# VARDHAMAN COLLEGE OF ENGINEERING

An Autonomous Institution, Affiliated to JNTUH & Approved by AICTE

Accredited by NAAC with A++ Grade

# EXAMINATION REFORMS POLICY

Enhancing Quality, Transparency & Academic Integrity

**Regulations: R22**

**Academic Year:**

**2022–23, 2023–24 & 2024–25**


**OFFICE OF THE DEAN**

**(EXAMINATIONS AND EVALUATION)**

# EXAMINATION REFORMS POLICY

*Enhancing Quality, Transparency & Academic Integrity*

## VARDHAMAN COLLEGE OF ENGINEERING (AUTONOMOUS)

**Hyderabad, Telangana**

**Affiliated to JNTUH | NAAC Accredited | NBA Programmes**

**Prepared by**

**OFFICE OF THE DEAN**

**(EXAMINATIONS AND EVALUATION)**

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**PREFACE**

The examination system plays a pivotal role in shaping the quality, credibility, and effectiveness of higher education. In an era marked by rapid technological advancements, evolving industry expectations, and an increasing emphasis on Outcome-Based Education (OBE), it has become imperative to re-examine and reform traditional approaches to assessment and evaluation.

Vardhaman College of Engineering (Autonomous) recognizes that examinations must go beyond testing memory and recall, and instead focus on assessing higher-order cognitive abilities, professional competencies, ethical values, and lifelong learning skills. In alignment with the AICTE Examination Reform Policy, NBA Graduate Attributes, and NAAC accreditation frameworks, this Examination Reform Policy document has been developed to establish a transparent, robust, student-centric, and outcome-oriented examination system.

This policy outlines structured reforms in assessment design, evaluation methodologies, grading practices, grievance redressal mechanisms, confidentiality protocols, and the integration of technology in examinations. The document emphasizes alignment between curriculum delivery, assessment strategies, and intended learning outcomes, ensuring coherence across the academic ecosystem.

The successful implementation of these reforms requires collective ownership and active participation from faculty members, students, administrators, and examination personnel. It is hoped that this policy will serve as a guiding framework for continuous improvement in assessment practices and contribute meaningfully to academic excellence and institutional quality assurance at **Vardhaman College of Engineering (Autonomous).**

**MESSAGE FROM THE PRINCIPAL**

I am pleased to present the Examination Reform Policy of Vardhaman College of Engineering (Autonomous), a significant step towards strengthening academic quality, assessment integrity, and outcome-based evaluation.

As an autonomous institution, Vardhaman College of Engineering bears the responsibility of designing and implementing an examination system that is fair, transparent, credible, and aligned with national and global best practices. The evolving demands of industry and society necessitate graduates who are not only technically competent but also possess critical thinking abilities, professional skills, and ethical values.

This policy reflects our commitment to continuous academic improvement, aligning assessment practices with AICTE guidelines, NBA accreditation requirements, and NAAC quality benchmarks. The proposed reforms encourage innovation in assessment, integration of technology, and the adoption of learner-centric evaluation methods that truly measure student achievement.

I appreciate the efforts of the Examination Reforms Committee, faculty members, and administrators who have contributed to the formulation of this comprehensive policy. I am confident that its effective implementation will enhance the credibility of our examination system and further strengthen the institution's pursuit of academic excellence.

I extend my best wishes to all stakeholders for the successful realization of these reforms.

**PRINCIPAL**
**Vardhaman College of Engineering (Autonomous)**

**MESSAGE FROM THE DEAN – EXAMINATIONS & EVALUATION**

The Examination Reform Policy is a cornerstone initiative aimed at transforming the assessment and evaluation processes at Vardhaman College of Engineering (Autonomous). Examinations are not merely a mechanism for grading, but a vital tool for measuring learning outcomes, ensuring academic standards, and guiding continuous improvement.

This policy emphasizes outcome-based assessment, transparency in evaluation, confidentiality in examination processes, structured grievance redressal, and the strategic use of technology. It advocates for diversified assessment methods, including projects, internships, rubrics, open-book examinations, and digital evaluation systems, to effectively assess higher-order cognitive skills and professional competencies.

The reforms outlined in this document are designed to ensure consistency, fairness, and reliability in examination-related activities, while also enhancing efficiency and accuracy through automation and digital governance. The alignment of assessment practices with course delivery methods and learning outcomes remains a key focus of this policy.

I am confident that with the cooperation and commitment of faculty, students, and administrative staff, these reforms will significantly strengthen the examination system and contribute to the overall academic excellence of the institution.

**Dean – Examinations & Evaluation**
**Vardhaman College of Engineering (Autonomous)**

**MESSAGE FROM THE CONTROLLER OF EXAMINATIONS**

The Examination Reform Policy of Vardhaman College of Engineering (Autonomous) represents a structured and forward-looking approach to strengthening the credibility, efficiency, and transparency of the institution's examination system. As the Controller of Examinations, I firmly believe that a robust examination framework is fundamental to upholding academic integrity, ensuring fairness in evaluation, and maintaining the trust of all stakeholders.

This policy provides a comprehensive roadmap for the systematic planning, execution, and monitoring of examination-related processes. It clearly defines procedures for question paper setting, moderation, conduct of examinations, evaluation, grading, result processing, and grievance redressal. By standardizing these processes, the policy ensures uniformity, accountability, and reliability across all academic programs.

A key focus of the Examination Reform Policy is the alignment of assessment and evaluation practices with Outcome-Based Education (OBE) principles. The structured mapping of Course Outcomes, Program Outcomes, and assessment components enables meaningful measurement of student learning and supports data-driven academic decision-making. The inclusion of rubric-based evaluation, internal–external assessment mechanisms, and diversified assessment tools strengthens objectivity and consistency in evaluation.

The policy also emphasizes the strategic use of technology in examination administration. Automation of examination workflows, digital record management, secure data handling, and transparent result processing enhance operational efficiency while minimizing errors and delays. These technology-enabled practices improve traceability and support effective governance of the examination system.

Confidentiality, security, and ethical conduct are integral to all examination-related activities. The policy establishes clear guidelines to safeguard sensitive information, prevent malpractices, and address grievances in a timely and transparent manner. Through well-defined responsibilities and review mechanisms, the examination system is designed to function with the highest standards of integrity and professionalism.

The successful implementation of this policy requires the active cooperation of faculty members, examination staff, students, and academic leadership. I am confident that collective adherence to these reforms will strengthen the examination processes, enhance stakeholder confidence, and contribute significantly to the institution's pursuit of academic excellence and continuous improvement.

**CONTROLLER OF EXAMINATIONS**
**Vardhaman College of Engineering (Autonomous)**

## EXECUTIVE SUMMARY – Examination Reforms

This report initiates a structured dialogue on **Examination Reforms at Vardhaman College of Engineering (Autonomous)**, drawing alignment with the **AICTE Examination Reforms Policy**, UGC guidelines, and best practices expected of autonomous institutions. The objective of this document is to recommend and institutionalize reforms that enhance **academic quality, transparency, flexibility, and relevance** in assessment and evaluation processes.

The guidelines presented herein are intended to support the **creation, implementation, and sustained operation of a robust examination system** that promotes outcome-based education and learner-centric assessment. These reforms represent the first step towards the **internalization and institutionalization of quality enhancement initiatives**, with success dependent on the **collective participation, ownership, and commitment** of all stakeholders—students, faculty, academic administrators, and the Examination Section.

The Examination Reforms Committee conducted a series of deliberations to review existing practices, identify gaps, and propose actionable recommendations suited to the autonomous status of Vardhaman College of Engineering. The focus areas of the reform framework include:

a) **Implementation of AICTE Examination Reform Policy** in alignment with autonomous college governance

b) **Standardized assessment and rubrics** for Mini Projects, Project Phase I & II, Internships, and Technical Seminars for B. Tech programs

c) **Blended learning assessment framework**, defining appropriate percentages and modalities for syllabus coverage through conventional (offline) and online modes for UG and PG programs

d) **Integration of Virtual Laboratories** to complement physical lab work and enhance experiential learning

e) **Revised Semester End Examination (SEE) question paper patterns** for UG and PG programs, applicable to students admitted from the academic year 2020–21 onwards, emphasizing Bloom's Taxonomy, CO–PO mapping, and competency-based evaluation

At this juncture, **examination reforms are critical to improving academic rigor, industry relevance, and learner outcomes**. The proposed reforms aim to ensure **fairness, academic integrity, continuous improvement, and timely evaluation**, while also supporting NAAC/NBA accreditation requirements and national education priorities.

It is anticipated that this policy document will serve as a **strategic roadmap** for Vardhaman College of Engineering to bring about meaningful, sustainable, and student-centric changes in the examination system. The active cooperation and support extended by the institution in the formulation of this report are **gratefully acknowledged**, and it is hoped that these reforms will significantly contribute to the institution's journey towards academic excellence.

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## A) FOR THE STUDENTS FROM THE ACADEMIC YEAR 2022–2023 ONWARDS

### 1) Implementation of AICTE – Examination Reform Policy

### 1.1 Preamble / Introduction

Evaluation, grading, and certification form the backbone of the academic framework at **Vardhaman College of Engineering (Autonomous)**. The examination system plays a pivotal role in assessing student learning, monitoring academic progression, and certifying competencies that enable graduates to function effectively in professional, societal, and economic environments. Examinations serve as critical checkpoints not only for learners but also for external stakeholders, ensuring that awarded certifications genuinely reflect the knowledge, skills, and attitudes acquired by students.

In line with the **AICTE Examination Reform Policy**, the institution recognizes the need to shift assessment practices beyond conventional rote-based evaluation towards higher levels of **Bloom's Taxonomy**. The reformed assessment framework emphasizes the evaluation of **higher-order cognitive skills**, including critical thinking, analytical reasoning, creativity, problem-solving ability, and professional competence—attributes that are essential for engineering graduates in a rapidly evolving technological landscape.

Student assessment and examination practices significantly influence the overall quality of education. The **academic rigor, relevance, and design of question papers** are key determinants of learning outcomes. As an autonomous institution, Vardhaman College of Engineering acknowledges the responsibility to continuously review and enhance its examination system to ensure alignment with **Outcome-Based Education (OBE)** principles, industry expectations, and national accreditation standards.

This policy document seeks to recommend and implement systematic reforms in the examination and evaluation processes at **Vardhaman College of Engineering (Autonomous)** to address the challenges posed by emerging trends in engineering education. At this juncture, **examination reforms are critical** for improving the quality, relevance, transparency, and credibility of assessments at the institutional level.

In view of these considerations, the Examination Reforms Committee has formulated this report for the **adoption and implementation of the AICTE Examination Reform Policy at Vardhaman College of Engineering**, structured around the following four key areas:

a) Important drivers for examination reforms
b) Strategies to align assessment with the desired student learning outcomes
c) Designing question papers to assess higher-order abilities and professional skills
d) Educational experiences and assessment opportunities to enhance learning effectiveness

These reforms aim to ensure a **student-centric, outcome-oriented, and quality-driven examination system**, reinforcing the institution's commitment to academic excellence, continuous improvement, and compliance with AICTE, NAAC, and NBA requirements.

## 1.2 Important Drivers for Examination Reform

### 1.2.1 Adoption of Outcome-Based Education (OBE)

Vardhaman College of Engineering (Autonomous) has adopted the **Outcome-Based Education (OBE)** framework in curriculum design, instructional delivery, and selected components of student assessment. While these initiatives mark a positive shift towards learner-centric education, the existing assessment practices require further strengthening to achieve full alignment with OBE principles.

One of the critical gaps identified is the **limited and inconsistent linkage between examination questions, assessment tools, and Program Outcomes (POs)**. In the absence of a systematic and structured mapping between Program Outcomes and assessment components, the measurement of outcome attainment becomes **inaccurate, incomplete, and unreliable**. This weak alignment undermines the effectiveness of the OBE framework and restricts the institution's ability to use assessment data for meaningful academic improvement.

Effective implementation of OBE demands that **every assessment activity—particularly question papers and internal evaluations—be explicitly mapped to defined Course Outcomes (COs) and Program Outcomes (POs)**. Without this essential linkage, the purpose of outcome-based assessment is diluted, rendering the entire exercise largely procedural rather than transformative.

Recognizing this challenge, the **AICTE Examination Reform Policy** emphasizes the need to redesign examination systems to ensure **outcome-oriented, competency-based, and skill-focused assessments**. As an autonomous institution committed to academic excellence, Vardhaman College of Engineering acknowledges the necessity to **adopt and institutionalize the reformed examination framework** recommended by AICTE.

In the context of rapidly evolving technological and professional requirements, **dynamic adaptation of examination and assessment practices** is essential to remain academically competitive and socially relevant. The proposed examination reforms aim to bridge the existing gaps, strengthen OBE implementation, and ensure that assessment practices genuinely reflect the intended learning outcomes and graduate attributes.

Here is a **refined, policy-aligned, and institution-specific version**, rewritten for **Vardhaman College of Engineering (Autonomous)** with **AICTE / OBE / NAAC / NBA–compliant language**.

### 1.2.2 Importance of Higher-Order Abilities and Professional Skills

In the existing examination system, a significant emphasis has traditionally been placed on **knowledge recall and memorization**. While foundational knowledge is essential, contemporary engineering education demands assessment mechanisms that go beyond rote learning and effectively evaluate **higher-order cognitive abilities**. These include the ability to **apply theoretical concepts, analyze complex situations, synthesize information, design solutions, and solve real-world engineering problems**, in alignment with the upper levels of **Bloom's Taxonomy**.

In addition to cognitive competencies, **professional and transferable skills** such as **effective communication, teamwork, ethical responsibility, leadership, adaptability, and lifelong learning** have emerged as critical determinants of graduate employability and professional success. Engineering graduates are increasingly expected to demonstrate not only technical proficiency but also the capacity to collaborate in multidisciplinary teams and continuously upgrade their skills in response to evolving industry requirements.

At **Vardhaman College of Engineering (Autonomous)**, higher-order abilities and professional skills are currently assessed primarily through **mini-projects, major projects, seminars, and internships**. While these assessment components provide valuable opportunities for skill development, there exists a clear need to **strengthen, standardize, and intensify the evaluation framework** to ensure consistent and objective measurement of these competencies across all programs.

