



## Two Best Practices Successfully Implemented By The Institution

### **1. Title of the Best Practice 1:**

#### **Engineering Design and Innovation**

### **2. Objectives of the Practice**

1. To emphasize Experiential Learning (ExL) and to enhance problem-solving ability by exploring and proposing solutions to realistic/social problems.
2. To inculcate research aptitude by engaging students in rich and authentic learning experiences to support research papers and patent publications.
3. To enhance Social/ Economic development through an ecosystem that promotes entrepreneurship and research culture among the students by collaborating with industries.
4. To evaluate alternative approaches and justify the use of selected tools and methods
5. To provide every student the opportunity to get involved individually or as a group to develop team skills and learn professionalism.

### **3. The Context**

The primary aim of implementing Engineering Design and Innovation (EDI) is to inculcate research and innovation among the engineering students of our Institute. The focus is on project-centric learning. The outcomes of Engineering Design and Innovation (EDI) are that students should be able to

- Identify projects relevant to societal needs
- Map the technologies learned with the project needs
- Apply the technological knowledge to design various feasible solutions
- Select the best possible solution to solve problem
- Develop/Fabricate a working model of proposed solution
- Testing and validate product performance

The focus of EDI is to promote project-centric learning with a focus on societal and industrial issues. The idea behind promoting and implementing EDI is to encourage students to tackle and find solutions for socially relevant problems using multiple technologies. The EDI focuses on identifying the project domain, determining the technology to be implemented to solve the

problem at hand, and finalizing the tool to be utilized to arrive at the solution. The role of Faculty and students in EDI project execution is clearly defined and shown in Fig. 1 below.

