7.2 - Best Practices

Best Practice 1: Utilization of 3D Printing Technology for Student Projects

1. Title of the Practice

Integration of 3D Printing Technology for Final-Year Student Projects

2. Objectives of the Practice

- To enable students to transform theoretical knowledge into tangible, functional prototypes.
- To enhance practical skills and creativity among students, preparing them for industry requirements.
- To foster interdisciplinary learning by utilizing advanced technology.
- To promote innovation and entrepreneurship through real-world applications of 3D printing.

3. The Context

The engineering field is rapidly evolving, with additive manufacturing and 3D printing emerging as vital technologies in design and manufacturing industries. Recognizing this trend, R K College of Engineering introduced a 3D printing machine as a resource to enable students to realize their project ideas effectively. This practice aligns with the institution's mission to impart hands-on experience and stay updated with technological advancements.

A challenge faced during the initial phase was ensuring that students and faculty were adequately trained in 3D printing technology. Workshops and training sessions were organized to overcome this, creating a knowledge base within the institution.

4. The Practice

- A state-of-the-art 3D printing machine was procured and installed in a dedicated lab.
- Students, especially those in their final year, are encouraged to design and prototype components as part of their projects.
- A structured training module is conducted for students to familiarize them with 3D printing software, materials, and operational techniques.
- Faculty members act as mentors, guiding students throughout the design, modeling, and printing phases.
- Completed projects are evaluated not only for their design and functionality but also for their alignment with industrial needs and innovation.

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5. Evidence of Success

- **Improved Project Outcomes**: Final-year projects have demonstrated increased quality, creativity, and practical applicability. For instance, students developed functional prototypes like custom-engineered tools, medical devices, and robotic components.
- **Recognition**: Some student projects using 3D printing have been presented at national-level conferences and competitions, receiving accolades for innovation.
- **Skill Development**: Students have gained hands-on experience with cutting-edge technology, improving their employability and technical competence.
- **Interdisciplinary Collaboration**: Projects have facilitated collaboration across various branches of engineering, enhancing the scope and utility of prototypes.

6. Problems Encountered and Resources Required

Problems Encountered:

- Initial resistance to adopting new technology due to a lack of familiarity.
- High material costs for 3D printing filaments and maintenance of the machine.

Resources Required:

- Continuous funding for maintaining and upgrading the 3D printing machine.
- Access to advanced 3D printing materials to broaden the scope of projects.
- Regular training programs to ensure new students and faculty are proficient in using the technology.

7. Notes

This practice has significantly contributed to building a culture of innovation and experiential learning at R K College of Engineering. Moving forward, the institution plans to expand this initiative by incorporating advanced 3D printing technologies, such as multi-material printers and metal 3D printers, to further diversify project outcomes.

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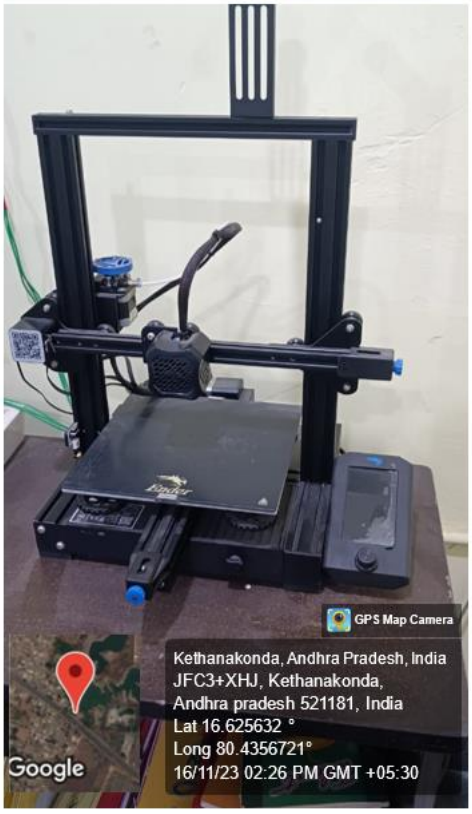
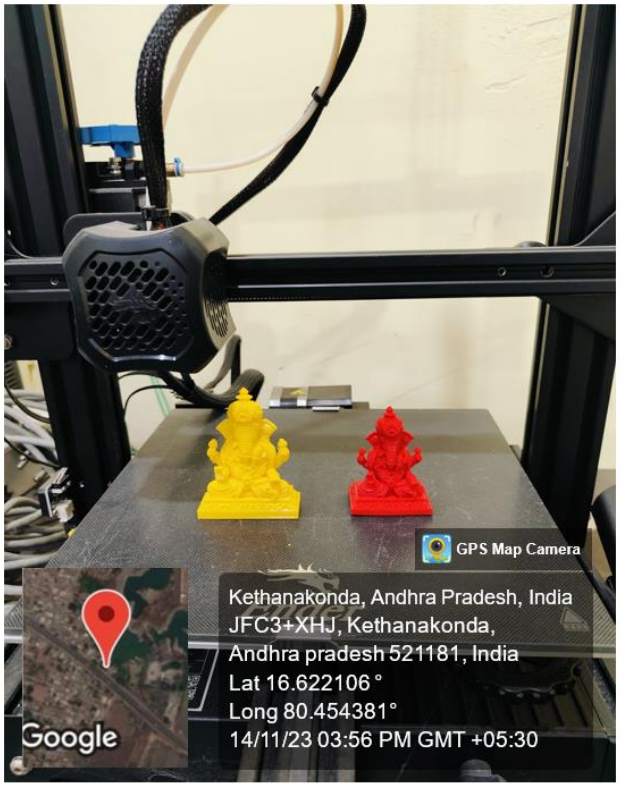
3D Printer