The AICTE Examination Reform Policy emphasizes the integration of **competency-based assessment** within both continuous and end-semester evaluation processes. Accordingly, the institution proposes to **embed the assessment of higher-order cognitive skills and professional competencies more rigorously within the examination system**, including internal assessments, project evaluations, and appropriately designed question papers supported by well-defined rubrics.

These reforms aim to ensure that the examination system at Vardhaman College of Engineering effectively captures the **holistic development of students**, aligns assessment with desired learning outcomes, and produces graduates who are technically sound, professionally competent, and prepared for lifelong learning.

Here is a **refined, coherent, and policy-ready version**, **contextualized to Vardhaman College of Engineering (Autonomous)** and written in **AICTE–OBE–NAAC/NBA compliant language**. The flow, terminology, and tone are suitable for an **official Examination Reform Policy document**.

## 1.3 Strategies to Be Adopted to Align Assessment with the Desired Student Learning Outcomes

### 1.3.1 Mapping Program Outcomes to Assessment (Examinations)

Program Outcomes (POs) represent the **knowledge, skills, attitudes, and professional competencies** that graduates are expected to possess upon completion of a program, irrespective of the specific discipline. While POs are framed at a generic level, they are developed and demonstrated through **discipline-specific learning experiences** embedded within the curriculum.

In an **Outcome-Based Education (OBE)** framework, there exists a clear hierarchical alignment that progresses from **Program Outcomes (POs)** to **Course Outcomes (COs)** and further to outcomes of individual learning experiences. Outcomes defined at each level must be **aligned with and contribute meaningfully to the attainment of the Program Outcomes**. Through assessment activities, students demonstrate their level of achievement of the intended Course Outcomes, which in turn collectively reflect the attainment of POs.

In a constructively aligned academic program, courses are systematically coordinated to ensure a **progressive development of competencies**, moving from introduction and reinforcement to mastery of learning outcomes. The ultimate effectiveness of an academic program depends on the **measurable and demonstrable attainment of Program Outcomes**, which must be established through **accurate, reliable, and valid assessment mechanisms**.

At **Vardhaman College of Engineering (Autonomous)**, Course Outcomes are defined for all courses and assessment tools are designed to evaluate these outcomes, thereby contributing to the attainment of Program Outcomes. However, periodic reviews have indicated that **not all Program Outcomes are being adequately addressed or measured through the existing assessment structure**. This highlights the need for a **more comprehensive and diversified assessment design**, wherein different courses and assessment methods collectively ensure coverage and attainment of all Program Outcomes.

Accordingly, the institution proposes to **strategically redesign courses and assessment methods** so that all Program Outcomes are effectively addressed through a combination of examinations, continuous assessments, projects, seminars, internships, and other appropriate evaluation tools.

### 1.3.2 Two-Step Process for Bringing Clarity to Program Outcomes

Program Outcomes serve as essential guiding statements for **curriculum design, instructional delivery, and assessment planning** at the program level. However, due to their **broad and high-level nature**, Program Outcomes are not directly measurable at the course or assessment level. Establishing a clear and observable connection between POs, Course Outcomes, and assessment tools therefore poses a significant challenge.

To enhance the **clarity, observability, and measurability** of Program Outcomes, it is necessary to further disaggregate them into more specific and assessable components. This can be effectively achieved through a **two-step process involving the identification of Competencies and Performance Indicators (PIs)**.

#### Step 1: Identification of Competencies

For each Program Outcome, relevant **competencies** are identified. Competencies represent the distinct abilities, skills, or attributes implied within a Program Outcome statement and may require **different types of assessment measures** for effective evaluation.

#### Step 2: Definition of Performance Indicators (PIs)

For each identified competency, **Performance Indicators (PIs)** are defined. PIs are **explicit, observable, and measurable statements** that describe the expected level of student performance. They serve as practical measuring tools to assess the extent to which a student has attained the intended learning outcomes.

Once this two-step process is completed at the program level, **Course Outcomes and assessment activities for all courses are designed by mapping examination questions and evaluation**

**components directly to the identified Performance Indicators**. This approach ensures that assessment questions used across various tools—such as internal tests, semester-end examinations, projects, and seminars—are meaningfully aligned with PIs.

By adopting this structured mapping process, wherein **examination questions are linked to Performance Indicators**, Vardhaman College of Engineering achieves **greater clarity, precision, and resolution** in the assessment of both Course Outcomes and Program Outcomes. This alignment strengthens the reliability of outcome attainment measurements and enhances the effectiveness of the OBE framework.

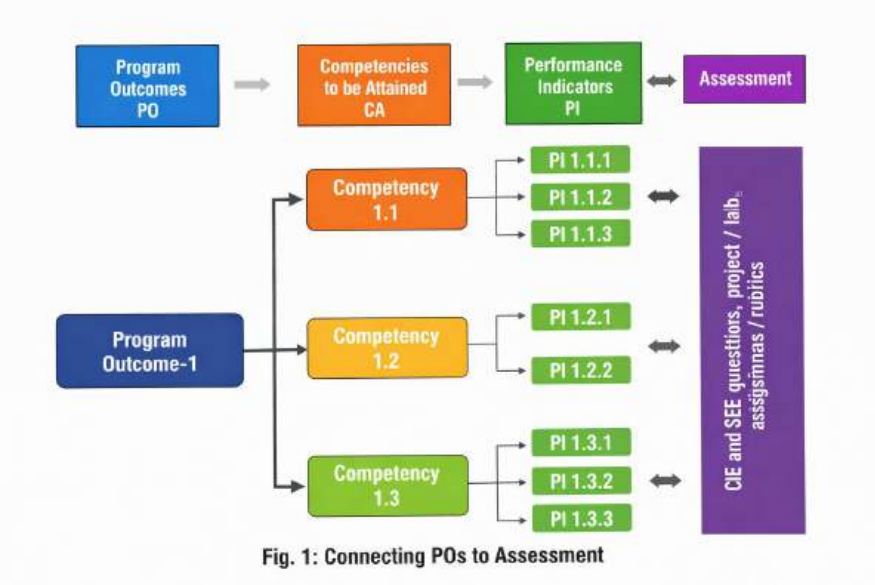


Fig. 1: Connecting POs to Assessment

Competencies represent the specific abilities and skills embedded within a Program Outcome, while Performance Indicators serve as measurable, observable, and assessable statements that clearly describe expected student performance. Assessment activities shall be designed and evaluated primarily based on Performance Indicators, which in turn provide evidence for the attainment of competencies and, ultimately, the Program Outcomes.

Accordingly, the assessment framework shall follow a structured and hierarchical process as outlined below:

**Program Outcomes (PO) → Competencies (CA) → Performance Indicators (PI)**

By institutionalizing this process across all departments, the college will achieve greater clarity, consistency, and reliability in outcome assessment, enabling accurate measurement of student achievement and facilitating continuous academic improvement in line with AICTE and NBA requirements.

### 1.4.1 Bloom's Taxonomy for Assessment Design

Bloom's Taxonomy provides a comprehensive and widely accepted framework for the **design of curriculum, teaching–learning strategies, and assessment methodologies**. In the context of

examination reforms, it serves as an essential tool for designing **balanced and outcome-oriented question papers** that assess student learning across different cognitive levels.

A conscious and systematic effort to map curriculum content and assessment activities to the various levels of Bloom's Taxonomy enables academic programs to move beyond the lower cognitive levels of **remembering and understanding**. Instead, it promotes the assessment of **higher-order cognitive abilities**, such as **application, analysis, evaluation, and creation**, which are critical for producing competent engineering graduates.

The **Revised Bloom's Taxonomy** emphasizes not only knowledge acquisition but also **thinking processes and the application of knowledge**. It is extensively used in engineering education to structure assessments, as it effectively characterizes the **complexity of learning tasks and higher-order intellectual skills**. The revised taxonomy identifies **six hierarchical levels of cognitive competencies** within the cognitive domain, namely:

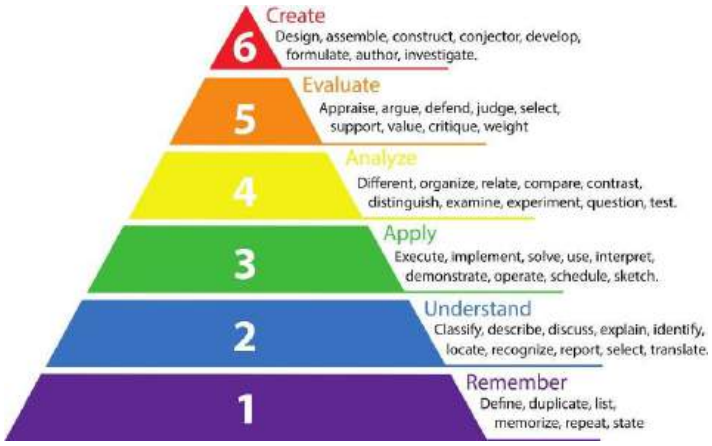



**Fig. 2. Revised Bloom's Taxonomy**

These levels provide a structured basis for designing examination questions and assessment tasks that progressively challenge students and accurately measure the attainment of **Course Outcomes (COs)** and **Program Outcomes (POs)**.

Accordingly, the institution proposes to adopt Bloom's Taxonomy as a **guiding framework for question paper setting and assessment planning**, ensuring appropriate weightage to higher-order cognitive skills in both Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A pictorial representation of the Revised Bloom's Taxonomy in the cognitive domain is shown in **Fig. 2**.

### 1.4.2 Action Verbs for Assessment

The **selection of appropriate action verbs** is a critical aspect of constructing effective assessment questions. Action verbs often serve as indicators of the **cognitive complexity and depth** of a question and therefore play a key role in aligning assessments with the intended learning outcomes. Over time, educators and assessment experts have developed a structured set of **measurable and observable action verbs** corresponding to each level of **Bloom's cognitive taxonomy**. These verbs assist faculty members not only in **describing and classifying knowledge, skills, and abilities**, but

also in **framing examination and assignment questions** that are appropriate to the cognitive level being assessed.

The purposeful use of action verbs ensures that assessment questions accurately evaluate whether students are expected to **recall, understand, apply, analyze, evaluate, or create** knowledge. Proper alignment between action verbs and cognitive levels enhances the **validity and reliability of assessments** and supports meaningful measurement of Course Outcomes (COs) and Program Outcomes (POs).

While framing assessment questions, it is essential to recognize that the **context in which an action verb is used determines its effective cognitive level**. The focus should therefore be on the **skill, action, or activity** that students are required to demonstrate, rather than on the verb alone. Careful consideration of this aspect enables the design of assessments that truly reflect the intended learning outcomes and promote higher-order thinking skills.

### 1.4.3 Assessment Planning

Effective assessment planning requires a **balanced distribution of assessment methods** that appropriately evaluate learning outcomes across different cognitive levels of **Bloom's Taxonomy**. Typically, the **lower and mid-level cognitive skills**—namely **remembering, understanding, and applying**, and to a limited extent **analyzing**—are assessed through **Continuous Internal Evaluation (CIE)** and **Semester End Examinations (SEE)**. These assessment modes are conducted within a **restricted time frame**, making them suitable for evaluating knowledge recall, conceptual understanding, procedural application, and basic analytical ability.

In contrast, the assessment of **higher-order cognitive abilities**, such as **analysis, evaluation, and creation**, requires **extended learning engagements** that allow students adequate time for reflection, design, experimentation, and problem-solving. Such abilities are more effectively assessed through **course-based projects, mini or minor projects, internships, laboratory work, seminars, and final-year major projects**, where students can demonstrate deeper understanding, innovation, and professional competence.

Accordingly, the institution proposes to adopt an **integrated assessment planning approach**, wherein different assessment tools are strategically selected to evaluate appropriate cognitive levels. This planned alignment ensures comprehensive measurement of Course Outcomes and Program Outcomes while promoting higher-order thinking and experiential learning. The mapping of assessment methods to Bloom's cognitive levels is illustrated in **Fig. 3**.

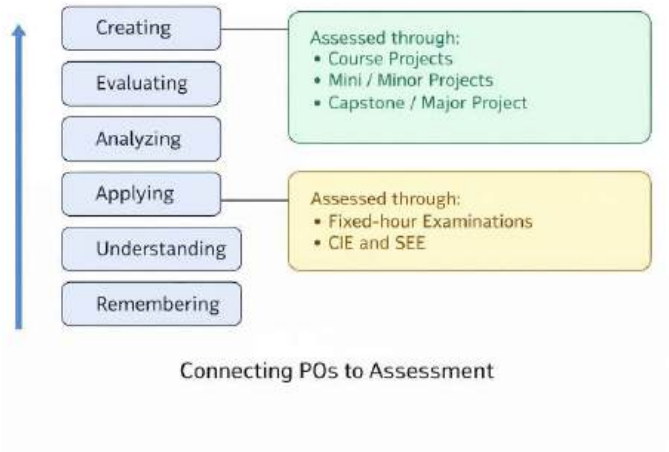



**Fig. 3: Mapping of Bloom's Learning Levels to Appropriate Assessment Methods**

## 1.5 Educational Experiences and Assessment Opportunities

In the 21st century, professional and transferable skills have emerged as essential attributes of a competent engineering graduate. Numerous studies and industry surveys indicate that employers increasingly value professional skills—such as communication, teamwork, leadership, ethical responsibility, adaptability, and lifelong learning—often placing them on par with or above domain-specific technical knowledge.

This emphasis is clearly reflected in the NBA Graduate Attributes, wherein six out of the twelve attributes are directly related to professional skills and higher-order abilities. Despite their recognized importance, evidence suggests that many students exhibit deficiencies in these competencies, highlighting a critical gap between academic preparation and industry expectations.

One of the primary challenges associated with professional skills and higher-order abilities is the difficulty in assessing them effectively through conventional, time-bound written examinations. Traditional assessment methods are largely designed to evaluate knowledge recall and basic understanding, and are therefore insufficient to capture complex behaviors, attitudes, and skills that develop over extended learning experiences.

Accordingly, there is a need to redefine educational experiences and expand assessment opportunities to ensure meaningful evaluation of these competencies. This calls for the integration of experiential learning activities, such as projects, internships, seminars, collaborative assignments, and reflective exercises, supported by well-defined rubrics and continuous assessment mechanisms. Such an approach enables holistic assessment of student learning and aligns the examination system with contemporary engineering education and industry requirements.