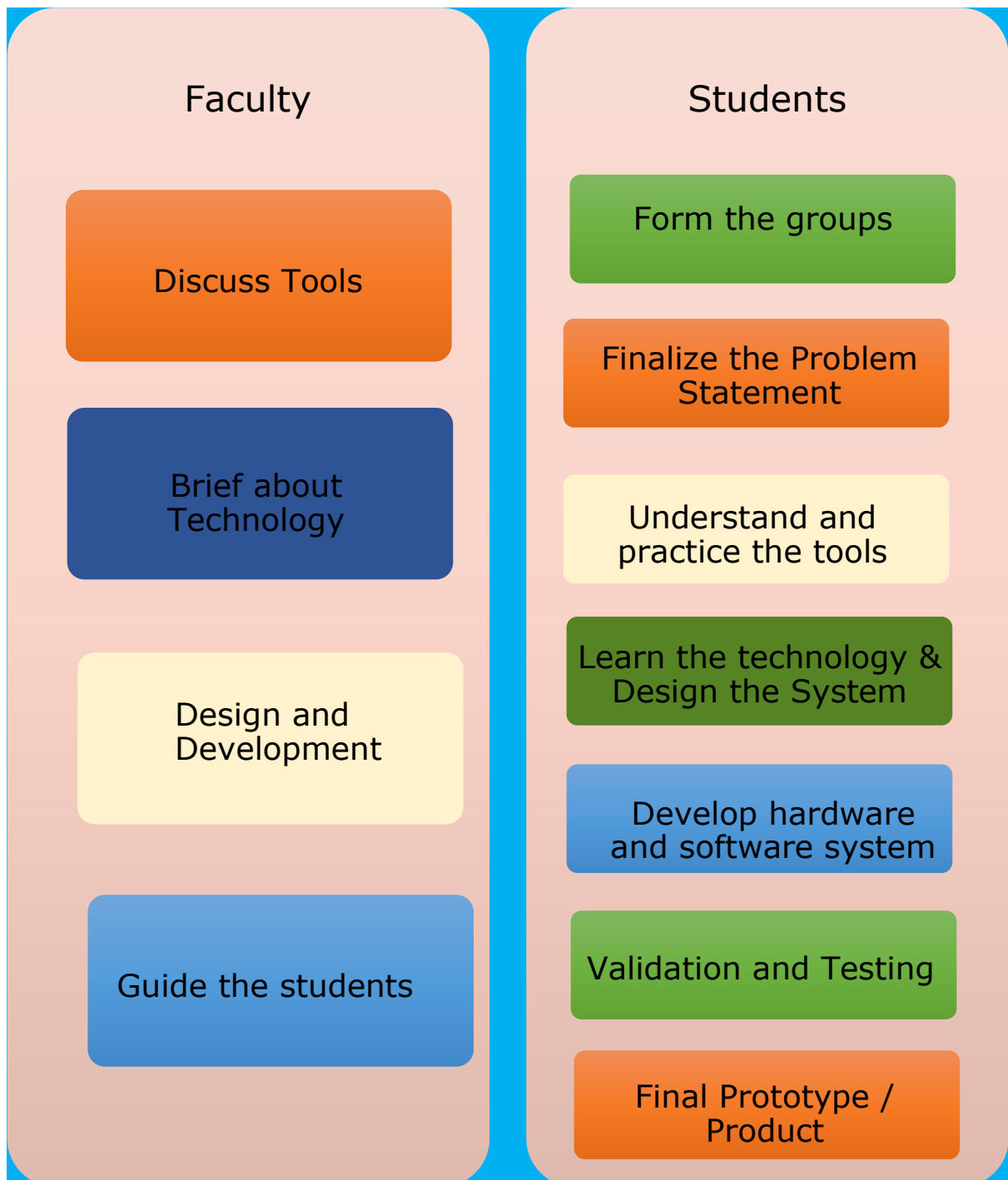


Fig. 1 Role of faculty and students

Students choose the domains form the list below (Fig. 2):

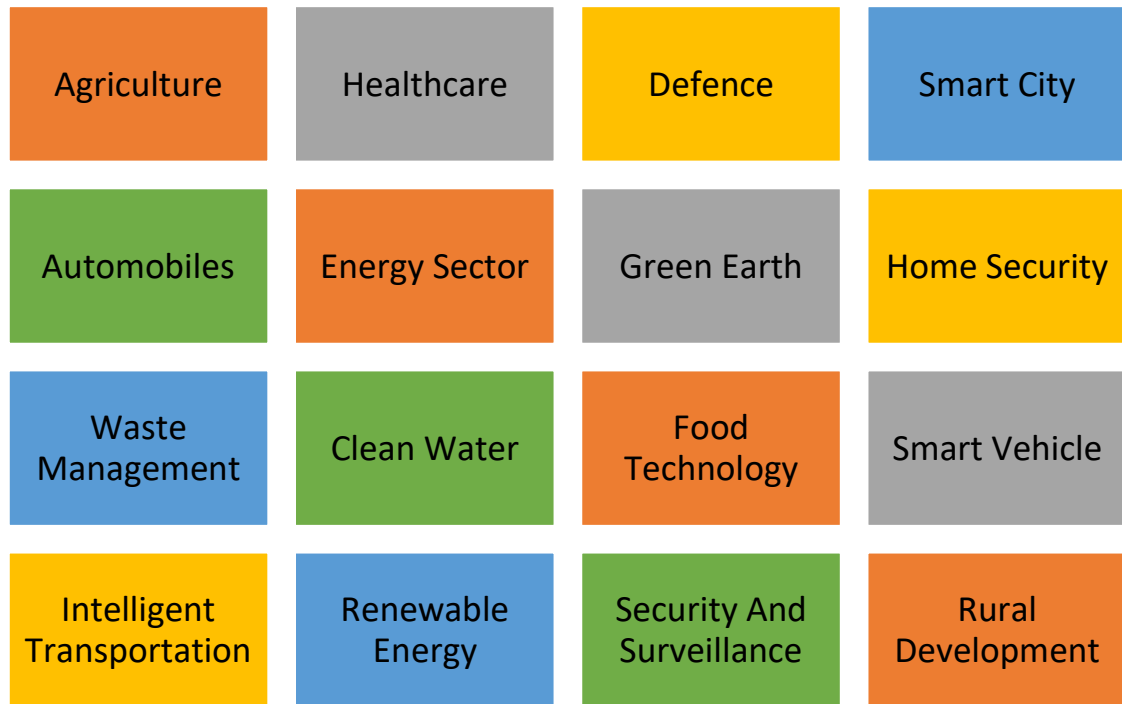


Fig. 2 Domains for EDI

The technology selected to solve the problem is shown in Fig. 3. data analytics, robotics, machine learning, artificial intelligence, cloud computing, MEMS, zigbee

