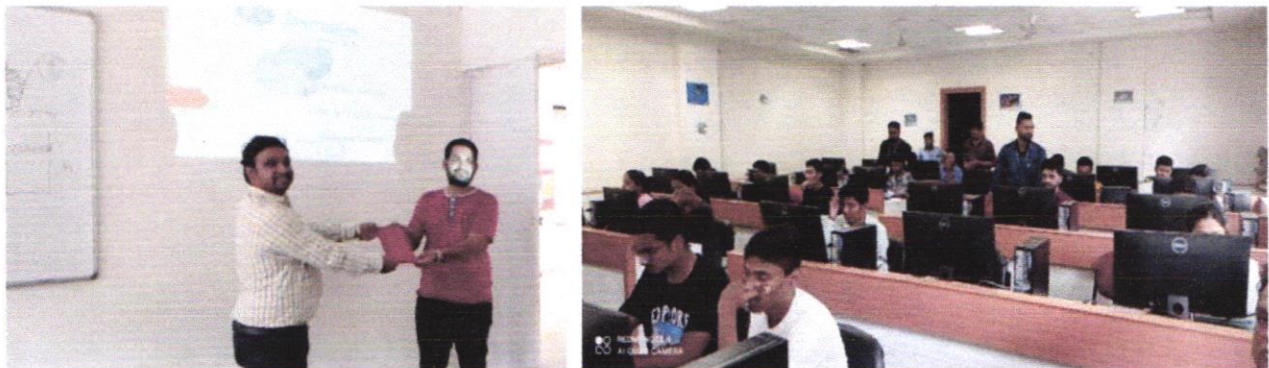



Fig. 5.5.11 Hands on training workshop on Hypermesh (Analysis) software

5.1.12 Content Beyond Syllabus


Faculties of the Department of Mechanical Engineering believe in teaching beyond the syllabus, it strengthens and expands students existing knowledge and adds interest to the subject. These practices lead to improve attendance and advanced teaching-learning. Subjects/topic related to Honors including Electric Vehicle Technology, Internet of Things are to be learn by students beyond the syllabus. Also, doing research on Smart-Polyhouse by developing the Gantry System and Agrowbot which is content beyond the syllabus.



5.1.13 Creating Video Lecture and Learning Resources

Faculties use this tool to share the lecture content and make it available with students at any time for their reference. In this method, faculties prepare a video of the content and make it available to the student on Google drive recorded lectures (shared on drive through Google classroom) etc. This is more beneficial to those who are not able to attend college due to various reasons. It also


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helps the weak student to revise the classroom session for better understanding. Student's feedback received on this activity is very positive and encouraging.

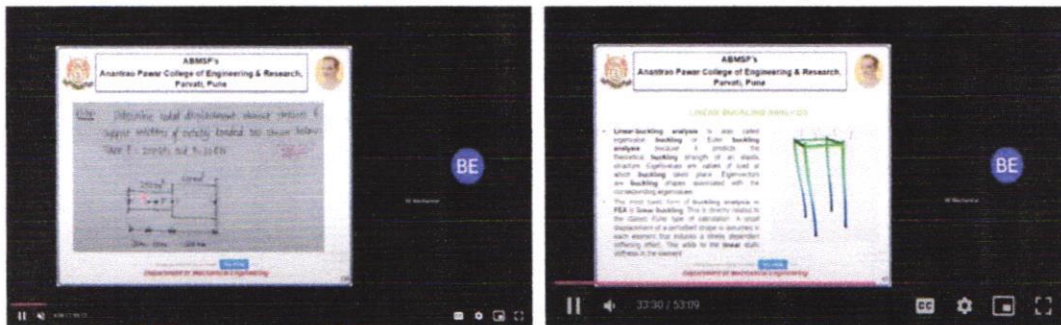


Fig. 5.5.13.A Conducting Online lecture on Google Meet

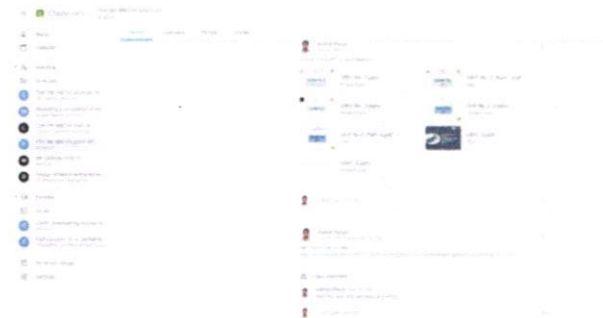


Fig. 5.5.13.B Sharing the Notes on Google Classroom



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Table B 5.5.13: Details of Google Classrooms of Faculties