### 1.5.1 Innovative Educational Experiences to Teach and Assess

The attainment of **professional outcomes and higher-order cognitive abilities** cannot be ensured solely through participation in individual courses or conventional classroom instruction. Such outcomes are typically developed through a **combination of structured academic activities and experiential learning opportunities**, both within and beyond the classroom environment.

To effectively address these challenges, **comprehensive reforms are required in curriculum design, student learning experiences, and outcome assessment practices**. These reforms should focus on creating **authentic, learner-centric, and experiential educational experiences** that enable students to apply knowledge, demonstrate professional competencies, and engage in reflective learning.

Accordingly, the following **innovative educational experiences** are recommended to facilitate the teaching, learning, and assessment of **professional skills and higher-order cognitive abilities**:

a) **Course-based projects** that promote application, analysis, and problem-solving
b) **Open-ended laboratory experiments** that encourage inquiry, experimentation, and innovation
c) **Project-Based Learning (PBL) modules** integrated within core and elective courses
d) **Massive Open Online Courses (MOOCs)** aligned with program outcomes to support self-directed learning
e) **Co-curricular and extra-curricular activities** that foster leadership, teamwork, and communication skills
f) **Mini and minor projects** to provide early exposure to design thinking and independent learning
g) **Final-year major projects** emphasizing system-level thinking, design, and evaluation
h) **Internship and industry immersion experiences** to enhance professional readiness and workplace skills
i) **E-portfolios of student work** to document learning progression, reflections, and outcome attainment

The systematic integration of these educational experiences, supported by **clearly defined rubrics and assessment criteria**, will enable meaningful evaluation of student learning, strengthen Outcome-Based Education practices, and ensure alignment with **NBA Graduate Attributes and AICTE examination reform guidelines**.

### 1.5.2 Using Scoring Rubrics as an Assessment Tool

To effectively evaluate the **innovative educational experiences** outlined above and to assess student work for the attainment of **Course Outcomes (COs)** and, consequently, **Program Outcomes (POs)**, it is essential to adopt **reliable, consistent, and transparent assessment tools**. The use of well-designed **scoring rubrics** plays a crucial role in achieving this objective.

Rubrics provide a **systematic and objective framework** for assessing and grading student performance. They define **clear criteria, performance levels, and expectations**, enabling

evaluators to assess student work consistently across diverse learning activities such as projects, laboratories, internships, seminars, and portfolios. By articulating measurable performance indicators, rubrics support accurate evaluation of both **technical competencies and professional skills**.

In addition to facilitating fair and consistent assessment, rubrics serve as a **transparent and motivating guide for learning**. When shared with students in advance, they help learners understand expectations, focus on desired learning outcomes, and take responsibility for their own progress. Rubrics thus function not only as grading tools but also as **instructional aids** that promote reflective learning and continuous improvement.

Overall, the systematic use of scoring rubrics enhances the **validity, reliability, and transparency of assessment practices**, strengthens Outcome-Based Education implementation, and supports evidence-based evaluation of CO and PO attainment in alignment with **AICTE examination reform guidelines and NBA accreditation requirements**.

### 1.5.3 Open-Book Examinations

An **open-book examination** is a form of time-constrained written assessment that permits students to refer to **prescribed textbooks, class notes, or other approved reference materials** while answering examination questions. Unlike traditional closed-book examinations, this assessment approach is designed to evaluate students' **conceptual understanding and problem-solving abilities** rather than mere recall of information.

Open-book examinations are particularly effective in assessing **higher-order cognitive skills**, such as **application, analysis, and evaluation**, which correspond to the upper levels of **Bloom's Taxonomy**. By allowing access to reference materials, students are encouraged to focus on **interpretation, reasoning, critical analysis, and decision-making**, thereby reflecting real-world professional practices.

However, the successful implementation of open-book examinations requires **careful selection of suitable courses and curriculum areas**. Not all subjects are appropriate for this mode of assessment. Courses that emphasize **conceptual understanding, design thinking, case analysis, and problem-based learning** are better suited for open-book examinations than those primarily focused on factual knowledge.

Accordingly, the institution proposes to adopt **open-book examinations selectively**, ensuring alignment with Course Outcomes and Program Outcomes while maintaining academic rigor and assessment integrity. This approach supports the objectives of the **AICTE Examination Reform Policy** and strengthens the implementation of **Outcome-Based Education**.

At present, the college does not practice **open-book examinations** as a regular component of assessment. However, as part of the examination reform initiative, **efforts shall be made to introduce open-book examinations for at least one course in each semester**, implemented as a component of **Continuous Internal Evaluation (CIE)**. This phased and controlled adoption will

enable both faculty and students to familiarize themselves with this assessment method while ensuring academic rigor and integrity.

The committee further **strongly recommends the implementation of a well-defined Course File (also referred to as a Conspectus File)** for every course offered by the institution. The Course File shall comprehensively document essential academic components, including **Course Objectives, Course Outcomes, course delivery models adopted for different topics, assessment strategies, and evaluation methods**. Such documentation will bring clarity and consistency in course planning, delivery, and assessment.

It is emphasized that **examination reforms must be closely aligned with course delivery methods and instructional structures**. Assessments should reflect the pedagogical approaches adopted in the classroom and laboratories, thereby ensuring coherence between teaching, learning, and evaluation. This alignment will strengthen the effectiveness of Outcome-Based Education implementation and support continuous quality improvement in academic processes.

## 2. Examination Committees

The academic council has been conferred to decide the methodology for examination and evaluation. Different Committees have formed to conduct and run the examinations smoothly.

### 2.1. Examination Committee:

The examination committee is formed and shall consist of the following members.

| Designation | Role |
|---|---|
| Principal | Chairman |
| Dean Examinations and Evaluation | Member Secretary |
| Controller of Examinations (COE) | Member |
| Additional Controller of Examinations | Member |
| Assistant Controller of Examinations | Member |
| All Chairpersons of Boards of Examiners | Member |
| One Senior Faculty of the College | Member |

**Powers and duties of Examination Committee:**

**The committee shall:**

i. Ensure proper organization of examinations of the college including evaluation, tabulation and declaration of results.

ii. Appoint chief examiners, examiners, and paper- setters from amongst the persons included in the panels prepared by the respective subject boards.

iii. Prepare the time schedule of examinations and dates of declaration of the results at the beginning of the semester and notify the same.

iv. Arrange for strict vigilance during the conduct of examination so as to avoid use of unfair means by the students, teachers, invigilators and supervisors etc...

v. Constitute a sub-committee consisting of three members of whom one shall be Chairman in order to investigate and take disciplinary action for malpractices and lapses on part of the candidates, paper setter, examiners, teachers or any other persons connected with the conduct of examinations. The recommendations of the sub-committee shall be placed before the Examination Committee, which take the disciplinary action in the matter as it deems fit.

vi. Undertake experiments in examination reforms.

vii. Meet twice during the academic year and such other times as may be required.

viii. Perform such duties and responsibilities that are assigned from time to time by the Academic Council.

**2.2. Board of Examiners:**

**Appointment, duties and responsibilities of the Chairs of the Board of Examiners**

i. The Chair of the Board of Examiners shall be appointed by the Director/Principal for each Department He/she shall preserve strict confidentiality regarding the work allotted to him and shall not violate the integrity of the examination system.

ii. The Chairman of the Board of Examiners has to prepare the list of question papers, with title and code, to be set Programme-wise, Semester-wise, course wise (Scheme/Regulations -wise).

iii. After the preparation of the list of question papers to be set, the same has to be forwarded to the COE with the Syllabus of the paper, Question paper pattern/ Model Question paper, and if possible past Question paper.

iv. The Chair of the Board shall ensure that the meetings of the Board of Examiners shall be conducted only in the college premises.

v. He/she shall also maintain the minutes of the meetings of the Board of examiners and send copies of these minutes to the COE.

vi. The Chair shall arrange with the approval of the COE, for the conduct of practical//projects examinations preferably earlier to the commencement of theory examinations or later as the case may be.

vii. He/she shall verify and confirm the required number of examiners and ensure that the valuation work is completed within a week/ 10 days.

viii. No person shall be a Chair of a Board of Examinations for more than one term of three years continuously.

**2.3. Equivalence Committee**

To resolve the issues of students migrating from one regulation to another Equivalence Committees are constituted in department level. This Committee identify the courses in one regulation with another with suitable modification and guidelines.

- Dean (Academics) **Chairman**
- Dean Examinations and Evaluation Member
- Concerned HOD Member
- One Senior Faculty of the department Member
- COE/ACOE Member

**Functions of Equivalence Committee:**

i. To consider the cases of migration of students from one regulation to the other and provide suitable equivalence by taking cognizance of the student need and requirement

ii. The tenure of Equivalence Committee is two years

iii. The quorum of the Equivalence Committee is 2/3rd

**2.4. Malpractice Committee**

The malpractice committee is formed and shall consist of the following members.

| **Designation** | **Role** |
|---|---|
| Principal | Chairman |
| Dean Examinations and Evaluation | Member Secretary |
| Controller of Examinations (COE) | Member |
| Additional Controller of Examinations | Member |
| Assistant Controller of Examinations | Member |
| Concerned Department HoD | Member |
| Concerned subject faculty | Member |
| Invigilator of the exam hall where the Student admitted to malpractice | Member |

When an invigilator suspects malpractice by any candidate, the material in the possession of the candidate and the answer script shall be confiscated and the matter reported to the COE / exams-in-charge/principal. The invigilator shall obtain a statement from candidate and submit the same along with his/her own report on the incident to the COE / Principal. If the candidate refuses to give a statement, the same fact shall be mentioned in the invigilators report. Such candidates shall be allowed to leave the exam hall only after the permission by the COE / principal / exams-in-charge.

COE send a notice to all the members of malpractice committee for a meeting and decide the disciplinary action to be taken on the candidate. The same will be communicate to the student and his/her parents over phone.

### 2.5. Result Committee

Result Committee meeting held at the end of every semester to discuss and approve the result of the particular semester end examinations.

| | |
|---|---|
| ➢ Principal | **Chairman** |
| ➢ Dean Examinations and Evaluation | Member Secretary |
| ➢ Controller of Examinations (COE) | Member |
| ➢ Additional Controller of Examinations | Member |
| ➢ JNTUH Nominee | Member |

**Functions of Results Committee:**

i. The members of Result Committee can scrutinize the results of all semesters.
ii. The Committee discuss about subject wise, overall pass/fail percentage.
iii. The Committee can date decisions about moderations and changes to be made.
iv. The Committee can approve the results and allow publishing the same.

## 3. Academic Regulations (R22)

### Under-Graduate Degree Programme in Engineering

Vardhaman College of Engineering (VCE) offers a 4-year (8 semesters) Bachelor of Technology (B.Tech.) degree programme, under Choice Based Credit System (CBCS) and the regulations published in this document are applicable to the students admitted in B. Tech programme from the academic year 2022-2023.

### 3.1. Eligibility for Admission

a. Admission to the undergraduate (UG) programme shall be made either on the basis of the merit rank obtained by the qualified student in entrance test conducted by the Telangana State Government (EAMCET) or the University or on the basis of any other order of merit approved by the University, subject to reservations as prescribed by the Government from time to time.
b. The medium of instructions for the entire undergraduate programme in Engineering will be English only.

### 3.2. B. Tech. Programme Structure

a. A student after securing admission shall complete the B.Tech. programme in a minimum period of four academic years (8 semesters), and a maximum period of eight academic years (16 semesters) starting from the date of commencement of first year first semester, failing which student shall forfeit seat in B.Tech programme. Each student shall secure 160 credits (with CGPA ≥ 5) required for the completion of the undergraduate programme and award of the B.Tech. degree.

b. UGC/ AICTE specified definitions/ descriptions are adopted appropriately for various terms and abbreviations used in these academic regulations/ norms.

c. **Semester Scheme -** Each undergraduate programme is of 4 academic years (8 semesters) with the academic year divided into two semesters of 22 weeks (≥ 90 instructional days) each and in each semester - 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE) under Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) indicated by UGC, and curriculum/course structure suggested by AICTE are followed.

d. **Credit Courses -** All courses are to be registered by the student in a semester to earn credits which shall be assigned to each course in an L: T: P: C (lecture periods: tutorial periods: practical periods: credits) structure based on the following general pattern.

   i. One credit for one hour/ week/ semester for Theory/ Lecture (L) courses or Tuto- rials.

   ii. One credit for two hours/ week/ semester for Laboratory/ Practical (P) courses.

e. **Mandatory Courses -** Courses like Environmental Science and Technology, Indian Constitution, Universal Human Values 2: Understanding Harmony,Gender Sensitization and Research Methodology are mandatory courses. These courses will not carry any credits.

f. **Course Classification -** All courses offered for the undergraduate programme in Engineering (B.Tech. degree programmes) are broadly classified as follows. The Institution has followed almost all the guidelines issued by AICTE/UGC.

| S. No. | Broad Course Classification | Course Group/ Category | Course Description |
|---|---|---|---|
| 1 | Foundation Courses (FnC) | BS – Basic Sciences | Includes Mathematics, Physics and Chemistry Courses |
| 2 | | ES - Engineering Sciences | Includes Fundamental Engineering Courses |
| 3 | | HS – Humanities and Social Sciences | Includes courses related to Humanities, Social Sciences and Management |
| 4 | Core Courses (CoC) | PC – Professional Core | Includes core courses related to the parent discipline/ department/ branch of Engineering. |
| 5 | Elective Courses (ElC) | PE – Professional Electives | Includes elective courses related to the parent discipline/ department/ branch of Engineering. |
| 6 | | OE – Open Electives | Elective courses which include inter-disciplinary courses or courses in an area outside the parent discipline/ department/ branch of Engineering. |
| 7 | Project Work (PW) | Internship/Mini-Project/Project Work | Industry Training/ Internship/Industry Oriented Mini-Project/Mini-Project/Skill Development Courses/Project Work Phase-I & II |

| | | | |
|---|---|---|---|
| 8 | Mandatory Courses (MC) | - | Mandatory Courses (non-credit) |

**3.3. Course Registration**

a. A 'faculty advisor or counselor' shall be assigned to a group of 20 students, who will advise the students about the undergraduate programme, its course structure and curriculum, choice/option for courses, based on their competence, progress, pre-requisites and interest.