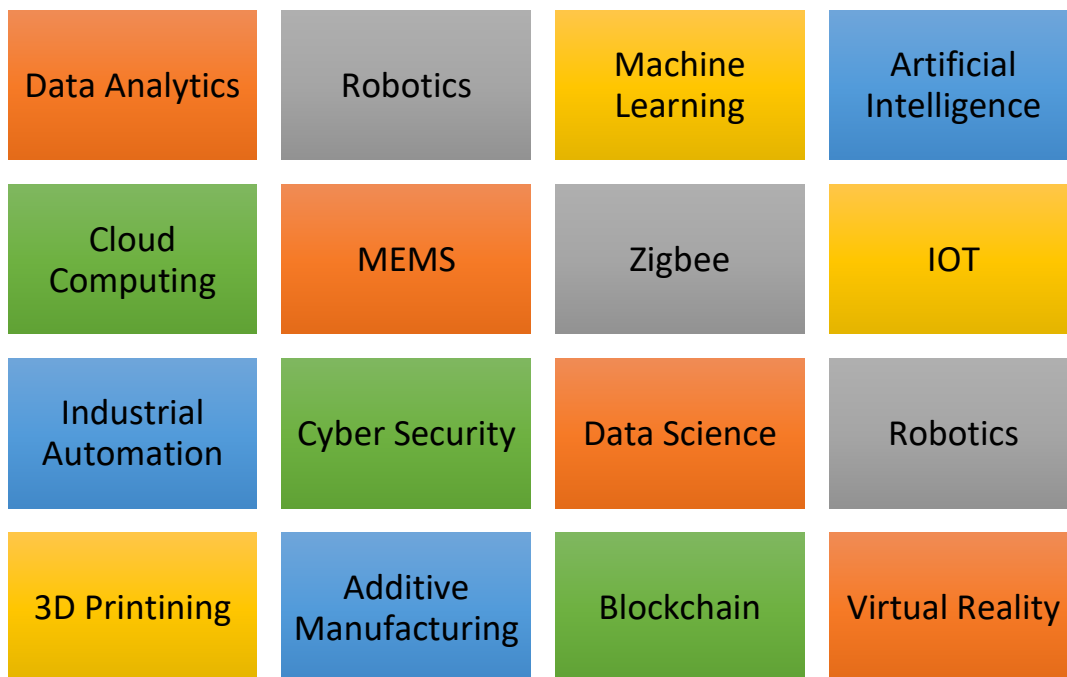


Fig.3 Technology used for EDI

- Students chooses one or more tools such as shown Java, C++, MATLAB, SCILAB, NS-2, Python, Lab view, Simulink, Embedded Hardware Platform, Code Composer Studio, 3D Printer.

#### 4. The Practice

The deployment of EDI is being done systematically and in a planned manner as follows:

- Multi-Disciplinary approach is used for the effective implementation of EDI.
- Minimum 4 and a maximum of around 8 project groups (from both S.Y. B.Tech. & T.Y. B.Tech.) are allotted to every faculty. Typically, 4 to 5 students are present in each group.
- Allotment of project groups to faculty is based on the student's choice and the domain expertise of the faculty.
- Project lists are compiled department wise and uploaded on Google classroom of Dean Academics for review and audit purposes.
- Project groups approach faculty as per given slot in time-table
- For multi-disciplinary projects faculty from concerned departments is allowed to work as guide.
- Dean Research and Innovation provide valuable guidance for all students frequently for the development of EDI.

## 5. Evidence of Success

- Systematic monitoring of the Engineering Design and Development is carried out by the Dean Academics. He takes a monthly review of the developments.
- Dean Research and Innovation also guide the faculty on the quality aspects of effective EDI development.
- Head of the Department along with the Assistant Head of Research takes weekly reviews of the faculty members and ensures continuous development of EDI.
- Apart from the above-mentioned points, an academic audit takes place in every semester by internal as well as external auditors related to monitor the progress and outcomes of EDI.
- At the end of the semester, experts from the top industries assess the students along with the internal examiner based on the information in table 1.

Table 1 EDI Monitoring and Assessment

EDI project - In semester Assessment -50 Marks				
Group and statement finalization	Formation problem	Attendance, reporting, Completion of Project	Regular Timely Progress	Project Design, implementation and testing(30M)
(10M)		(10M)		<ul style="list-style-type: none"> <li>➤ 10marks- Design (Block diagram/Circuit Diagram/Algorithm/design calculation/CAD model)</li> <li>➤ 10 marks- Manufacturing (component assembly/ writing code/circuit boards/Simulation)</li> <li>➤ 10 Marks- Testing and results</li> </ul>
EDI project End Semester Assessment -50 Marks				
Project quality and Demo (20M)			Project Viva, Report writing and overall understanding (30M)	