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3D Printed Products by Students (Mobile Stand)

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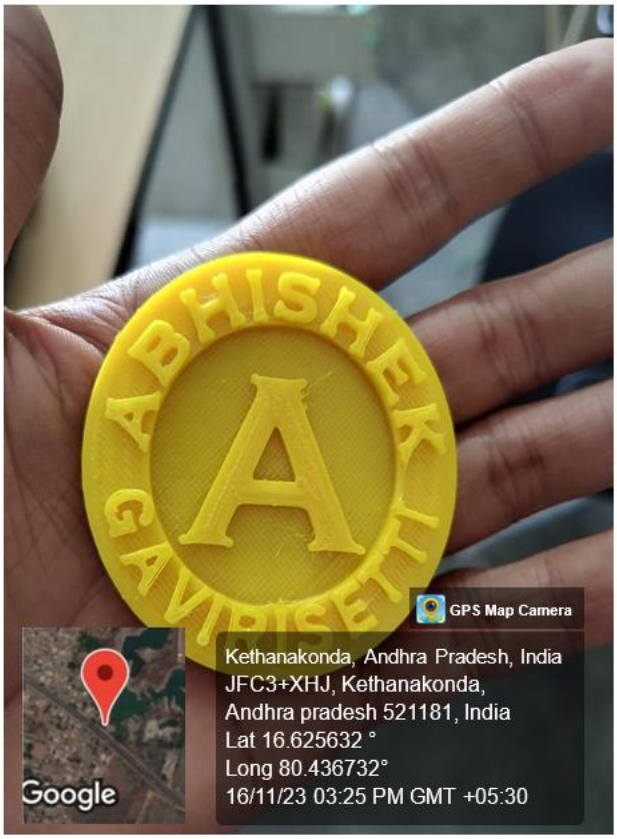
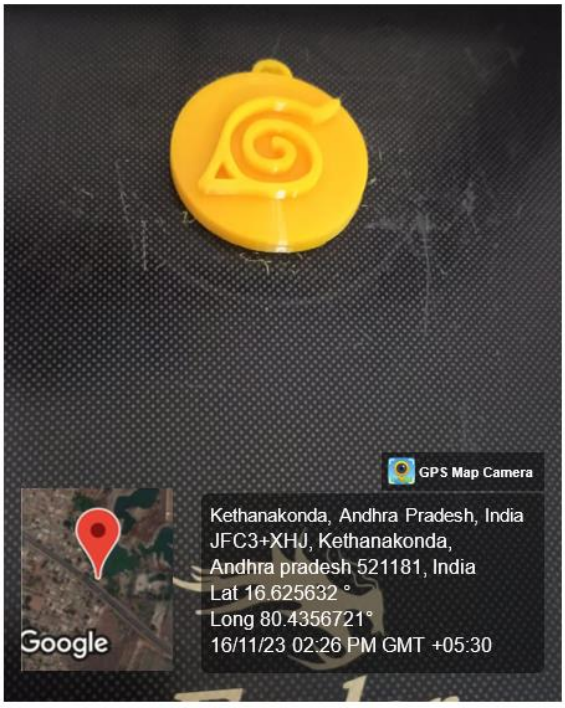


Key Chain Logo



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At R K College of Engineering, final-year students utilized a state-of-the-art 3D printing machine to complete innovative projects. These projects, focusing on advanced engineering solutions, were presented and published at the National Conference on 'Advanced Trends in Engineering Sciences & Technology (ATEST),' organized by the institution. This practice fosters hands-on learning, innovation, and research culture, enhancing students' technical skills and industry readiness. It also highlights the institution's commitment to staying at the forefront of technological advancements, providing a platform for students to gain recognition and contribute to engineering knowledge.