**b.** The academic office of the college invites 'registration forms' from students before the beginning of the semester through 'online registration', ensuring 'date and time stamping'. **The online registration requests for any 'current semester' shall be completed before the commencement of SEEs (Semester End Examinations) of the 'preceding semester'.**

c. A student can apply for online registration, only after obtaining the 'written approval' from faculty advisor/counselor, which should be submitted to the college academic office through the Head of the Department. A copy of it shall be retained with the Head of the Department, Faculty Advisor/ Mentor and the student.

d. A student may be permitted to register for all the courses in a semester as specified in the course structure **with maximum additional course(s) limited to 6 Credits (any 2 elective courses),** based on progress and SGPA/ CGPA, and completion of the 'pre-requisites' as indicated for various courses, in the department course structure and syllabus contents.

e. Choice for 'additional courses', not more than any 2 elective courses in any Semester, must be clearly indicated, which needs the specific approval and signature of the Faculty Advisor/Mentor/HOD.

f. If the student submits ambiguous choices or multiple options or erroneous entries during online registration for the course(s) under a given/ specified course group/ category as listed in the course structure, only the first mentioned course in that category will be taken into consideration

g. Course options exercised through online registration are final and cannot be changed or interchanged; further, alternate choices also will not be considered. However, if the course that has already been listed for registration by the Head of the Department in a semester could not be offered due to any inevitable or unexpected reasons, then the student shall be allowed to have alternate choice either for a new course (subject to offering of such a course), or for another existing courses (subject to availability of seats). Such alternate arrangements will be made by the Head of the Department, with due notification and time-framed schedule, within a week after the commencement of class-work for that semester.

h. Dropping of courses may be permitted, only after obtaining prior approval from the faculty advisor/ counselor 'within a period of 15 days' from the beginning of the current semester.

i. Open Electives: The students have to choose three Open Electives (OE-I, II & III) from the list of Open Electives given by other departments. However, the student can opt for an Open Elective courses offered by his own (parent) department, if the student has not registered

and not studied that course under any category (Professional Core, Professional Electives, Mandatory Courses etc.) offered by parent department in any semester. Open Elective courses already studied should not repeat/should not match with any category (Professional Core, Professional Electives, Mandatory Courses etc.) of courses even in the forthcoming semesters.

j. Professional Electives: The students have to choose six Professional Electives (PE-I to VI) from the list of professional electives given.

k. Professional Electives: The students have to choose six Professional Electives (PE-I to VI) from the list of professional electives given.

**3.4. Courses to be Offered**

a. A course may be offered to the students, only if a minimum of 15 students opt for it.

b. More than one faculty member may offer the same course (lab/ practical may be included with the corresponding theory course in the same semester) in any semester. However, selection of choice for students will be based on - 'first come first serve basis and CGPA criterion' (i.e. the first focus shall be on early online entry from the student for registration in that semester, and the second focus, if needed, will be on CGPA of the student).

c. If more entries for registration of a course come into picture, then the Head of the Department concerned shall decide, whether or not to offer such a course for two (or multiple) sections.

d. In case of options coming from students of other departments/ branches/ disciplines (not considering open electives), first priority shall be given to the student of the 'parent department'.

**3.5. Attendance Requirements**

a. A student shall be eligible to appear for the semester end examinations, if the student acquires a minimum of 75% of attendance in aggregate of all the courses (including attendance in mandatory courses like Environmental Science and Technology, Gender Sensitization, Universal Human Values 2: Understanding Harmony, Indian Constitution and Research Methodology) for that semester. Two periods of attendance for each theory course shall be considered, if the student appears for the continuous assessments of that course.

b. Shortage of attendance in aggregate up to 10% (65% and above, and below 75%) in each semester may be condoned by the college academic committee on genuine and valid grounds, based on the student's representation with supporting evidence.

c. A stipulated fee shall be payable for condoning of shortage of attendance.

d. Shortage of attendance below 65% in aggregate shall in NO case be condoned.

e. Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examinations of that semester. They get detained and their registration for that semester shall stand canceled, including all academic credentials (internal marks etc.) of that semester. They will not be promoted to the next semester. They may seek re-registration for all those courses registered in that semester in which the student is detained, by seeking re-admission into that semester as and when offered; if there are any professional electives and/ or open electives, the same may also be re-registered if offered. However, if those electives are not offered in later semesters, then alternate electives may be chosen from the same set of elective courses offered under that category.

f. A student fulfilling the attendance requirement in the present semester shall not be eligible for readmission into the same class.

**3.6. Academic Requirements**

**The following academic requirements have to be satisfied, in addition to the attendance requirements mentioned in Item No. 3.5.**

a. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course, if student secures not less than 35% (14 marks out of 40 marks) in the Continuous Internal Evaluation(CIE), not less than 35% (21 marks out of 60 marks) in the Semester End Examination(SEE) and a minimum of 40% (40 marks out of 100 marks) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of letter grades, this implies securing 'C' grade or above in that course.

b. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Social Innovation / Engineering Exploration / Engineering Design / Product Realization / Industry Oriented Mini Project (or) Internship, if the student secures not less than 40% marks (i.e. 40 out of 100 allotted marks) in each of them. The student is deemed to have failed, if he (i) does not submit a report, or (ii) not make a presentation of the same before the evaluation committee as per schedule, or (iii) secures less than 40% marks in Social Innovation / Engineering Exploration / Engineering Design/ Product Realization / Industry Oriented Mini Project (or) Internship evaluations.

c. A student may reappear once for each of the above evaluations, when they are scheduled again; if the student fails in such 'one reappearance' evaluation also, the student has to reappear for the same in the next subsequent semester, as and when it is scheduled.

**d. Promotion Rules**

| S. No | Promotion | Conditions to be fulfilled |
|---|---|---|
| 1 | First year first semester to first year second semester | Regular course of study of first year first semester. |
| 2 | First year second semester to Second year first semester | (i) Regular course of study of first year second semester. |
| | | (ii) Must have secured at least 20 credits out of 40 credits i.e., 50% credits up to first year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not. |
| 3. | Second year first semester to Second year second semester | Regular course of study of second year first semester. |

| | | |
|---|---|---|
| 4 | Second year second semester to Third year first semester | (i) Regular course of study of second year second semester. |
| | | (ii)Must have secured at least 48 credits out of 80 credits i.e., 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not. |
| 5 | Third year first semester to Third year second semester | Regular course of study of third year first semester. |
| 6 | Third year second semester to Fourth year first semester | (i) Regular course of study of third year second semester. |
| | | (ii) Must have secured at least 72 credits out of 120 credits i.e., 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not. |
| 7 | Fourth year first semester to Fourth year second semester | Regular course of study of fourth year first semester. |

A student (i) shall register for all courses covering 160 credits as specified and listed in the course structure, (ii) fulfills all the attendance and academic requirements for 160 credits, **(iii) earn all 160 credits by securing SGPA ≥ 5.0 (in each semester), and CGPA ≥ 5 (at the end of 8 semesters), (iv) passes all the mandatory courses, to successfully complete the undergraduate programme. The performance of the student in these 160 credits shall be considered for the calculation of the final CGPA (at the end of undergraduate programme), and shall be indicated in the grade card / marks memo of IV-year II semester.**

If a student registers for 'extra courses' (in the parent department or other departments/branches of Engg.) other than those listed courses totaling to 160 credits as specified in the course structure of his department, the performances in those 'extra courses' (although evaluated and graded using the same procedure as that of the re- quired 160 credits) will not be considered while calculating the SGPA and CGPA. For such 'extra courses' registered, percentage of marks and letter grade alone will be indi- cated in the grade card / marks memo as a performance measure, subject to completion of the attendance and academic requirements as stated in regulations Items 6 and 7.1 –7.4 above.

**A student eligible to appear in the semester end examination for any course, but absent from it or failed (thereby failing to secure 'C' grade or above) may reappear for**

**that course in the supplementary examination as and when conducted. In such cases, internal marks (CIE) assessed earlier for that course will be carried over, and added to the marks to be obtained in the SEE supplementary examination for evaluating performance in that course.**

e. A student detained in a semester due to shortage of attendance may be re-admitted in the same semester in the next academic year for fulfillment of academic requirements. The academic regulations under which a student has been re-admitted shall be applicable. Further, no grade allotments or SGPA/ CGPA calculations will be done for the entire semester in which the student has been detained.

f. A student detained due to lack of credits, shall be promoted to the next academic year only after acquiring the required number of academic credits. The academic regulations under which the student has been readmitted shall be applicable to him.

### 3.7. Evaluation - Distribution and Weightage of Marks

| Type of Course | CIE | | SEE |
|---|---|---|---|
| Theory | 30 Marks for CAT | Average of Two Mid Term Examinations | 60 Marks |
| | 10 Marks for AAT | Assignment, Viva-Voce/ PPT/ Poster/ Case Study or any other | |
| Practical | 40 Marks | 10M Day-to-Day Evaluation<br>10M Viva-Voce<br>10M Internal Exam (Average of CAT1 and CAT2)<br>10M Lab Project | 10M Write-up<br>15M Experiment/program<br>15M Evaluation of results<br>10M Presentation on another experiment/ program<br>10M Viva-voce |
| Internship/ Mini-Project | 40 Marks | 20 Marks – Department Review<br>20 Marks – Supervisor Review | 60 Marks- Viva-Voce by External Examiner |
| Project Work Phase-I | 100 Marks | 50 Marks – Department Review<br>50 Marks – Supervisor Review | -- |
| Project Work Phase - II | 40 Marks | 20 Marks – Department Review<br>20 Marks – Supervisor Review | 60 Marks – Viva-Voce by External Examiner |

**The semester end examinations (SEE), for theory courses, will be conducted for 60 marks consisting of two parts viz. i) Part- A for 10 marks, ii) Part - B for 50 marks.**

| Part | Description | Marks |
|---|---|---|
| Part - A | Compulsory question with 10 sub-questions from all units (equal marks) | 10 |
| Part - B | Descriptive questions (5 questions, one from each unit, with either/or choice) | 50 |
| | Total SEE Marks | 60 |
| Duration = 3 Hours | | |

**The student, in each theory course, shall have to earn 35% of marks (i.e. 14 marks out of 40 marks) in CIE, 35% of marks (i.e. 21 marks out of 60 marks) in SEE and overall 40% of marks (i.e. 40 marks out of 100 marks) in both CIE and SEE put together.**

| Component | Maximum Marks | Minimum % Required | Minimum Marks |
|---|---|---|---|
| **CIE** | **40** | **35%** | **14** |
| **SEE** | **60** | **35%** | **21** |
| **CIE + SEE (Overall)** | **100** | **40%** | **40** |

3.8. For practical courses there shall be a Continuous Internal Evaluation (CIE) during the semester for 40 marks and 60 marks for Semester End Examination (SEE). The 40 marks for Continuous Internal Evaluation are divided as follows:

3.8.1. A write-up on day-to-day experiment in the laboratory (in terms of aim, compo- nents, procedure and expected outcome) which shall be evaluated for 10 marks

3.8.2. 10 marks for viva-voce (or) tutorial (or) case study (or) application (or) poster presentation of the course concerned.

3.8.3. Internal practical examination conducted by the laboratory teacher concerned shall be evaluated for 10 marks.

3.8.4. The remaining 10 marks are for Laboratory Project, which consists of the De- sign (or) Software / Hardware Model Presentation (or) App Development (or) Prototype Presentation submission which shall be evaluated after completion of laboratory course and before semester end practical examination.

3.9 For conducting laboratory end examinations of all UG Programmes, one internal examiner and one external examiner are to be appointed by the Principal of the College, before commencement of the lab end examinations. The external examiner should be selected from the six panel of examiners identified from outside the college and submitted by Head of the Department.

**The student, in each field/research-based course, shall have to earn 35% of marks (i.e. 14 marks out of 40 marks) in CIE, 35% of marks (i.e. 21 marks out of 60 marks) in SEE and overall, 40% of marks (i.e. 40 marks out of 100 marks) in both CIE and SEE put together.**

**The student is eligible to write Semester End Examination of the concerned course, if the student scores 35% (14 marks) of 40 in Continuous Internal Evaluation (CIE).**

**In case, the student appears for SEE of the concerned course but not secured 35% of CIE marks, his performance in that course in SEE shall stand canceled in-spite of appearing the SEE.**

**3.10 student can re-register for courses in a semester:**

*a*. If the internal marks secured by a student in the Continuous Internal Evaluation for 40 marks (average of two mid-term examinations consisting of objective and descriptive parts, average of two assignments and Course Viva-voce/ PPT/Poster Presentation/ Case Study or any other on a topic in the concerned course) are less than 35% and failed in those courses.

*b*. They may seek re-registration for all those courses registered in that semester in which the student is failed. The student has to re-appear for CIE and SEE as and when offered.

*c*. A student must re-register for the failed course(s) for 40 marks within four weeks of commencement of the classwork in next academic year. His Continuous Internal Evaluation marks for 40 obtained in the previous attempt stand cancelled. The student has to obtain fresh set of marks for 40 allotted for CIE (Sum of average of two mid-term examinations consisting of Objective & descriptive parts, Average of two Assignments & Course Viva-voce/PPT/ Poster presentation/ Case Study on a topic in the concerned course). Head of the Dept. will take care of this.

*d*. For mandatory courses of Environmental Science and Technology, Gender Sensitiza- tion, Universal Human Values 2: Understanding Harmony, Indian Constitution and Research Methodology a student has to secure 40 marks out of 100 marks (i.e., 40% of the 100 marks allotted) in the Continuous Internal Evaluation for passing the course.

*e*. No marks or letter grades shall be allotted for mandatory/non-credit courses. Only Pass/Fail shall be indicated in Grade Card.