<ul style="list-style-type: none"> <li>➤ 10 Marks- Meeting Specifications</li> <li>➤ 10 Marks- Final working</li> </ul>	<ul style="list-style-type: none"> <li>➤ 10Marks- Viva</li> <li>➤ 10Marks- Report in paper format.</li> <li>➤ 10Marks- Overall Understanding</li> </ul>
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### 6. Evidence of Success

- It is observed that implementation of EDI has ensured students learn Team Work, Communication skills, and connecting with people.
- Students Self-confidence has improved and resulted in enhancement of students Design and Programming Skills.
- Based on the EDI, a student’s conference has been organized every semester wherein 1800+ papers are presented in 192 parallel sessions along with 200+ industry experts.
- Papers in various publications as an outcome of EDI, SDP and Course Project is as follows:

<b>UG Research and Outcome</b>		<b>Publications</b>	
<b>Student strength</b>	5798	<b>Scopus Indexed</b>	347
<b>EDI Projects/year</b>	1456	<b>SCI Indexed</b>	38
<b>SDP Projects /year</b>	2380	<b>Other</b>	98
<b>Course Project</b>	5168	<b>Patents</b>	
		<b>Published</b>	32
		<b>Granted</b>	39
		<b>Filed</b>	16

Students have designed and implemented around 1456 EDI projects, 2380 SDP projects, 5168 Course projects, 400 Major and 55 Research projects per year.

## **7. Problems Encountered and Resources Required**

1. Finalization of the project domain and scope is very pivotal. It is finalized by domain expertise. In the review process, domain experts finalize the methodology and scope of the project.
2. Project domains such as IOT and embedded systems require hardware equipment such as sensors and implementation kits (Rasbery pi). Institute gives financial assistance to purchase such tools.
3. Different industries and companies are involved and have taken the initiative to guide students and faculties to complete their real-time projects.
4. Industries MOU and Sponsorship support the excellent quality of the project.
5. Plagiarism tools are required for research publication, and patents are the outcome of EDI Project implementation. The Ithenticate tool is used to check the plagiarism.
6. Financial assistance is required for the students and faculties for good-quality patent filing, publication and grants. Institute supports for paper publication the different journals such as Scopus, Web of Science, IEEE, and UGC Care.

## **8. Notes**

- Engineering Design and Innovation has ensured that students are made aware of the latest technology & tools relevant to solve real-world problems.
- Students are encouraged to use MOOCs, research papers, books, and Literature Reviews, thereby enhancing the self-study component of the students.
- Industries connect for problem definition has improved and if the required project can be further continued in next Semester.

## **1. Title of the Best Practice 2:**

### **Assessment Based on Top Professional Skills of this Decade.**

## **2. Objectives of the Practice**

1. To bridge the gap between industry, need, and academic education.
2. To improve students' employability by focusing on the skills required by industry.
3. To enhance skills among the students to perceive their dream careers based on their interests and strengths.
4. To emphasize on start-up and research as a career alternative that will support for societal benefits.
5. To emphasize learning activities that are long-term, inter-disciplinary, and student-centric.

## **3. The Context**

As per the industry need, the student is likely to select their profession in any of the domain. The institute has recognized the importance of developing skills and have come out with a 360-degree assessment model after due discussions and deliberations with all the stakeholders. Few of the top skills required to be successful in any profession are listed as below:

- ✓ Critical thinking
- ✓ Complex problem-solving ability
- ✓ Creativity / innovation
- ✓ Team management
- ✓ Presentation of ideas
- ✓ Brainstorming Discussions / deliberations
- ✓ Carrying out Surveys
- ✓ Design of systems
- ✓ Work on case studies
- ✓ Technical writing / blogs
- ✓ Hands on ability
- ✓ Emotional Quotient



✓ Judgement and decision making

Students can have the choice of making their career in civil services, defence services or start-up or politics. They may take up a role of researcher, programmer, developer, system analysts, business analysts, quality assurance etc.in the industry.

