Collaborative Educational Goal Attainment System (CEGAS)

Mr.R.Arunkumar[1], Ragul Vasanth.S.M[2], Aravindhan.U.D[3]
[1]Professor
[1, 2, 3] CSBS, Sethu Institute of Technology

Abstract- *The Course Attainment System is a web-based application designed to streamline the process of managing student marks, calculating CGPA, and monitoring course attainment in academic institutions. Accessible through a network, the system provides a centralized platform for students, faculty, and administrators to input, update, and analyze academic data.*

Built with modern web technologies, the application ensures high availability, scalability, and secure data transmission. Its intuitive interface and automated calculations reduce manual effort and improve the accuracy of academic record management. The system can be integrated with existing educational platforms and supports multi-user operations across devices, fostering a collaborative and transparent academic environment.

This project aims to enhance academic accountability and provide actionable insights to improve teaching strategies and student outcomes.

I. INTRODUCTION

An international agreement by the Washington Accord is responsible for accrediting Engineering degree programmes. Accreditation makes the institute understand their strengths, weaknesses and opportunities. It helps the institute to accept the innovative and modern methods for the betterment of the institute. One of the important criterions in the National Board of Accreditation is related to the achievement of course outcomes and program outcomes. NBA anticipates that the evaluation of a student's performance and knowledge will be based on the evaluation and attainment derived from the course and programme outcomes (Marey et al, 2018; Ahankari et al, 2016).

Course outcomes are narrower statements that explain what learners are supposed to understand after the completion of the course, and how they are able to use the skills, ethics; knowledge gained, and how they will be helpful to the society. The COs are one-to-one continuous mapping to POs, and further on, are mapped to program- specific objectives (PSO). Program outcomes are narrower statements that describe the skills, knowledge, and actions that students learn from the programme during their enrollment. Programme outcomes are well defined and are common for all the courses and mentioned in the university SAR-UG guidelines (Vanjale et al, 2015; Sudheer, et al, 2016; Karthikeyan et al, 2016).

II. CORRELATION BETWEEN PROGRAMME OUTCOME AND COURSE OUTCOME

Each CO can be defined to address a subset of programme outcomes. It is possible to correlate the COs with POs by identifying the strength of mapping with the help of correlation levels 1, 2 or 3.1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) (Vanjale et al, 2015; Sudheer, et al, 2016). The effectiveness of mapping is determined by the assessment techniques used to calculate course and programme outcomes. The stakeholder's suggestions also should be taken into account while setting the target level. A CO-PO matrix can be created based on the strength of selected POs. To illustrate mapping, an example of Electronics

Instruments and Measurement subject (EIM) ELX304 in semester 3 Electronics Branch is taken into consideration to understand the correlation between CO & PO and the target level is set as 1, 2 or 3 as defined above. The Course Outcomes are defined as in Table 1.

III. TOOLS AND ATTAINMENT

Attainment is the result obtained as a standard outcome in order to accomplish the desired objectives. Appropriate assessment tools and targets are set to measure the attainment of each of the course outcomes. In order to achieve the course outcome, following direct and indirect tools are used.

A. DIRECT ATTAINMENT

IAE Answer Sheet Evaluation: The internal examination marks in theory paper are evaluated by calculating the average of the two internal assessment exams that are conducted. It is a measure to continually determine the achievement of course outcomes in relation to course objectives Grayscale Conversion: Converts the image to a

single-channel grayscale format, reducing computational complexity and simplifying feature extraction.

1. Assignment: Assignment can be one of the assessing metrics for primarily determining the expertise of the student.
2. Lab Experiment: Lab experiment may be one of the evaluation parameters for primarily evaluating the functional experience of the student with its design capabilities.
3. Case Study: In order to primarily test student knowledge, case study may be one of the evaluating criteria.
4. University Papers Result analysis: End Semester examination (theory or practical) is the metric used by the subject teacher to measure the achievement of course outcomes.

B. Indirect attainment

1. Industrial Visit: Industrial visit helps to gather information from students related to programme satisfaction.
2. Seminars: Seminar grades will be determined by the end-of-semester evaluation.
3. Quiz: Collect a wide range of data from students related to programme satisfaction.
4. Course Exit Survey: Helps to gather information from students related to programme satisfaction after completion of the course.
5. Feedback: Collect a wide range of data on outcome-based education in the teaching and learning programme. Project Selection: At the end of the eighth semester, the project marks for the final year shall be based on an
6. assessment by a committee consisting of senior faculty along with Head of Department and project guide.