**3.11 Grading Procedure**

a. Grades will be awarded to indicate the performance of students in each Theory Course, Laboratory / Practicals / Industry-Oriented Mini Project/Internship/SDC and Project Stage. Based on the percentage of marks obtained (Continuous Internal Evaluation plus Semester End Examination, both taken together) as specified in item 8 above, a corresponding letter grade shall be given.

b. As a measure of the performance of a student, a 10-point absolute grading system using the following letter grades (as per UGC/AICTE guidelines) and corresponding percentage of marks

shall be followed:

| Percentage of Marks Secured in a Course | Letter Grade | Meaning | Grade Points |
|---|---|---|---|
| ≥ 90 | O | Outstanding | 10 |
| ≥ 80 and <90 | A+ | Excellent | 9 |
| ≥ 70 and < 80 | A | Very Good | 8 |
| ≥ 60 and <70 | B+ | Good | 7 |
| ≥ 50 and <60 | B | Average | 6 |
| ≥ 40 and <50 | C | Pass | 5 |
| Below 40 | F | Fail | 0 |
| Absent | AB | Absent | 0 |

c. A student who has obtained an 'F' grade in any course shall be deemed to have 'failed' and is required to reappear as a 'supplementary student' in the semester end examination, as and when offered. In such cases, internal marks in those courses will remain the same as those obtained earlier.

d. To a student who has not appeared for an examination in any course, 'Ab' grade will be allocated in that course, and he is deemed to have 'Failed'. A student will be required to reappear as a 'supplementary student' in the semester end examination, as and when offered next. In this case also, the internal marks in those courses will remain the same as those obtained earlier.

e. A letter grade does not indicate any specific percentage of marks secured by the student, but it indicates only the range of percentage of marks.

f. A student earns Grade Point (GP) in each course, on the basis of the letter grade secured in that course. The corresponding 'Credit Points' (CP) are computed by multiplying the grade point with credits for that particular course.

**Credit Points (CP) = Grade Point (GP) x Credits for a course**

g. A student passes the course only when GP ≥ 5 ('C' grade or above)

h. The Semester Grade Point Average (SGPA) is calculated by dividing the sum of credit points (ΣCP) secured from all courses registered in a semester, by the total number of credits registered during that semester. SGPA is rounded off to two decimal places. SGPA is thus computed as

$$\mathrm{SGPA}(S_i) = \frac{\sum_{i=1}^{N} C_i \times G_i}{\sum_{i=1}^{N} C_i}$$

**where 'i' is the course indicator index (considering all courses in a semester), 'N' is the no. of courses 'registered' for the semester (as specifically required and listed under the course structure of the parent department), $C_i$ is the no. of credits allotted to the $i^{th}$ course, and $G_i$ represents the grade points (GP) corresponding to the letter grade awarded for that $i^{th}$ course.**

i. The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student in all semesters considered for registration. The CGPA is the ratio of the total credit points secured by a student in all registered courses (of 160) in all semesters, and the total number of credits registered in all the semesters. CGPA is rounded off to two decimal places. CGPA is thus computed from the I year II semester onwards at the end of each semester as per the formula

$$\mathrm{CGPA} = \frac{\sum_{j=1}^{M} C_j \times G_j}{\sum_j C_j}$$

**(i.e., up to and inclusive of S semesters, S ≥ 2),**

where 'M' is the total no. of courses (as specifically required and listed under the course structure of the parent department) the student has 'registered' i.e., from the 1st semester onwards up to and inclusive of the 8th semester, 'j' is the course indicator index (takes into account all courses from 1 to 8 semesters), Cj is the no. of credits allotted to the jth course, and Gj represents the grade points (GP) corresponding to the letter grade awarded for that jth course. After registration and completion of I year I semester, the SGPA of that semester itself may be taken as the CGPA, as there are no cumulative effects.

**j. Illustration of calculation of SGPA**

| **Course (i)** | **Credits ($C_i$)** | **Letter Grade** | **Grade Points ($G_i$)** | **Credit Points $C_i \times G_i$** |
|---|---|---|---|---|
| Course 1 | 4 | A | 8 | 4 × 8 = 32 |
| Course 2 | 4 | O | 10 | 4 × 10 = 40 |
| Course 3 | 4 | C | 5 | 4 × 5 = 20 |
| Course 4 | 3 | B | 6 | 3 × 6 = 18 |
| Course 5 | 3 | A+ | 9 | 3 × 9 = 27 |
| Course 6 | $\sum$ 3 | C | 5 | $\sum$ 3 × 5 = 15 |
| | $C_i$ =21 | | | $C_i \times G_i$= 152 |

**SGPA = 152/21 = 7.24**

**k. Illustration of Calculation of CGPA up to 3rd Semester**

| Semester | Course | Credits Allotted | Letter Grade secured | Grade Points | Credit Points (CP) |
|---|---|---|---|---|---|
| I | Course 1 | 3 | A | 8 | 24 |
| I | Course 2 | 3 | O | 10 | 30 |
| I | Course 3 | 3 | B | 6 | 18 |
| I | Course 4 | 4 | A | 8 | 32 |
| I | Course 5 | 3 | A+ | 9 | 27 |
| I | Course 6 | 4 | C | 5 | 20 |
| II | Course 7 | 4 | B | 6 | 24 |
| II | Course 8 | 4 | A | 8 | 32 |
| II | Course 9 | 3 | C | 5 | 15 |
| II | Course 10 | 3 | O | 10 | 30 |
| II | Course 11 | 3 | B+ | 7 | 21 |
| II | Course 12 | 4 | B | 6 | 24 |
| II | Course 13 | 4 | A | 8 | 32 |
| II | Course 14 | 3 | O | 10 | 30 |
| III | Course 15 | 2 | A | 8 | 16 |
| III | Course 16 | 1 | C | 5 | 5 |
| III | Course 17 | 4 | O | 10 | 40 |
| III | Course 18 | 3 | B+ | 7 | 21 |
| III | Course 19 | 4 | B | 6 | 24 |
| III | Course 20 | 4 | A | 8 | 32 |
| III | Course 21 | 3 | B+ | 7 | 21 |
| Total Credits: | | 69 | Total Credit Points: | | 518 |

**CGPA = 518/69 = 7.51**

**The calculation process of CGPA illustrated above will be followed for each subsequent semester until 8th semester. The CGPA obtained at the end of 8th semester will become the final CGPA secured for entire B.Tech programme.**

l. For merit ranking or comparison purposes or any other listing, only the 'rounded off' values of the CGPAs will be used.

m. SGPA and CGPA of a semester will be mentioned in the semester Memorandum of Grades if all

courses of that semester are passed in first attempt. Otherwise the SGPA and CGPA shall be mentioned only on the Memorandum of Grades in which sitting he passed his last exam in that semester. However, mandatory courses will not be taken into consideration.

### 3.12 SGPA, CGPA and Percentage of Marks

a. Computation of SGPA and CGPA are done using the procedure listed in 9.6 to 9.9
b. For final percentage of marks equivalent to the computed final CGPA, the following formula may be used.

**% of Marks = (final CGPA – 0.5) × 10**

### 3.13 Passing Standards

a. A student shall be declared successful or 'passed' in a semester, if he secures a GP≥ 5 ('C' grade or above) in every course in that semester (i.e. when the student gets an SGPA ≥ 5.0 at the end of that particular semester); and he shall be declared successful or 'passed' in the entire undergraduate programme, only when gets a CGPA ≥ 5.00 ('C' grade or above) for the award of the degree as required.
b. After the completion of each semester, a grade card or grade sheet shall be issued to all the registered students of that semester, indicating the letter grades and credits earned. It will show the details of the courses registered (course code, title, no. of credits, grade earned, etc.) and credits earned. There is NO exemption of credits in any case.

### 3.14 Award of Degree

A student who registers for all the specified courses as listed in the course structure and secures the required number of 160 credits (with CGPA ≥ 5.0), within 8 academic years from the date of commencement of the first academic year, shall be declared to have 'qualified' for the award of B.Tech. degree in the branch of Engineering selected at the time of admission.

### 3.15 Award of 2-Year B.Tech. Diploma Certificate

a. A student is awarded 2-Year UG Diploma Certificate in the concerned engineering branch on completion of all the academic requirements and earned all the 80 credits (within 4 years from the date of admission) upto B. Tech. – II Year – II Semester, if the student want to exit the 4-Year B. Tech. program and requests for the 2-Year B.Tech. (UG) Diploma Certificate.
b. The student once opted and awarded for 2-Year UG Diploma Certificate, the student will be permitted to join in B. Tech. III Year I Semester and continue for completion of remaining years of study for 4-Year B. Tech. Degree ONLY in the next academic year along with next batch students. However, if any student wishes to continue the study after opting for exit, he/she should register for the courses in III Year I Semester before the commencement of classwork for that semester.
c. The students, who exit the 4-Year B.Tech. program after II Year of study and wish to re-join the B.Tech. program, must submit the 2-Year B.Tech. (UG) Diploma Certificate awarded to him, subject to the eligibility for completion of the degree.
d. A student may be permitted to take one year break after completion of II Year – II Semester or B. Tech. III Year II Semester (with university permission through the principal of the college well in advance) and can re-enter the pro- gram in next Academic Year in the same college and complete the course on fulfilling all the

academic credentials within a stipulated duration i.e. double the duration of the program (Ex. within 8 Years for 4-Year program).

### 3.16 Student Transfers

a. There shall be no branch transfers after the completion of admission process.
b. The students seeking transfer to Vardhaman College of Engineering from various other Universities/institutions have to pass the failed subjects which are equivalent to the subjects of Vardhaman College of Engineering, and also pass the subjects of Vardhaman College of Engineering which the students have not studied at the earlier institution. Further, though the students have passed some of the subjects at the earlier institutions, if the same subjects are prescribed in different semesters of Vardhaman College of Engineering, the students have to study those subjects in VCE in spite of the fact that those subjects are repeated.
c. The transferred students from other Universities/Institutions to Vardhaman College of Engineering who are on rolls are to be provided one chance to write the CBT (for internal marks) in the equivalent subject(s) as per the clearance letter issued by the University.
d. The Vardhaman College of Engineering shall provide one chance to write the inter- nal examinations in the equivalent course(s) to the students transferred from other universities/institutions to Vardhaman College of Engineering who are on rolls, as per the clearance (equivalence) letter issued by the Institution.

## 4. Academic Regulations for B.Tech (Lateral Entry Scheme) from the Academic Year 2023-24

**a. Eligibility for the award of B.Tech Degree (LES)**
**b. The LES students after securing admission shall pursue a course of study for not less than three academic years and not more than six academic years.**
c. The student shall register for 120 credits and secure 120 credits with CGPA ≥ 5 from II year to IV-year B.Tech. programme (LES) for the award of B.Tech. degree.
d. The students, who fail to fulfil the requirement for the award of the degree in six academic years from the year of admission, shall forfeit their seat in B.Tech.
e. The attendance requirements of B. Tech. (Regular) shall be applicable to B.Tech. (LES).

**f. Promotion rule**

| S. No | Promotion | Conditions to be fulfilled |
|---|---|---|
| 1 | Second year first semester to second year second semester | Regular course of study of second year first semester. |
| 2 | Second year second semester to third year first semester | (i) Regular course of study of second year second semester.<br>(ii) Must have secured at least 24 credits out of 40 credits i.e., 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not. |
| 3 | Third year first semester to third year second semester | Regular course of study of third year first semester. |
| 4 | Third year second semester to fourth year first semester | (i) Regular course of study of third year second semester. (ii) Must have secured at least 48 credits out of 80 credits i.e., 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not. |
| 5 | Fourth year first semester to fourth year second semester | Regular course of study of fourth year first semester. |

g. All the other regulations as applicable to B. Tech. 4-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme).

h. LES students are not eligible for 2-Year B. Tech. Diploma Certificate.

**5. Malpractices Rules**

**Disciplinary Action for Improper Conduct in Examinations**

| # | Nature of Malpractices/Improper conduct | Punishment |
|---|---|---|
| | **If the student:** | |
| 1 (a) | Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, cell phones, pager, palm computers or any other form of material concerned with or related to the course of the examination (theory or practical) in which student is appearing but has not made use of (material shall include any marks on the body of the student which can be used as an aid in the course of the examination) | Expulsion from the examination hall and cancellation of the performance in that course only. |

| | | |
|---|---|---|
| 1 (b) | Gives assistance or guidance or receives it from any other student orally or by any other body language methods or communicates through cell phones with any student or persons in or outside the exam hall in respect of any matter. | Expulsion from the examination hall and cancellation of the performance in that course only of all the students involved. In case of an outsider, he will be handed over to the police and a case is registered against him. |
| 2 | Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the course of the examination (theory or practical) in which the student is appearing. | Expulsion from the examination hall and cancellation of the performance in that course and all other courses the student has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the courses of that semester/year. The hall ticket of the student is to be cancelled and sent to the Controller of Examinations. |
| **3.** | Impersonates any other student in connection with the examination. The student who has impersonated shall be expelled from examination hall. The student is also debarred and forfeits the seat. The performance of the original student who has been impersonated, shall be cancelled in all the courses of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining courses of that semester/year. | The student is also debarred for two consecutive semesters from class work and all SEE examinations. The continuation of the course by the student is course to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him. |
| **4.** | Smuggles in the answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination. | Expulsion from the examination hall and cancellation of performance in that course and all the other courses the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The student is also debarred for two consecutive semesters from class work and all SEE examinations. The continuation of the course by the student is course to the academic regulations in connection |

| | | |
|---|---|---|
| | | with forfeiture of seat. |
| **5.** | Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks. | Cancellation of the performance in that course. |
| 6. | Refuses to obey the orders of the chief superintendent/assistant – superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the college campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination. | In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that course and all other courses the student(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the courses of that semester/year.<br>The students also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them. |

| | | |
|---|---|---|
| 7. | Leaves the exam hall taking away answer script or intentionally tears off the script or any part thereof inside or outside the examination hall. | Expulsion from the examination hall and cancellation of performance in that course and all the other courses the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The student is also debarred for two consecutive semesters from class work and all SEE examinations. The continuation of the course by the student is course to the academic regulations in connection with forfeiture of seat. |
| 8. | Possesses any lethal weapon or firearm in the examination hall. | Expulsion from the examination hall and cancellation of the performance in that course and all other courses the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The student is also debarred and forfeits the seat. |
| 9. | If student of the college, who is not a student for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8. | Expulsion from the examination hall and cancellation of the performance in that course and all other courses the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The student is also debarred and forfeits the seat.<br>Person(s) who do not belong to the college will be handed over to the police and, a police case will be registered against them. |

| | | |
|---|---|---|
| 10. | Comes in a drunken condition to the examination hall. | Expulsion from the examination hall and cancellation of the performance in that course and all other courses the student has already appeared for including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. |
| 11. | Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny. | Cancellation of the performance in that course and all other courses the student has appeared for including practical examinations and project work of that semester/year examinations. |

## 6. Assessment Rubrics for Internship, Technical Seminar, Mini & Major Projects

### Preamble

The Internship Evaluation Rubrics are designed to provide a systematic and transparent method for evaluating the performance, learning outcomes, and overall development of students during their internship experience. These rubrics are a critical component of the internship program, aiming to assess the students' practical application of theoretical knowledge, their professional conduct, and their ability to contribute effectively to the host organization.