#### 4. The Practice

Assessment components are distributed amongst various significant factors. Each factor is assigned the marks based on its implication. The final score of that component is the summation of all marks obtained for each factor given by internal and external examiner. The distribution of various components is mentioned below:

❖ Seminar Assessment (G-PPT)–

Sr. No.	Parameter	Marks
1	Contents of slides	25
2	Understanding of concepts	25
3	Presentation Skills	25
4	Performance in Q & A Session	25
	Total	100

❖ Group Discussion (GD)–

Sr. No.	Parameter	Marks
1	Level of Participation	25
2	Knowledge of the Topic	15
3	Communication skill and Vocabulary	25
4	Critical Thinking	25
5	Overall Impression of Examiner	10
	Total	100





❖ Design Assignment–

<b>Sr. No.</b>	<b>Parameter</b>	<b>Marks</b>
1	Novelty, Originality, and concreteness	15
2	Understanding of Design	30
3	Engineering approach towards design	25
4	Communication and presentation skills	10
5	Design report, writeup, conclusion	20
	Total	100

❖ Survey Assignment–

<b>Sr. No.</b>	<b>Parameter</b>	<b>Marks</b>
1	Comprehensiveness of the survey	15
2	Understanding of survey topic	20
3	Significance and relevance	25
4	Communication and presentation	10
5	References, Bibliography, literature survey	10
6	Survey report, writeup, conclusion	20
	TOTAL	100

❖ Blog Assignment–

Sr. No.	Parameter	Marks
1	Clarity problem statement	10
2	Understanding, tools, and technology used	30
3	Approach of analysis of case	25
4	Significance and relevance of findings	25
5	References, Bibliography, literature survey	10
	TOTAL	100

❖ **Involvement of Industry:**

The industry advisory board (IAB) suggests assessment methods. The assessment is carried out by a pair of external examiners one from industry and other from academics. Their feedback is taken for further improvement in the ISO format.

❖ **ISO Audit:**

The institute has ISO 9001:2020 in place. The monitoring of the assessment of the best practice is included in the ISO audit. External ISO audit is carried out once a year. The best practice is implemented since last 3 years and is now matured enough. No non-conformity has been reported since last 3 years by the external ISO auditors.

❖ **Student Feedback:**

The institute has student feedback is in place since 2001. The component of the best practice is also included in the feedback since 2018-19. The students rate the teachers based on his teaching, mentoring, guiding, counselling, and inspirational abilities. They also rate the teacher on how he can relate the skill sets to the chosen career path, and efforts taken to improve the skills.

❖ **Accrediting Bodies**

During NAAC, NBA visits, both the committees have appreciated and acknowledged the effectiveness of this scheme. The institute got A++ grade in NAAC.



## 5. Evidence of Success

1. All round development of the students
2. Student readiness to face industry challenges with professional skills
3. Removes monotony, disinterest, and fear of examination / learning. Learning is now joyful.
4. Personalized and interactive assessment of each student
5. Students select the career based on their strengths. Also, students can work in a planned manner to achieve their career aspirations by improving the relevant skills
6. If the student is good in few skills, he gets good grades. If good in all grades, gets top grades.
7. Multiple opportunities to the students in each subject as against one opportunity
8. Overall result of the student has been improved due to this type of assessment as shown in figure 1.
9. The performance of the students is also increased in the group discussions and personal interviews during the placement scrutiny. As a result, the placement has also increased in last three years as shown in figure 2.
10. Student have also chosen a career other than industry jobs
11. It is observed that after implementation of skill-based assessment, the students' abilities are honed.