Sr. No.	Name of Faculty	Academic Year	Subject	Class	Google Classroom Link
1	Prof. A. R. Pawar	2023-24	TE	Computer Aided Engineering	https://classroom.google.com/c/NjYxOTA2Mjg4Mzg0
2	Prof. A. R. Pawar	2023-24	BE	Modelling & Simulation of Electric & Hybrid Vehicles (Honors)	https://classroom.google.com/c/NTIzNTM0NjA3Mjc0
3	Prof. S. H. Darekar	2022-23	SE	Solid Mechanics	https://classroom.google.com/c/NDk3OTU2NTEyNDkw?cjc=gozih3e
4	Prof. S. H. Darekar	2022-23	SE	Kinematics of Machinery	https://classroom.google.com/c/NTE2NjQwMjkxMTY0?cjc=qytzma5
5	Prof. A. R. Pawar	2021-22	TE	Computer Aided Engineering	https://classroom.google.com/c/NDUyMjUwNzg4MDU3
6	Prof. A. R. Pawar	2021-22	BE	Finite Element Analysis	https://classroom.google.com/c/Mzc0NTU1MDI4OTgy
7	Prof. C. E. Kolambe	2020-21	TE	Artificial Intelligence & Machine Learning	https://classroom.google.com/c/NjY5NzU1MjkzMTc3
8	Prof. C. E. Kolambe	2020-21	SE	Kinematics of Machinery	https://classroom.google.com/c/NjU5NzEzMzA3Njgx

5.1.14 Industry / Academia Expert Lectures (an innovative tool for updating knowledge)

The objective of industry/academia expert lectures is to explore recent technology and development. Students get benefited to relate theoretical with practical inputs of recent changes in technology, also it upgrades knowledge with valuable information from their experiences. The students are bestowed with knowledge about Industry needs, latest technical updates, avenues for Higher studies, etc.



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Fig. 5.5.14 Expert (Industry) Lecture Delivery to the Students

Table B 5.5.14: Details of Industry / Academia Expert Lectures

Sr. No.	Academic Year	SEM I/II	Name of Guest	Name of Organization / Institute	Subject	Class	No. of Students Attended
1	2023-24	I	Prof. Mahesh Shinde	JSPM College of Engineering, Hadapsar	Mechatronics	TE	24
2	2023-24	I	Prof. Rohit Jadhav	Nutan Maharashtra Institute of Technology, Talegaon, Pune	Heat Mass Transfer	TE	45
3	2023-24	I	Prof. Nilesh Gaikwad	Pimpri Chinchwad College of Engineering & Research, Ravet, Pune	Heat Ventilation Air Conditioning & Refrigeration	BE	30
4	2022-23	I	Prof. Rohit Jadhao	PCET's Nutan Maharashtra Institute of Engineering and Technology, Pune	overview of the fundamental principles of Heat and Mass Transfer	TE	45
5	2022-23	II	Mrs. Shaila Kulkarni	Ample Business Solutions	Carrier Guidance	SE, TE,	50