The evaluation covers key aspects of the internship, including the student's choice of industry/domain, clarity of objectives, understanding of their job description, the development and execution of a plan of action, their diligence in maintaining a regular diary, technical and presentation skills, problem solving and critical thinking abilities, and report preparation capabilities. Each of these components plays an essential role in determining how well students integrate into real-world work environments and how effectively they translate classroom learning into tangible skills.

The rubrics not only serve to assess student performance but also provide students with valuable feedback for self-reflection and improvement. By evaluating students across multiple categories, these rubrics help identify strengths, highlight areas for further development, and guide students towards achieving professional growth and readiness for future career challenges.

At Vardhaman College of Engineering, we believe that the internship experience is an important milestone in a student's academic journey. By adhering to these evaluation criteria, we ensure that our students gain practical exposure, develop critical skills, and are well-prepared to succeed in their chosen fields. This evaluation process also ensures that the internship experience is meaningful and beneficial to both students and the organizations they collaborate with.

### 6.1 Student's Diary Internship Evaluation Stages

The internship evaluation is divided into three key stages: **Review-1 (Initial Assessment)**, **Review-2 (Mid-Level Assessment)**, and **Review-3 (Final Assessment)**.

1. **Review-1: Initial Assessment**

   This stage serves as the starting point for the internship evaluation. It focuses on the intern's initial understanding of the industry/domain, the clarity of their objectives, their job description, their plan of action, and their regularity in maintaining a diary. It is aimed at ensuring that the intern has a clear direction and a solid foundation for their internship, as well as evaluating their commitment to the tasks at hand.

2. **Review-2: Mid-Level Assessment**

   The mid-level assessment focuses on the intern's progress toward achieving the goals and objectives set during the initial phase. This stage evaluates the intern's ability to execute tasks effectively, their problem-solving skills, and their adaptability in the workplace. It also provides an opportunity for the intern to reflect on their progress and make adjustments to their plan of action, if necessary. Feedback during this stage helps guide the intern towards successful completion of the internship.

3. **Review-3: Final Assessment**

   The final assessment evaluates the overall outcome of the internship. It reviews the completion of the intern's objectives, the quality of their work, the impact of their contributions to the organization, and their growth throughout the internship. This stage also assesses the student's ability to reflect on their experience and demonstrate the skills, knowledge, and competencies gained during the internship.

These evaluation stages ensure that students at Vardhaman College of Engineering receive continuous feedback throughout their internship, allowing for personal and professional development, as well as ensuring that the internship experience is meaningful, aligned with their academic goals, and contributes to their future career readiness.

### 6.1.1 Internship Review-1 (Initial Assessment)

The **Internship Review-1 (Initial Assessment)** serves as an important evaluation of the intern's early progress and alignment with the objectives set at the beginning of the internship. This review focuses on several critical criteria, such as the **Choice of Industry/Domain**, **Objectives**, **Job Description**, **Plan of Action**, and **Regularity and Maintenance of Diary**. Each of these elements is designed to assess how well the intern has identified a suitable industry for their career goals, how effectively they have set and are pursuing their objectives, and how organized and reflective they are in their approach to the internship experience. The initial review ensures that the intern is on track to meet the expectations of both the organization and their academic program, providing an opportunity to make any necessary adjustments moving forward.

**1. Choice of Industry/Domain (6 Marks)**

**Description:**
This criterion evaluates the intern's selection of the industry or domain for their internship. A well-chosen industry/domain should align with the intern's academic background, career aspirations, and the potential for gaining valuable practical experience. The relevance of the domain to the intern's field of study is key, and it should provide opportunities to apply theoretical knowledge in real-world situations.

**Key Aspects Evaluated:**

- Relevance of the chosen industry/domain to the intern's academic background and career goals
- Alignment with future career aspirations or professional interests
- Potential for learning and skill development within the chosen domain
- Opportunities for practical application of knowledge and technical skills

**2. Objectives (6 Marks)**

**Description:**
This criterion assesses the clarity and relevance of the objectives set by the intern at the beginning of the internship. Objectives should be specific, measurable, achievable, relevant, and time-bound (SMART). Clear objectives are essential for guiding the intern's activities and providing direction throughout the internship, ensuring the intern knows what is expected of them and can track their progress.

**Key Aspects Evaluated:**

- Clarity, specificity, and relevance of the internship objectives
- Alignment of objectives with academic learning and career goals
- Realism and feasibility of the objectives within the internship duration
- Measurability of objectives and progress tracking throughout the internship

**3. Job Description (6 Marks)**

**Description:**
This criterion evaluates how well the intern understands the job description and the tasks assigned to them. The job description should clearly outline the intern's responsibilities, expected deliverables, and areas where they can contribute to the organization. A good understanding of the job description ensures that the intern is focused, engaged, and contributes meaningfully to the work environment.

**Key Aspects Evaluated:**

- Clarity of the job description and understanding of responsibilities
- Relevance of the tasks to the intern's skills and academic background
- Appropriateness of the workload and challenge level
- Ability to take initiative and adapt to tasks outlined in the job description

**4. Plan of Action (6 Marks)**

**Description:**
The Plan of Action assesses the intern's ability to develop a clear, structured approach to achieving the goals and objectives of the internship. This plan should outline the steps, timeline, and resources required to complete tasks and meet objectives effectively. It demonstrates the intern's organizational and problem-solving skills, as well as their ability to manage their time and responsibilities.

**Key Aspects Evaluated:**

- Structure and clarity of the plan, including defined steps and timelines
- Realism and feasibility of the plan in terms of available resources and time
- Ability to prioritize tasks and manage workload effectively

- Adaptability of the plan to changes or unforeseen challenges during the internship

**5. Regularity and Maintenance of Diary (6 Marks)**

**Description:**
This criterion evaluates how consistently and thoroughly the intern maintains their internship diary, which documents daily activities, tasks, reflections, and progress. Regularly updated and well-maintained diaries allow for effective tracking of learning experiences, accomplishments, and challenges faced throughout the internship. The diary serves as both a reflective tool and a record of work completed.

**Key Aspects Evaluated:**

- Consistency in maintaining the diary with daily or weekly updates
- Clarity and detail in documenting tasks, activities, and learning outcomes
- Reflection on challenges faced, skills learned, and areas for improvement
- Organization and presentation of the diary, including proper documentation of progress

These criteria assess various key aspects of an intern's early performance and progress during their internship, ensuring they are on track to achieve their goals while providing insights into areas that may need further development as they continue their professional experience.

### Evaluation Rubrics for Review-1: Initial Assessment (30 Marks)

**Purpose**: To evaluate the intern's understanding of the internship objectives, job description, planned learning activities, and their ability to maintain a plan of action and a regular internship diary.

| Criteria: Review-1 | 1-2 Marks | 3-4 Marks | 5-6 Marks |
|---|---|---|---|
| **Choice of Industry/Domain (6 Marks)** | Little understanding of the industry/domain or misalignment with career goals. | Shows basic understanding of the chosen industry/domain but lacks depth or enthusiasm. | Clear understanding and strong alignment of the chosen industry/domain with personal career goals and interests. |
| **Objectives (6 Marks)** | Objectives are unclear, unrealistic, or irrelevant to the internship. | Objectives are somewhat clear but lack specificity or alignment with the internship focus. | Objectives are clear, specific, and highly relevant to the internship role and learning goals. |
| **Job Description (6 Marks)** | Job description is not well understood; lacks clarity or does not align with internship tasks. | Job description is somewhat understood, but there is confusion about key responsibilities or deliverables. | Job description is thoroughly understood; intern can clearly articulate the role, responsibilities, and expected deliverables. |
| **Plan of Action (6 Marks)** | Plan of action is vague, lacks clear steps, or does not | Plan of action has some structure but lacks specific | Plan of action is detailed, with clear steps, milestones, and |

| Criteria: Review-1 | 1-2 Marks | 3-4 Marks | 5-6 Marks |
|---|---|---|---|
| | align with internship goals. | milestones or clarity in execution. | timelines that align well with internship objectives. |
| **Regularity and Maintenance of Diary (6 Marks)** | Diary is irregular or poorly maintained; entries are missing or lack detail. | Diary is somewhat consistent but lacks depth or regularity in entries. | Diary is consistently maintained, with detailed and reflective entries on a regular basis that demonstrate clear progress. |

**Total for Review-1: 30 Marks**

**Mapping of Review-1 Criteria to Program Outcomes**

| Internship Evaluation Criteria: Review-1 | Program Outcomes (POs) Mapped |
|---|---|
| **Choice of Industry/Domain** | **PO1: Engineering Knowledge** - Application of engineering knowledge in real-world settings. |
| | **PO6: The Engineer and The World -** Awareness of global challenges and sustainable practices in engineering. |
| | **PO8: Individual and Collaborative Team work**- Demonstrates the ability to work both independently and collaboratively in a professional setting. |
| **Objectives** | **PO4: Conduct Investigations of Complex Problems** - Defining problems and setting goals for effective problem-solving. |
| | **PO5: Engineering Tool Usage** - Alignment of objectives with the usage of modern engineering tools and technologies. |
| | **PO9: Communication** - Ability to communicate clear and actionable objectives. |
| **Job Description** | **PO1: Engineering Knowledge** - Understanding and application of engineering knowledge in the context of the assigned job. |
| | **PO2: Problem Analysis** - Analyzing and addressing specific problems or tasks within the job description. |
| | **PO3: Design/Development of Solutions** - Applying design principles to tasks outlined in the job description. |
| **Plan of Action** | **PO3: Design/Development of Solutions** - Creating a systematic plan for problem-solving and task completion. |
| | **PO4: Conduct Investigations of Complex Problems** - Ability to approach complex problems methodically with a structured plan. |

| Internship Evaluation Criteria: Review-1 | Program Outcomes (POs) Mapped |
|---|---|
| | **PO6: The Engineer and The World** - Considering societal impact and addressing real-world problems through the plan of action. |
| **Regularity and Maintenance of Diary** | **PO8: Individual and Collaborative Team Work** - Demonstrates personal accountability and consistency in documenting work and progress. |
| | **PO9: Communication** - Clear, organized documentation of tasks, activities, and reflections. |
| | **PO11: Life-long Learning** - Encourages reflective practice and self-assessment, promoting continuous improvement and learning. |

### Internship Review-2 (Mid-Level Assessment)

The **Internship Evaluation Review-2 (Mid-Level Assessment)** serves as a crucial point in evaluating the intern's progress and achievements midway through their internship. This review focuses on assessing the intern's engagement in learning activities, technical proficiency, and overall work quality. Key aspects such as the consistency in maintaining their internship diary and reports, their level of professionalism and regularity, and their ability to effectively present their work are all carefully evaluated. The goal of this assessment is to gauge how well the intern is progressing toward meeting the objectives set at the beginning of the internship, while also identifying areas for further growth and development as they continue their professional journey.

**1. Learning Activities (6 Marks)**

This criterion assesses the extent to which the intern engages in various learning activities throughout the internship. It includes the intern's participation in projects, problem-solving tasks, workshops, training sessions, or any other activities that contribute to their learning and development. The focus is on the intern's ability to adapt and apply theoretical knowledge in practical situations, showing initiative in acquiring new skills, and demonstrating active engagement in the learning process.

**Key aspects evaluated:**

- Active participation in learning experiences
- Application of theoretical concepts to real-world tasks
- Willingness to explore new tools, techniques, and technologies
- Ability to adapt to the demands of the work environment

**2. Technical Skills (6 Marks)**

This criterion evaluates the intern's proficiency in applying technical knowledge and skills relevant to their field of study. It covers the ability to use industry-specific tools, software, equipment, or methodologies to accomplish tasks. The intern is expected to demonstrate their competence in executing technical tasks, analyzing data, developing solutions, and addressing technical challenges effectively.

**Key aspects evaluated:**

- Mastery of relevant technical skills and tools
- Effective application of engineering principles to tasks
- Ability to troubleshoot and solve technical problems
- Quality and accuracy of work produced

**6.. Internship Diary and Report Progress (6 Marks)**

This criterion evaluates the intern's ability to maintain a regular and detailed record of their daily activities, progress, and reflections throughout the internship. The internship diary and report should document the tasks completed, challenges faced, skills learned, and personal reflections on the work experience. Regular updates and comprehensive reports demonstrate the intern's commitment to tracking their progress and reflecting on their development over time.

**Key aspects evaluated:**

- Consistency and regularity in maintaining the diary
- Clarity and organization of diary entries and reports
- Depth of reflection on learning and challenges faced
- Progress in completing assigned tasks and meeting objectives

**4. Professionalism & Regularity (6 Marks)**

This criterion assesses the intern's behavior and attitude in a professional work environment. It includes the intern's punctuality, reliability, adherence to workplace norms, and overall work ethic. Professionalism also extends to how the intern interacts with colleagues, supervisors, and clients. Regularity refers to the intern's consistency in performing tasks and maintaining a high standard of work throughout the internship duration.

**Key aspects evaluated:**

- Punctuality, reliability, and consistency in work
- Adherence to workplace policies, ethical standards, and professional conduct
- Ability to collaborate and communicate respectfully with colleagues and supervisors
- Demonstration of a positive attitude, accountability, and responsibility

**5. Presentation Skills (6 Marks)**

This criterion evaluates the intern's ability to effectively communicate and present their work, ideas, and findings, both verbally and visually. Strong presentation skills are crucial for conveying technical information clearly and confidently to various audiences, including supervisors, peers, and stakeholders. This includes the ability to structure presentations logically, engage the audience, and use appropriate visual aids.

**Key aspects evaluated:**

- Clarity, organization, and structure of the presentation
- Ability to explain technical concepts in an understandable manner
- Confidence and effectiveness in verbal communication
- Use of appropriate visuals, slides, or other presentation aids

- Ability to answer questions and engage in discussions during presentations

These criteria collectively evaluate the intern's technical competence, engagement in learning, professionalism, communication skills, and their overall progress and development during the internship. Each aspect is vital for determining how well the intern has integrated into the workplace and contributed to the organization, while also developing the skills necessary for their future career.