- Feedback on Facilities: Helps to gather information on facilities from the students

The process for measuring attainment of each of the POs is: First set the target level using the co-relation level 1, 2 or 3. Keep track of the information that will be used to assess the course's outcome. The information can include the internal assessment, assignment, laboratory experiments, project evaluation student feedback, course exit survey, etc. Select the appropriate tool for direct and indirect attainment. Calculate the total number of students for the set course outcome. Calculate the average score obtained in any of the tool used for individual course outcome. Target level 1, 2, or 3 is set depending upon percentage of students getting higher than average percentage marks. (Karthikeyan et al, 2016; Sujit et al, 2016; Saxena, 2015; Maitra et al, 2016)

III. RESULTS AND DISCUSSION OF EVALUATION OF PROGRAMME

The target levels are set in order to achieve the desired outcome. Target levels are defined as per the levels of understanding. Level 1 is defined as a minimum of 50 per cent of students getting higher than average percentage marks. Similarly, Level 2 is defined as a minimum of 60 per cent of students getting higher than average percentage marks and Level 3 is defined as a minimum of 70 per cent of students getting higher than average percentage marks.

A.Direct Attainment

Table 3 shows CO-PO mapping obtained by direct attainment. IAE marks are used as a tool for direct attainment. The questions for internal assessment examination are framed considering the course outcomes described for the subject and the same are related to the program outcomes as shown in Table 2.

ELX305		Direct Attainment						
Subject Name	ELM		IAEI			IAEII		ESE
Year & Sem	S.E. (SEMIII)	T1Q1	T1Q2	T1Q3	T2Q1	T2Q2	T2Q3	Q
Ac. Year	2016–17	PO1	PO2	PO1, PO3	PO5	PO5, PO4	PO5	
Faculty	Rushali Thakkar	CO1	CO2	CO3	CO4	CO5	CO6	Cos
No.	Name of Student	10	5	5	10	5	5	41
1	ABC	3	1	5	7	5	4	45
2	DEF	8	0	4	2	5	0	46
3	GHI	7	2	5	4	1	4	41
4	JKL	4	3	5	2	1	0	50
5	MNO	4	3	0	2	0	3	63

Table 1

B.*Indirect Attainment*

Table 3 shows CO-PO mapping obtained by indirect attainment. Course Exit Survey Marks are used as a tool for indirect attainment. The questions in Course Exit Survey are framed considering the course outcomes described for the subject and the same are related to the programme outcomes as shown in Table

ELX305		Indirect Attainment					
Subject Name	ELM	Course Exit Survey					
Year & Sem	S.E. (SEMIII)	CES1	CES2	CES3	CES4	CES5	CES6
Ac. Year	2016–17	PO1	PO2	PO3	PO1	PO2	PO8
Faculty	Rushali Thakkar	CO1	CO2	CO3	CO4	CO5	CO6
No.	Name of Student	5	5	5	5	5	5
1	ABC	4	4	4	4	4	4
2	DEF	2	2	3	2	2	2
3	GHI	4	4	4	1	1	2
4	JKL	4	4	3	4	1	3
5	MNO	4	3	4	4	4	3
---	---	-	-	-	-	-	-
58	RST	5	5	4	4	5	5
59	UVW	5	5	5	5	5	4
60	XYZ	5	5	4	4	3	3
	Average	4.07	3.9	3.7	3.5	3.5	3.4
	total students > average	48	38	51	30	32	28
	% of students > average	89	71	95	56	60	52

Table 2

C. Conclusion

Table 4 indicates the attainment level obtained using direct and indirect tools. The attainment level is set as per the tool selected for direct and indirect attainment considering average score obtained for the set course outcome. If the target level is achieved with the attainment level then there is no gap and the course outcome and programme outcome are perfectly matched. However, if the target level is not matched to the attainment level, then there is a need for identification of the gap and corrective action to be planned to achieve the target level.

EIM	PO_1 CO_1	PO_2 CO_2	PO_3 CO_3	PO_4 CO_4	PO_5 CO_5	PO_6 CO_6
EXL304 (Target)	2	2	3	2	2	2
Direct Attainment	1.5	-	2	2	2	-
Indirect attainment	2	2.5	3	-	-	1