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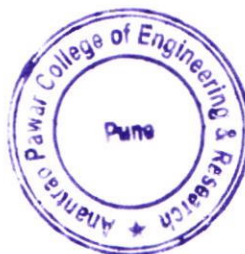
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						BE	
6	2022-23	I	Prof. Sachin Yadav	Genba Sopanrao Moze College of Engineering, Balewadi, Pune	Solid Mechanics	SE	48
7	2022-23	I	Dr. C. S. Dharankar	AISSMS College of Engineering, Shivajinagar, Pune	Vibration Measurements	BE	45
8	2022-23	II	Dr. Suraj Bhojar	NIPAM Professional and Patent Agent Associate Director MIT ATD University	Intellectual Property Rights and Patent Facilitation	SE, TE, BE	55
9	2021-22	II	Mr. Vijay Margaje	Ample Business Solution	Preparation and Role of Graduate Engineer at Campus Interview	BE	44
10	2021-22	II	Prof. Atul Kashid	Pimpri Chinchwad College Of Engineering, Akurdi, Pune	Optimization using Statistical Methods	TE, BE	52
11	2021-22	I	Mr. Amit Bedre	Structural Engg. BROSE INDIA, Pune	Basics of Industry Automation	TE, BE	62
12	2021-22	I	Dr. Subhash Gadhave	DYPIT, Pimpri, Pune	Introduction to Modern Tools and Techniques	BE	45



5.1.15 Field Visits (an innovative tool for practical exposure)

The purpose of the visit is to provide practical exposure to the students including the technical aspects of mechanical engineering including design, manufacturing, and production with the latest manufacturing technologies. Industrial visits provide an excellent starting point to achieve practical knowledge. Students observe and learn on how theoretical ideas are placed into action,


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thereby aiding their practical learning. Students are exposed to the real working atmosphere and were shown how things work in an organization.

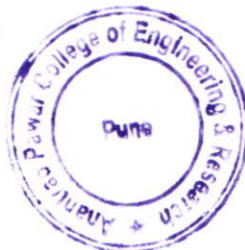
Table B 5.5.15: Details of Field/ Industrial Visit

Sr. No.	Academic Year	SEM I/II	Name of Industry	Subject	Class	No. of Students Attended
1	2023-24	I	Aditya Auto, Chakan Pune	Mechatronics	TE	42
2	2023-24	I	Pawana Power Station, Pune	Turbo Machine	BE	11
3	2023-24	I	Katraj Milk Dairy, Katraj, Pune	Thermodynamics	SE	56
4	2023-24	I	Katraj Milk Dairy, Katraj, Pune	Heat Ventilation Air Conditioning & Refrigeration	BE	14
5	2023-24	I	Katraj Milk Dairy, Katraj, Pune	Heat Mass Transfer	TE	17
6	2023-24	I	Pumping Station, Parvati, Pune	Turbo Machine	BE	18
7	2022-23	II	PMPML Workshop, Swarget, Pune	Applied Thermodynamics	SE	56
8	2022-23	II	Malegaon Sugar Factory, Malegaon, Pune	Turbo Machine	BE	42



Mamyc

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Fig. 5.5.15 Industrial Visit of Students

5.1.16 NPTEL/Swayam/ATAL/Spoken Tutorials courses (an innovative tool to enhance teaching-learning)

Technology Enhanced Learning is a trend in Higher Education. There are several government initiatives in India towards e-learning. National Programme on Technology Enhanced Learning (NPTEL/ATAL/Spoken Tutorial) is one of the major initiatives. Faculties of the Department of Mechanical Engineering, upgrade their knowledge and enhance skill by completing such course, and output is reflected in their improved teaching. Faculties also encourage students to enroll for such a program to get additional inputs for the respective subject. The feedback received from faculties as well as students reflects that, such a program help in updating knowledge and depth of understanding.



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Fig. 5.5.16.A NPTEL Certificate



Fig. 5.5.16.B ATAL Certificate




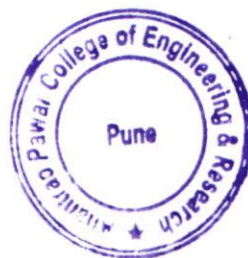
Fig. 5.5.16.C Spoken Tutorial Certificate


5.1.17 Student Chapter Activities



The department has following professional chapters which provides a good platform for the students to take active part in the various competitions, seminars and lectures arranged by the society. The activities help the students to showcase their talents in terms for team building, communications skills, team work, target work and overall development in professional activities. One faculty advisor is associated with each student chapter for mentoring, guidance and overall governance.