The following are the articles published by students in the United International Journal of Engineering and Sciences.

Sl. No.	Title	Weblink
1	Tensile Strength Analysis of 3D-Printed Specimens Using Universal Testing Machine	View Article
2	Impact Strength Analysis of 3D-Printed Specimens Using Izod Impact Testing Machine	View Article
3	Compression Strength Analysis of 3D-Printed Specimens Using Universal Testing Machine	View Article
4	Micro Hardness Analysis of 3D-Printed Specimens Using Vickers Apparatus	View Article
5	Flexural Strength Analysis of 3D-Printed Specimens Using Universal Testing Machine	View Article
6	3D Printer Assembly And Text Logo Printing	View Article
7	3D Printing Rapid Prototyping: A Game-Changer in Dentistry	View Article

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Best Practice 2: Skill Development for Faculty and Students through Competency Development Cell (CDC).

The technologies and competencies required for Industry 4.0 and Research advances are dynamic and need to be updated by both students and faculty.

From the student perspective, the Industry needs and expectations are dynamic. Formal education may not meet all the required industry competencies. The gap analysis between industry and Graduate competencies needs to be identified and addressed from time to time.

From the faculty perspective, the competencies related to advanced research and mezzanine technologies need to be updated to match the present-day requirements. Lifelong learning is the need of the hour, and faculty should also update along with students to guide them through projects and internships. Regularly updating the technical and academic competencies will enable faculty to design advanced curricula and state of the art research laboratories.

It is customary that various training programs are planned and organized by the respective individual departments for both students and faculty. But focus on contemporary competencies and multidisciplinary concepts may not be in the per view of planning by the departments. So, a focused section is required, which can collect the requirements from industry, research bodies as well as departments of the institution. This section can plan and conduct the training programs to achieve focused outcomes.

Objectives:

The CDC's main aim is to develop faculty and students' skills to fill the industrial and research gap through the following objectives.

- Encourage the students to opt for meaningful choices for their careers in the dynamic world.
- Organize training and development programs for students and faculty on strategically relevant competencies.
- Explore Internships and establish connections with Industry.

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The Practice

The competency development cell is designed to work closely with academic departments along with the Training and Placement cell as initial stage competencies are identified through Training Need Analysis (TNA) from departments.

- With the requirements identified, focused training programs are organized. Along with training and development activities, internships are organized. Faculty training programs are usually carried out during the summer and winter breaks of the semester.
- The outcomes of the practice are measured through various metrics. For students, metrics like placements, internships, highest packages, number of students progressing to Post graduation, and Research are considered. Metrics like Internships offered several research publications in areas related to mezzanine technologies are considered for measuring outcomes for faculty training.
- Experts from the industry, as well as in-house faculty, will train for competency development. Besides delivering these hands-on sessions, guidance and mentoring continue to enhance the achievement of the outcome.
- Students are trained in Core competencies, Problem Solving, Statistics, Programming competencies, and Mezzanine technologies. Frequent diagnosis tests are conducted to identify the level of competencies to plan the following training sessions.

Faculty

Student

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Evidence of Success:

Sl. No.	Particular	Link
1	The students completed various Skill development courses.	View Document
2	The students visited various industrial trips/field trips.	View Document
3	Faculty participate in Faculty development programs/webinars/seminars conducted or organized by industry resource persons.	View Document
4	College interaction with industries through several memorandums of understanding (MOU).	View Document

Problems encountered, and Resources required:

Dedicated people for CDC are required for conducting diagnosing tests and training needs analysis every semester. Also coordinating the multidisciplinary competency training activities is a challenge and expertise is needed in handling them. Continuous monitoring of the changes and requirements in the industry and research is required. Monitoring the outcomes through the designed metrics is very much necessary for future planning.

The scope of the CDC can be further increased by offering Competency training to outside faculty and students. Awareness of required competencies should be provided right from their first year of education and motivation should be provided continuously in achieving them. The future scope of this best practice is "Service to other Institutions through Knowledge and skill sharing by CDC activities.

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