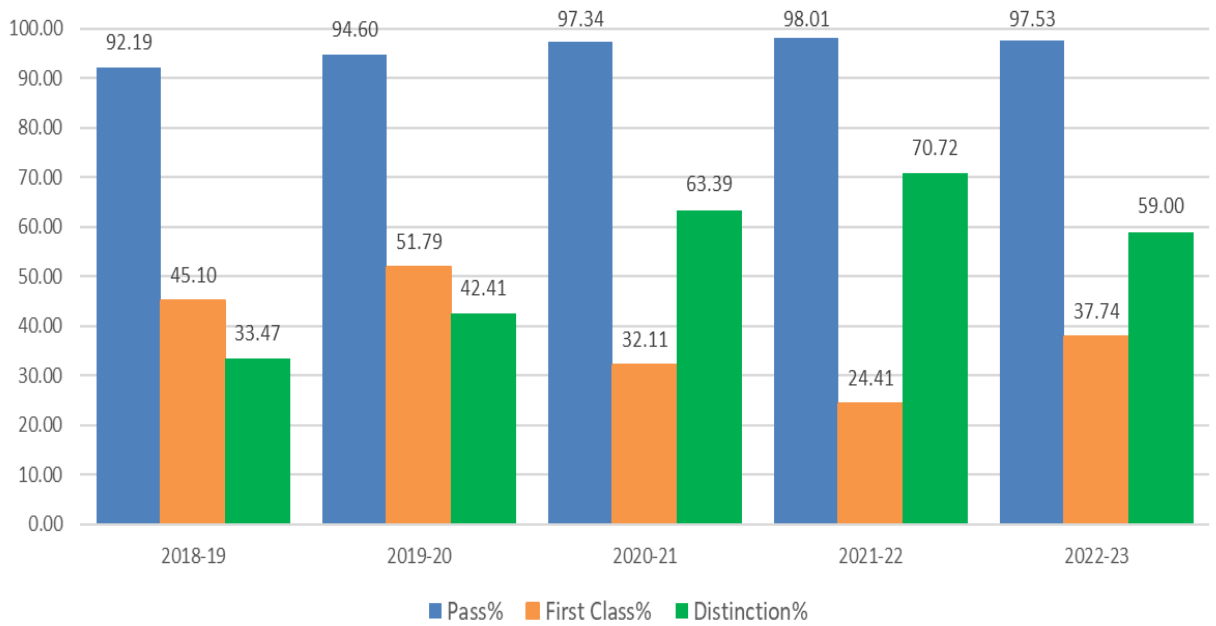


Fig.1 Students Result

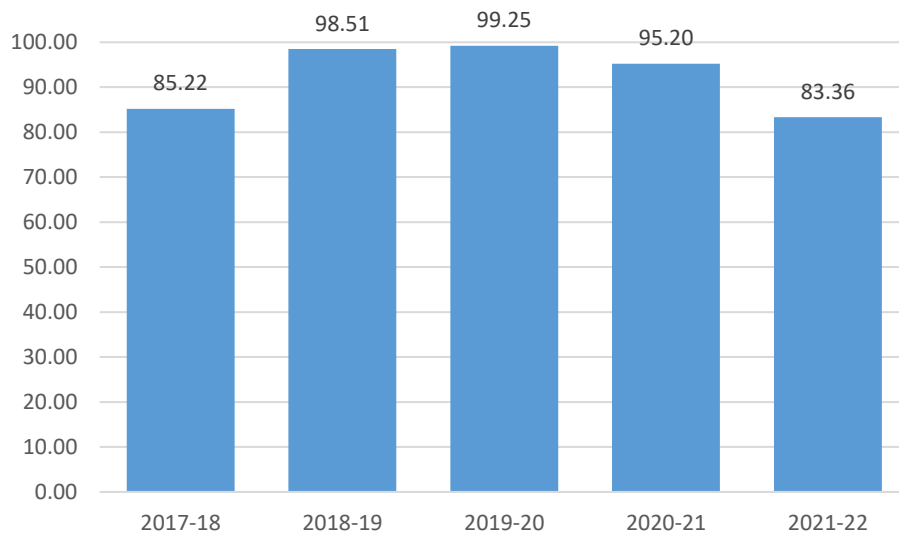


Fig.2 Students Placements and Higher Study

## 6. Problems Encountered and Resources Required

Initially, the faculty and students faced many challenges while implementing the assessment tools such as judging the students and assigning the weightage for the different parameters in the component. The finalisation of weightage for these components are decided by the experts and senior faculty members as per the industry need. The assessment parameters are now standardized through systematic test development procedures based on the stakeholders' requirements. The designed and applied parameters show sufficient evidences in students skill improvement through their placements and student and industry feedback.

Using intellectual tools and approaches helps in educational measurements, such as designing opportunities, gathering evidences and interpreting it. The designed assessment tool is practiced and manageable through automated processes. It is reflected in students' performance as a professional development series.

To be maximally effective, applied assessment approach promotes the interaction with students and application of general principles and techniques with reasonably deep cognitive domain understating.

## 7. Notes

- ❖ This best practice emphasizes on improving these skills
  
- ❖ Ensures all round growth of the student by improving
  - Critical thinking through design assignments and projects
  - Communication, active listening, interpersonal communication, leadership qualities, and public speaking through seminar, group discussions and CVV
  - Time management, team building, project planning and decision making through project work and quiz
  - The writing ability through blog writing, project reports in the form of publications
  - Design abilities, problem solving ability through design assignment and project work



- ❖ This best practice is directly relevant to students' career and helps them to perceive their dream career.
- ❖ The practice has been appreciated by the students, parents, examiners, industry, academicians, other stakeholders, all the boards and forums.
- ❖ Thus, students can make their career irrespective of job market as important skills such as innovation, creativity, critical thinking, complex problem-solving ability, research ability, etc are emphasized in this best practice.