- i. ISTE Student Chapter
- ii. FSAI Student Chapter
- iii. Heritage Club
- iv. MESA


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- v. ISHRAE Chapter
- vi. Institute of Engineers (India) Student Chapter

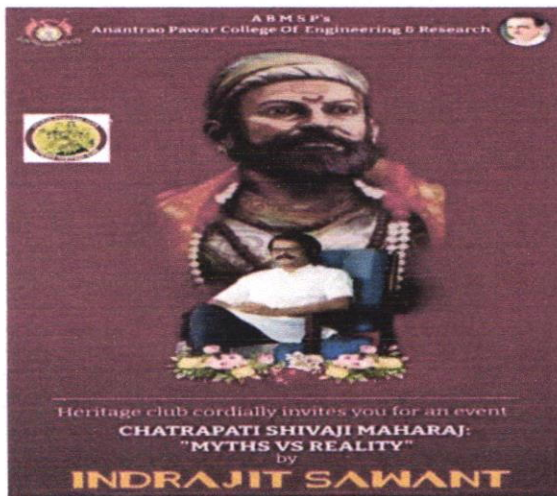


Fig. 5.5.17.A Heritage Club Student Chapter Event Poster Fig. 5.5.17.B FSAI Chapter Trophy

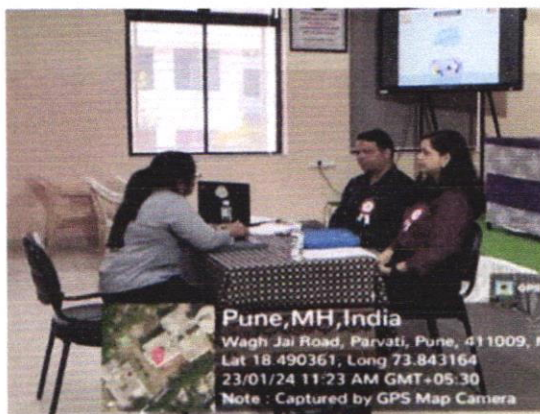
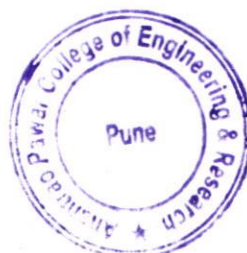



Fig. 5.5.17.C ISTE Student Chapter Arranged Mock Interview Event for Students


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Fig. 5.5.17.D ISTE Student Chapter Event

Table B 5.5.17: Details of Events organized by Student Chapter


Sr. No.	Event Details	Schedule Date
1	Poster Competition on Engineers Day	12 Sep 2022
2	Spartktech (Annual Gathering, Technical, Non-Technical, Cultural Events)	14-17 Feb 2023
3	Teachers Day	06 Sep 2021
4	Engineers Day	15 Sep 2021
5	Spartktech (Annual Gathering, Technical, Non-Technical, Cultural Events)	21-23 Apr 2022
6	AICTE- ISTE Induction/ Refresher Program on "Improving Excellence in Teaching"	08 Feb 2021



5.1.18 Virtual Labs

In certain labs like the dynamics of machinery lab, some relevant experiments are conducted online on web browsers with the help of simulators. Such online facilities are called as virtual


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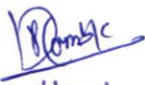

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labs (<http://www.vlab.co.in/>), and are a part of an excellent innovative initiative taken by the MHRD of India.

Outcome:



- Remote-access to simulation-based Labs in various disciplines of Science and Engineering.
- Use of virtual labs enthuse students to conduct experiments by arousing their curiosity. This would help them in learning basic and advanced concepts through remote experimentation.
- It provides a complete Learning Management System around the Virtual Labs where the students/ teachers can avail the various tools for learning, including additional web-resources, video-lectures, animated demonstrations and self-evaluation.