### Evaluation Rubrics for Review-2: Mid-Level Assessment (30 Marks)

**Purpose**: Evaluate the intern's ability to start with the internship, basic communication skills, and ability to document initial experiences (e.g., in the internship diary). The assessment also includes their preparation for initial feedback and early stages of presentation.

| Criteria: Review-2 | 1-2 Marks | 3-4 Marks | 5-6 Marks |
|---|---|---|---|
| **Learning Activities (6 Marks)** | Learning activities are not defined, or there is little relation to the internship role or goals. | Learning activities are defined but lack detail or alignment with the internship objectives. | Learning activities are well-defined, relevant, and directly aligned with the internship objectives and goals. |
| **Technical Skills (6 Marks)** | Struggles to use basic online tools for communication and work. | Adequate understanding of tools but lacks fluency. | Proficient in using digital tools for work and communication. |
| **Internship Diary and Report Progress (6 Marks)** | Internship diary lacks detail or consistency; major gaps in daily/weekly records. A little progress on internship report. | Diary is complete but lacks clarity or is somewhat inconsistent. The report progress lacks depth or structure. | Consistently well-documented diary with clear entries, reflecting daily/weekly activities and learnings. Making significant progress on the report. |
| **Professionalism & Regularity (6 Marks)** | Unprofessional behavior, inconsistent presence or response times. | Occasionally misses deadlines or virtual meetings, but generally punctual. | Always professional, consistently punctual for online meetings and responsive to messages. |
| **Presentation Skills (6 Marks)** | Presentation lacks structure or clarity, with poor visual or verbal communication. | Presentation is clear but lacks confidence or depth. | Delivers a well-structured, clear, and engaging presentation, demonstrating good verbal and visual communication. |

**Total for Review-2: 30 Marks**

**Mapping of Review-2 Evaluation Criteria to Program Outcomes**

| Internship Evaluation Criteria: Review 2 | Program Outcomes (POs) Mapped |
|---|---|
| **Learning Activities** | **PO1: Engineering Knowledge** - Applying theoretical knowledge to practical tasks during the internship. |
| | **PO4: Conduct Investigations of Complex Problems** - Engaging in activities that require problem-solving and critical thinking. |
| | **PO9: Communication** - Demonstrating the ability to document and communicate learning progress through various activities. |
| **Technical Skills** | **PO1: Engineering Knowledge** - Demonstrating the application of technical knowledge and engineering principles to tasks. |
| | **PO5: Engineering Tool Usage** - Effectively using tools, technologies, and techniques relevant to the engineering field. |
| | **PO6: The Engineer and The World** - Applying technical skills to solve real-world problems and contribute to society. |
| **Internship Diary and Report Progress** | **PO7: Ethics -** Ethical conduct in documenting and reporting work. |
| | **PO8: Individual and Collaborative Team Work** - Maintaining regular updates in the diary demonstrates responsibility and independent work. |
| | **PO9: Communication** - Effectively communicating progress, challenges, and reflections through written reports and diary entries. |
| | **PO11: Life-long Learning** - Reflecting on progress and maintaining documentation that aids in continuous self-assessment and learning. |
| **Professionalism & Regularity** | **PO8: Individual and Collaborative Team Work** - Demonstrating professionalism and the ability to work effectively in a team environment. |
| | **PO9: Communication** - Professional communication with supervisors, peers, and teams, both verbal and written. |
| | **PO11: Life-long Learning** - Developing habits of professionalism and regularity that contribute to a strong work ethic and career development. |

| Internship Evaluation Criteria: Review 2 | Program Outcomes (POs) Mapped |
|---|---|
| **Presentation Skills** | **PO3: Design/Development of Solutions** - Presenting engineering solutions, designs, or findings clearly and persuasively. |
| | **PO9: Communication** - Clear, effective communication through presentations, both verbal and visual. |
| | **PO10: Project Management and Finance** - Effectively presenting project-related information, timelines, and progress to stakeholders in a structured manner. |

This table clearly maps each of the internship evaluation criteria to the relevant Program Outcomes (POs), ensuring that students are assessed in alignment with the core competencies required for their academic and professional development.

### Internship Review-3 (Final Assessment)

The **Internship Review-3 (Final Assessment)** provides a comprehensive evaluation of the intern's overall performance, growth, and achievements throughout the duration of the internship. This final assessment is designed to gauge the intern's ability to apply their learning in real-world scenarios, the quality of their technical work, and the development of essential professional skills. Criteria such as **Problem Solving & Critical Thinking**, **Task Management**, **Technical Proficiency & Work Quality**, **Professional Growth**, and **Presentation Skills** are evaluated in-depth. Additionally, the **Viva-Voce Examination**, **Internship Diary (Final Reflection)**, and **Internship Report (Final)** will be assessed to provide a holistic view of the intern's progress and contributions. This review serves to determine how effectively the intern has met the objectives set at the start of the internship and whether they are fully prepared to transition into the next phase of their academic or professional career.

**1. Problem Solving & Critical Thinking (5 Marks)**

**Description:**
This criterion evaluates the intern's ability to approach complex problems with analytical and critical thinking skills. The intern is expected to demonstrate their capability in breaking down challenges, analyzing situations, and developing effective solutions. This includes their ability to identify key issues, gather relevant data, and apply logical reasoning to resolve problems.

**Key Aspects Evaluated:**

- Ability to identify and analyze problems effectively
- Application of critical thinking to develop practical and innovative solutions
- Use of appropriate tools and methods to address issues
- Independence in approaching and solving complex challenges

**2. Task Management (5 Marks)**

**Description:**
Task Management assesses the intern's ability to prioritize, plan, and execute tasks effectively. This includes managing multiple responsibilities, meeting deadlines, and adjusting to unforeseen challenges. The intern should demonstrate good time management, organizational skills, and the ability to maintain focus on objectives.

**Key Aspects Evaluated:**

- Effective prioritization and time management skills
- Ability to handle multiple tasks and meet deadlines
- Organization and structuring of work to achieve goals efficiently
- Flexibility and adaptability in managing unexpected challenges

**3. Technical Proficiency & Work Quality (5 Marks)**

**Description:**
This criterion measures the intern's technical skills and the quality of their work. It evaluates how well the intern applies technical knowledge in their tasks and the level of professionalism and accuracy demonstrated in their deliverables. High-quality work should reflect attention to detail, thoroughness, and technical competence.

**Key Aspects Evaluated:**

- Mastery and application of relevant technical skills and tools
- Accuracy, precision, and quality of work produced
- Ability to troubleshoot and correct errors or issues
- Consistency in producing high-quality results over time

**4. Professional Growth (5 Marks)**

**Description:**
Professional Growth assesses the intern's development in areas such as communication, collaboration, responsibility, and self-discipline. This includes the intern's ability to take initiative, seek feedback, and demonstrate continuous improvement. It also includes their growth in soft skills that are critical in a professional environment.

**Key Aspects Evaluated:**

- Willingness to learn, adapt, and take initiative
- Ability to accept and apply constructive feedback
- Development of communication and interpersonal skills
- Growth in responsibility, accountability, and work ethics

**5. Presentation Skills (5 Marks)**

**Description:**
Presentation Skills assess the intern's ability to communicate their ideas, work, and results effectively to an audience. This includes clarity, organization, and professionalism in presenting technical information. The intern should also be able to use visuals or other presentation aids to enhance understanding.

**Key Aspects Evaluated:**

- Clarity and organization of the presentation
- Ability to communicate complex ideas in an understandable way
- Professionalism and confidence during the presentation
- Effective use of visual aids, charts, and slides to support the presentation

**6. Viva-Voce Examination (Response Quality) (5 Marks)**

**Description:**
The Viva-Voce Examination assesses the intern's ability to explain and defend their work in a formal

setting. This includes the intern's ability to respond to questions and provide insightful answers regarding their tasks, methodologies, and problem-solving processes during the internship.

**Key Aspects Evaluated:**

- Depth of understanding of the work and tasks completed
- Ability to explain technical concepts clearly and confidently
- Logical reasoning and clarity in responses to questions
- Confidence and professionalism during the examination

**7. Internship Diary (Final Reflection) (5 Marks)**

**Description:**
This criterion evaluates the intern's final reflection in their internship diary. The intern is expected to document their learning, experiences, challenges, and growth throughout the internship. The final reflection should demonstrate the intern's ability to critically assess their own development and the value of the internship experience.

**Key Aspects Evaluated:**

- Depth and thoughtfulness of the final reflection
- Analysis of learning outcomes, skills gained, and areas for improvement
- Clarity in documenting challenges faced and how they were overcome
- Overall organization and presentation of the diary

**6.1.2.2. Internship Report (Final) (5 Marks)**

**Description:**
The final internship report is a comprehensive document that summarizes the intern's entire internship experience. It includes details about the tasks completed, projects worked on, methodologies used, and lessons learned. The report should be clear, well-structured, and demonstrate the intern's ability to document and communicate their work professionally.

**Key Aspects Evaluated:**

- Organization, clarity, and structure of the report
- Thorough documentation of tasks, results, and processes
- Ability to analyze and reflect on the internship experience
- Professional writing style and adherence to report guidelines

These criteria collectively assess the intern's technical and professional development throughout the internship. The final assessment will provide a clear understanding of how well the intern has met the expectations set at the beginning and how ready they are for the next stage in their academic or professional journey.

### 6.1.3 Evaluation Rubrics for Review-3: Final Assessment (40 Marks)

**Purpose**: Evaluate the intern's overall performance, based on their **internship report**, **presentation**, and the **viva-voce examination**, assessing the depth of their understanding, ability to respond to questions, and overall preparedness to conclude the internship.

| Criteria: Review-3 | 0-1 Marks | 2-3 Marks | 4-5 Marks |
|---|---|---|---|
| **Problem Solving & Critical Thinking (5 Marks)** | Struggles to solve problems independently and | Identifies problems but needs help to address them. | Independently solves problems, |

| Criteria: Review-3 | 0-1 Marks | 2-3 Marks | 4-5 Marks |
|---|---|---|---|
| | needs constant guidance. | | demonstrating strong critical thinking skills. |
| **Task Management (5 Marks)** | Regularly misses deadlines | Meets deadlines, | Effectively manages tasks and consistently meeting deadlines, |
| **Technical Proficiency & Work Quality (5 Marks)** | The intern's work lacks consistency, and the technical aspects are poorly executed. | Work is of acceptable quality but may require significant revisions. | Work is of high quality, demonstrating thorough understanding and technical proficiency. |
| **Professional Growth (5 Marks)** | Little to no growth in skills, attitude, or performance during the internship. | Shows some growth but still requires improvement in some areas. | Demonstrates strong professional growth and improvement throughout the internship. |
| **Presentation Skills (5 Marks)** | Presentation is unclear, lacks structure, and fails to engage the audience. | Presentation is clear but lacks depth or engagement. | Delivers an engaging, well-organized, and professional presentation that clearly demonstrates a thorough understanding of the project. |
| **Viva-Voce Examination (Response Quality) (5 Marks)** | Struggles to answer questions or provides vague or incorrect responses. | Can answer basic questions but lacks depth or clarity in responses. | Answers questions with depth and confidence, providing clear and insightful responses. |
| **Internship Diary (Final Reflection) (5 Marks)** | Diary lacks reflection on the overall internship experience and learning. | Provides some reflection, but lacks depth in analyzing overall learning. | Provides a deep, insightful reflection on the internship experience, showing growth and key takeaways. |
| **Internship Report (Final) (5 Marks)** | Report is poorly structured, lacks clarity, or significant analysis. | Report is clear but lacks some necessary details or depth in analysis. | Report is well-structured, detailed, and provides a thorough analysis of the internship experience. |

**Total for Review-3: 40 Marks**

**Mapping of Review-3 Evaluation Criteria to Program Outcomes**

| Internship Evaluation Criteria: Review-3 | Program Outcomes (POs) Mapped |
|---|---|
| **Problem Solving & Critical Thinking** | **PO2: Problem Analysis** - Ability to analyze complex problems, identify key issues, and develop solutions using critical thinking and problem-solving techniques. |
| | **PO4: Conduct Investigations of Complex Problems** - Applying logical reasoning and investigative skills to address engineering problems. |
| | **PO5: Engineering Tool Usage** - Using modern tools and methodologies for solving engineering problems effectively. |
| **Task Management** | **PO3: Design/Development of Solutions** - Managing tasks to ensure effective design and development processes. |
| | **PO7: Ethics -** Demonstrating ethical decision-making in task execution. |
| | **PO8: Individual and Collaborative Team Work** - Managing individual tasks and coordinating team efforts to meet deadlines and project milestones. |
| | **PO10: Project Management and Finance** - Planning and managing tasks and resources to achieve project goals efficiently. |
| **Technical Proficiency & Work Quality** | **PO1: Engineering Knowledge** - Demonstrating a strong understanding of engineering concepts and applying them to produce high-quality work. |
| | **PO5: Engineering Tool Usage** - Proficiency in using modern engineering tools and technologies to enhance work quality and technical performance. |
| | **PO6: The Engineer and The World** - Ensuring the work produced meets professional and ethical standards while addressing societal needs. |
| **Professional Growth** | **PO7: Ethics -** Ability to act ethically and responsibly in the workplace. |
| | **PO8: Individual and Collaborative Team Work** - Exhibiting growth in working independently and collaboratively in professional settings. |
| | **PO9: Communication** - Developing effective communication skills, both written and verbal, for professional settings. |
| | **PO11: Life-long Learning** - Demonstrating a commitment to professional growth and continuous learning throughout the internship. |

| Internship Evaluation Criteria: Review-3 | Program Outcomes (POs) Mapped |
|---|---|
| **Presentation Skills** | **PO3: Design/Development of Solutions** - Presenting design solutions and engineering concepts clearly to stakeholders and peers. |
| | **PO9: Communication** - Ability to present ideas and findings clearly and effectively through both oral and written communication. |
| **Viva-Voce Examination (Response Quality)** | **PO4: Conduct Investigations of Complex Problems** - Showcasing the ability to respond to questions related to problem-solving, technical details, and project outcomes. |
| | **PO9: Communication** - Demonstrating clear and concise verbal communication during the viva, with the ability to respond thoughtfully to questions. |
| **Internship Diary (Final Reflection)** | **PO9: Communication** - Clear documentation of daily activities, tasks, and reflections, demonstrating strong written communication skills. |
| | **PO11: Life-long Learning** - Reflecting on learning experiences and documenting growth and challenges faced during the internship, promoting continuous self-assessment and improvement. |
| **Internship Report (Final)** | **PO1: Engineering Knowledge** - Applying engineering knowledge in the report to describe projects, solutions, and methodologies used during the internship. |
| | **PO7: Ethics -** Ethical conduct in documenting and reporting work. |
| | **PO9: Communication** - Producing a comprehensive and well-organized report that effectively communicates the internship experience, learning outcomes, and technical results. |
| | **PO10: Project Management and Finance** - Presenting a well-structured report that includes project management details such as timelines, deliverables, and outcomes. |

## Conclusion

The **Internship Evaluation Rubrics** document provides a structured and comprehensive framework for assessing an intern's progress, skills, and overall performance throughout the internship experience. By evaluating key aspects such as **problem-solving**, **technical proficiency**, **task management**, **professional growth**, and **communication skills**, this rubric ensures that interns receive constructive feedback that helps them reflect on their learning and development. The three stages of review—**Initial Assessment (Review-1)**, **Mid-Level Assessment (Review-2)**, and **Final**

**Assessment (Review-3)**—ensure a thorough and progressive evaluation of the intern's journey. These reviews are designed to track not only the technical competencies gained but also the professional and personal growth that occurs during the internship period. The final evaluation gives a complete picture of the intern's readiness to transition into their career and helps identify areas of improvement for future professional endeavors.