IV. BLOCK DIAGRAM

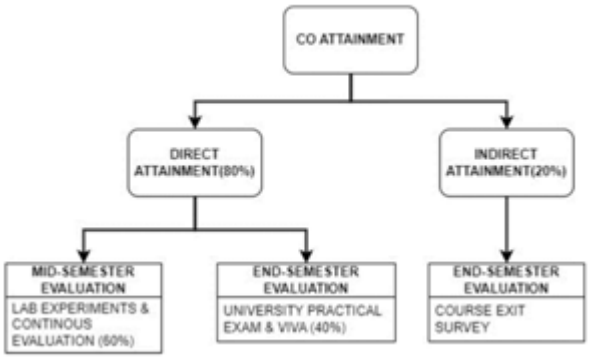

FIG 1.1

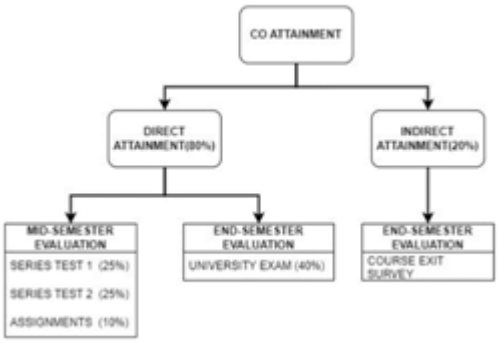

FIG 1.2

V. RESULT AND DISSCUSSION

A. UI Design Components in MERN

1. Frontend (React)
    - Component-Based Architecture: React allows modular UI development.
    - Material-UI (MUI): Provides pre-styled components.
    - Ant Design: Enterprise-level UI framework.
    - Tailwind CSS: Utility-first styling framework.
    - Shadcn/UI: A modern and customizable UI library.
2. State Management
    - Redux Toolkit: Centralized state management.
    - React Query: Efficient API state handling.
    - Zustand: Lightweight alternative to Redux.
3. Backend (Express & Node.js)
    - REST API: JSON-based communication with frontend.
    - GraphQL: Alternative API for efficient querying.
    - JWT Authentication: Secure user sessions.
    - Mongoose: ODM for MongoDB.

Brief Explanation for Journal Paper

Your journal paper can focus on the significance of UI design in MERN applications, highlighting:

- User Experience (UX): How intuitive UI improves user engagement.
- Component Reusability: Enhancing development speed.
- Performance Optimization: Reducing unnecessary re-renders in React.
- API Integration: Efficient data fetching and state management.
- Security Best Practices: Protecting frontend-backend communication.

REFERENCES

[1] Marey. M., Ibrahim, Y.E., Ruiz, E.C.S. (2018). Integrated assessment of course and program learning outcomes for accreditation process. IEEE Global Engineering Education Conference (EDUCON), 175-182.

[2] Ahankari, S.S., Jadhav, A.A. (2016). e-Rubrics: A Formative as Well as Summative Assessment Tool for Assessment of Course and Program Outcomes. IEEE Eighth International Conference on Technology for Education, 246-247.

[3] Vanjale, M., Shelar, S., Mane, P.B. (2015). Assessment of Course Outcomes (COs) in University affiliated engineering programs - case study of Course Outcome attainment. IEEE 3rd International Conference on MOOCs, Innovation and Technology in Education, Amritsar, 112-116.

[4] Sudheer, K., Sujit, V.V.N., Prasad., Ravichand, K. (2016). A Novel Method of Learning Outcome Assessment in Outcome Based Education. IEEE 4th International Conference on MOOCs, Innovation and Technology in Education (MITE), Madurai, 328-331

[5] Karthikeyan, P., Pandeeswari, S.T., Ruby, M., I. A. S., Kanimozhi, M. (2016). EIAT: Enhanced Indirect Assessment Tool for Assessing the Graduate Degree Programme Outcomes. IEEE 4th International Conference on MOOCs, Innovation and Technology in Education (MITE), Madurai, 88-93.

[6] Sujit, V.V.N., Prasad, N.V.G., Ravichand, K. (2016) A Novel Method of Learning Outcome Assessment in Outcome Based Education. IEEE 4th International Conference on MOOCs, Innovation and Technology in Education (MITE), Madurai, 328-331

[7] Saxena, Mittal, U., Pawar, A., Chandana, V.K. (2015) Limitations and improvement in the assessment of Course outcomes. IEEE 3rd International Conference on MOOCs, Innovation and Technology in Education (MITE), Amritsar, 46-51.

[8] Maitra,S., Gopalram, K. (2016) Ethics and Soft Skill Assessment Tool for Program Outcome Attainment: A Case Study. IEEE 4th International Conference on MOOCs, Innovation and Technology in Education (MITE), Madurai, 317-324K.

[9] Dargham, J.A., Chekima, A., Yin, R.C.K., Wong, F. (2013). A direct assessment method of the achievement of the program outcomes from the courses outcomes. IEEE 5th Conference on Engineering Education (ICEED), Kuala Lumpur, 131-135