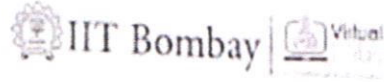



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Institute : ABMSP's Anantrao Pawar College of Engineering and Research

Region : Pune

NCID : 215


Workshop Date : 03 Nov 2023


Department	Users	Usage
Computer Engineering	1	10
Electronics and Communications	1	2
Electronics and Telecommunications Engineering	19	36
Information Technology	9	67
Mechanical Engineering	11	34

Nodal Coordinator : Prof Sharad Jagtap

System Support : Prof. Ramesh Lavhe


Coordinating Team : Prof. Sharad Jagtap Prof. Sampada Ahirrao Prof. Devika Rankhambe

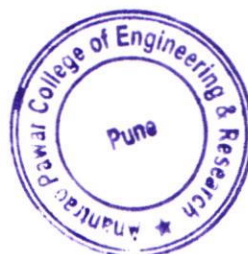

 Nodal Coordinator Signature



 Head of Institute/Principal Signature



1. Scan and Upload the duly signed ORIGINAL SOFT COPY of this report.
2. Keep the HARD COPY with you in the Virtual Labs file for the record.

Fig. 5.5.18 Virtual Lab Event Report (IIT Bombay)


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5.1.19 Cutting-edge Initiative

The modern educational system is changing rapidly to incorporate innovative methodologies and approaches that encourage an inclusive and diverse community. In an analogous way, every instructor has their own distinctive teaching approach. All educators, though, aspire to help students cultivate a love of learning. The department has several cutting-edge initiatives that make use of modern technology, as listed below:

- Avishkar
- Hackathon
- Swachh Sarvekshan Technology Challenge by Pune Municipal Corporation
- National Innovation & Startup Policy (NISP)
- Institute Innovation Council

Outcome:

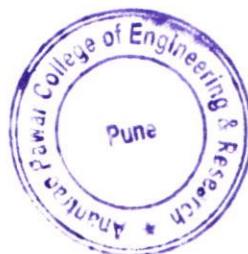
- Students get exposure to discover and develop their entrepreneurial skills, project ideas at national level.
- Students get opportunity to present their research projects



Fig. 5.5.19.A Swachh Sarvekshan Trophy & Felicitation to Students by Mr. Chandrakant Dada Patil, Higher Education Minister, Govt. of Maharashtra





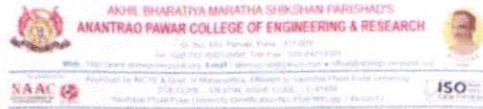
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**APCOER- INNOVATION AND
START UP POLICY**

FOR "STUDENTS AND FACULTY MEMBERS"
(Aligned with National Innovation and
Start-up policy-2019)



**ABMSP's Anantrao Pawar College of Engineering
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Maharashtra, India**


NOTIFICATION
Regarding Publication of Innovation and Start-up Policy Document


The National Innovation and Start-up Policy (NISIP) for students and faculty as per the established on 12th September 2019 at ANITA, New Delhi, NISIP as a guiding document will enable an institute to actively engage students, faculty and staff in innovation and entrepreneurship related activities. This NISIP framework which will facilitate in bringing industry-academia synergy in terms of Intellectual property, Entrepreneurship management, Technology Incubation and Institutional start-up policy, thus enabling creation of robust innovation and start-up ecosystem across all HEIs.

In continuation with the initiatives taken by the Ministry of Education (MoE), Ministry of Financial Resources Development (MFRD) and guidelines received from the AICTE's National Innovation Start-up policy team, ABMSP's Anantrao Pawar College of Engineering and Research, Pune as one of the recognized technical education institutes, would like to be part of this initiative. As per the questionnaire given by the MoE, Innovation cell, NISIP implementation committee is constituted at APCOER to frame, implement, assist and monitor Institutional Innovation Entrepreneurship and Start-up Policy. After receiving approval from Governing body and Institutional Innovation Council at APCOER, would like to publish Institutional Innovation and start-up policy document to promote the innovative and entrepreneurial ecosystem and help in shifting the mind set from job seekers to job-providers among young students.

With Best Regards,

Prof. Nilesh A. Jadhav
NISIP Co-ordinator
APCOER, Pune





Dr. Sunil B. Thakare
Prin. (i/c)
APCOER, Pune





Fig. 5.5.19.B APCOER Startup (IIC) & NISP Policy Amendment Letter



Fig. 5.5.19.C Avishkar Event Exhibition by Students


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