**Ultimately, this evaluation framework is essential for fostering the intern's growth, ensuring alignment with academic and industry expectations, and contributing to their long-term success. It also benefits organizations by providing a fair and consistent assessment of interns' contributions and achievements during the internship. Through this evaluative process, both the intern and the host organization can better understand the value of the internship experience, setting the foundation for future career advancement.**

**MINI PROJECT**

### 6.3 RUBRICS FOR MINI-PROJECT EVALUATION

The Mini-Project is an essential component of the academic curriculum, designed to evaluate students' ability to apply theoretical knowledge to practical problems, enhancing their problem-solving, research, and technical skills. This project is carried out in the third year of the graduation program and is evaluated through a **Continuous Internal Evaluation (CIE)** worth 40 marks and a **Semester End Examination (SEE)** worth 60 marks. The evaluation process involves the Project Review Committee (PRC), the respective supervisors, and an external examiner. These evaluation components are structured to measure the quality of the project and ensure alignment with the Program Outcomes (POs) and relevant Sustainable Development Goals (SDGs).

The **Continuous Internal Evaluation (CIE)** focuses on the systematic assessment of the project's progress, quality, and overall contribution to learning. This evaluation is carried out for 40 marks and is divided into four key components, each evaluated for 10 marks, and aims to assess different stages and aspects of the project:

1. **Abstract Level Review (10 Marks)**
   This component evaluates the clarity, relevance, and novelty of the project's concept, idea, and research objectives. The quality of the problem statement, initial hypothesis, and proposed approach will be critically examined. The review will ensure that the project is aligned with the intended learning outcomes and addresses a relevant real-world problem or academic challenge.

2. **Implementation Level Review (10 Marks)**
   In this phase, the project's design and implementation process will be scrutinized. This evaluation focuses on the technical execution, methodology, tools, and frameworks employed to solve the identified problem. Students will be assessed on their ability to demonstrate proficiency in project execution, adherence to the timeline, and practical application of theoretical concepts.

3. **Report and Manuscript Review (10 Marks)**
   This component assesses the students' ability to effectively communicate their research and project outcomes. The clarity, structure, and completeness of the written report, including proper documentation of methodology, results, and conclusions, will be evaluated. Additionally, the adherence to academic writing standards, proper citations, and overall manuscript quality will be considered.

4. **Project Completion Review (10 Marks)**
   The final stage evaluates the completion of the project, including its functionality, scalability, and presentation. Students are assessed on the project's overall coherence, the achievement of the project goals, and the level of innovation. This review also considers the preparedness of the student to present and defend their project outcomes in a professional manner.

The **Semester End Examination (SEE)**, worth 60 marks, serves as a comprehensive evaluation of the student's ability to apply theoretical knowledge and practical skills acquired throughout the project work. It assesses the final outcome of the project, focusing on the originality, implementation, and overall presentation of the work. The SEE evaluates the depth of understanding demonstrated by the student in the project's execution, analysis, and conclusion, as well as the clarity and professionalism of the final presentation. The SEE also provides an opportunity for students to defend their work, justifying their approach, methods, and results, while demonstrating their ability to critically analyze and articulate the significance of their findings.
These evaluation parameters are carefully mapped to **Program Outcomes (POs)** to ensure that students meet the expected learning objectives of the program. Additionally, the rubrics are aligned with relevant **Sustainable Development Goals (SDGs)**, ensuring that the projects contribute to global sustainability efforts and address pressing societal challenges. By following these rubrics, the Mini-Project evaluation process strives to holistically measure both the technical and academic competencies of students, preparing them for future academic or professional endeavours.

**I. Continuous Internal Evaluation (CIE)-40 Marks**

***A.* PRC Review: Abstract Level Review (ALR)-10 Marks** *(30 Marks scaled down to 10 Marks)*

| # | Parameter | Assessment Activity | POs Mapped | Descriptors and Scoring Criteria in Marks | | |
|---|---|---|---|---|---|---|
| | | | | High (4-5) | Medium (2-3) | Low (0-1) |
| 1 | Topic Relevance and Novelty | Team | PO1, PO2, PO3, PO4, PO6, PO7 | Topic is highly relevant, clearly defined, and presents a novel research idea with strong motivation. | Topic is somewhat relevant but lacks novelty or clear motivation. | Topic is not relevant or lacks novelty, with an unclear research motivation. |
| 2 | Problem Statement and Objectives | Team | PO1, PO2, PO3 | Clear problem statement with well-defined objectives aligned with the project's goals. | Problem statement is somewhat vague; objectives are partially defined. | No clear problem statement or objectives, making the proposal unfocused. |
| 3 | Literature Review (Initial) | Team | PO1, PO2, PO3, PO11 | Well-referenced review identifying key works and research gaps that justify the need for the project. | Brief literature review with minimal references; gaps not clearly identified. | No literature review or research gaps identified. |

| | | | | | | |
|---|---|---|---|---|---|---|
| 4 | Methodology Overview | Team | PO1, PO3, PO4, PO5, PO7 | Clear and feasible approach with preliminary methodology details. | Methodology is somewhat vague, lacking clarity in execution. | No methodology or impractical approach. |
| 5 | Presentation and Clarity of Proposal | Individual | PO8, PO9, PO10 | Proposal is clear, well-organized, and effectively conveys project details. | Proposal is somewhat clear but needs better structure. | Proposal is unclear, making evaluation difficult. |
| 6 | Response to Questions | Individual | PO8, PO9, PO10 | Confident and well-structured answers to panel questions. | Some responses lack clarity or depth. | Inadequate responses, lacking understanding. |

**B. Supervisor Review: Implementation Level Review (ILR)-10 Marks** *(30 Marks scaled down to 10 Marks)*

| # | Parameter | Assessment Activity | POs Mapped | Descriptors and Scoring Criteria in Marks | | |
|---|---|---|---|---|---|---|
| | | | | High (4-5) | Medium (2-3) | Low (0-1) |
| 1 | Topic Relevance and Novelty | Team | PO1, PO2, PO3, PO4, PO6 PO7 | Strong relevance and novelty with clear project direction. | Topic is relevant but lacks a strong innovative element. | Topic is not well-defined or lacks novelty. |
| 2 | Problem Statement and Objectives | Team | PO1, PO2, PO3 | Problem statement and objectives remain well-aligned with progress. | Some refinement needed in problem definition or objectives. | Objectives unclear or not aligned with implementation. |
| 3 | Methodology and Feasibility | Team | PO1, PO3, PO4, PO5, PO6, PO7 | Detailed methodology with a feasible and systematic approach. | Some gaps in methodology or feasibility concerns. | No clear methodology or implementation plan. |
| 4 | Results and Discussions | Team | PO1, PO2, PO3, PO5 | Clear and well-interpreted results, with meaningful discussions. | Results are present but lack depth in interpretation. | No results or inadequate discussion of findings. |
| 5 | Communication and Presentation | Individual | PO8, PO9, PO10 | Well-organized, clear, and effective presentation. | Presentation is somewhat clear but needs improvement. | Poorly structured presentation with unclear delivery. |

| # | Parameter | Assessment Activity | POs Mapped | Descriptors and Scoring Criteria in Marks | | |
|---|---|---|---|---|---|---|
| | | | | High (4-5) | Medium (2-3) | Low (0-1) |
| 6 | Response to Questions | Individual | PO8, PO9, PO10 | Clear, insightful responses to panel questions. | Some responses lack clarity or depth. | Inadequate responses with poor understanding. |

***C.*** **Supervisor Review: Report and Manuscript Review (RMR)-10 Marks** *(30 Marks scaled down to 10 Marks)*

| # | Parameter | Assessment Activity | POs Mapped | Descriptors and Scoring Criteria in Marks | | |
|---|---|---|---|---|---|---|
| | | | | High (4-5) | Medium (2-3) | Low (0-1) |
| 1 | Organization and Structure | Team | PO1, PO8, PO9, PO10 | Well-organized and structured report with logical flow. | Some structure issues affecting readability. | Poor organization with no logical structure. |
| 2 | Clarity, Writing Quality and Content Accuracy | Team | PO1, PO6, PO7, PO9 | Clear, well-written report with no errors. | Some sections unclear, requiring minor corrections. | Poorly written with major content issues. |
| 3 | Analysis, Interpretation and Conclusions | Team | PO1, PO2, PO3, PO8 | Comprehensive analysis with well-supported conclusions. | Some interpretation presents but lacks depth. | No meaningful analysis or incorrect conclusions. |
| 4 | References and Citations | Team | PO1, PO2, PO8, PO11 | Properly formatted references with relevant sources cited. | Some citations missing or incorrect formatting. | No proper citations or references. |
| 5 | Originality and Novelty of Work | Team | PO1, PO2, PO3, PO7, PO8 | Work demonstrates significant originality and novel contributions. | Some novel aspects, but minor contributions. | No originality or lacks significant contributions. |
| 6 | Individual Contribution | Individual | PO8, PO9, PO10 | Strong individual contributions evident in the report. | Some individual effort present but unclear. | No clear individual contributions. |

***D.*** **PRC Review: Project Completion Review (PCR)-10 Marks** *(40 Marks scaled down to 10 Marks)*

| # | Parameter | Assessment Activity | POs Mapped | Descriptors and Scoring Criteria in Marks | | |
|---|---|---|---|---|---|---|
| | | | | High (4-5) | Medium (2-3) | Low (0-1) |
| 1 | Topic Relevance | Team | PO1, PO2, PO3, PO4 | Highly relevant topic with clear project impact. | Relevant topic but lacks strong impact. | Weak topic relevance or misalignment with goals. |
| 2 | Novelty | Team | PO1, PO2, PO3 | Clearly innovative aspects with contributions to research. | Some innovative aspects, but not well articulated. | No novelty or contribution evident. |
| 3 | Problem Statement and Objectives | Team | PO1, PO2, PO3 | Well-defined problem statement and successfully met objectives. | Objectives met partially, but some gaps remain. | Objectives unclear or not achieved. |
| 4 | Literature Review | Team | PO1, PO2, PO3 | Comprehensive literature review highlighting gaps and contributions. | Some research gaps identified, but not fully developed. | No proper literature review or research gaps identified. |
| 5 | Methodology and Feasibility | Team | PO1, PO3, PO4, PO5 | Well-structured, justified methodology with practical feasibility. The methodology considers cost analysis, safety, environmental impact, sustainability, and ethical concerns. | Methodology is present but lacks clarity or justification. Feasibility aspects are not fully addressed. | No clear methodology or feasibility analysis, and important factors like safety, environment, or ethics are ignored or absent. |
| 6 | Conclusions and References | Team | PO1, PO2, PO3, PO9 | Strong conclusions based on findings; well-cited references. | Some conclusions present, but lack support or clarity. | Weak conclusions with inadequate references. |
| 7 | Communication and Presentation | Individual | PO9, PO10 | Well-structured, clear, and engaging final presentation. | Some clarity issues or lack of engagement. | Poorly structured or ineffective presentation. |

| # | Parameter | Assessment Activity | POs Mapped | Descriptors and Scoring Criteria in Marks | | |
|---|---|---|---|---|---|---|
| | | | | High (4-5) | Medium (2-3) | Low (0-1) |
| 8 | Response to Questions | Individual | PO9, PO10 | Clear, confident responses with strong understanding. | Some gaps in responses or lack of depth. | Poor responses with weak understanding. |

**II. Semester End Examination (SEE)-60 Marks** *(Evaluation by External Examiner, PRC and Supervisor)*

| # | Parameter | Assessment Activity | POs Mapped | Descriptors and Scoring Criteria in Marks | | |
|---|---|---|---|---|---|---|
| | | | | High (4-5) | Medium (2-3) | Low (0-1) |
| 1 | Topic Relevance and Societal Impact | Team | PO1, PO2, PO3, PO6, PO7 | Highly relevant topic with clear societal/industrial impact and alignment with SDGs. | Relevant topic but lacks strong impact or sustainability focus. | Weak topic relevance or misalignment with goals. |
| 2 | Novelty and Innovation | Team | PO1, PO2, PO3, PO5 | Clearly innovative aspects with unique contributions using modern tools. | Some innovative aspects, but not well-articulated. | No novelty or contribution evident. |
| 3 | Problem Statement and Objectives | Team | PO1, PO2, PO3 | Well-defined problem statement with successfully met objectives. | Objectives met partially, but some gaps remain. | Objectives unclear or not achieved. |
| 4 | Literature Review and Research Gap Identification | Team | PO1, PO2, PO4 | Comprehensive literature review highlighting gaps and contributions. | Some research gaps identified, but not fully developed. | No proper literature review or research gaps identified. |
| 5 | Methodology and Feasibility | Team | PO1, PO3, PO4, PO5, PO7 | Well-structured, justified methodology with practical feasibility considering cost, safety, environmental impact, and ethical concerns. | Methodology is present but lacks clarity or justification. Feasibility aspects are not fully addressed. | No clear methodology or feasibility analysis, ignoring critical factors. |

| # | Parameter | Assessment Activity | POs Mapped | Descriptors and Scoring Criteria in Marks | | |
|---|---|---|---|---|---|---|
| | | | | High (4-5) | Medium (2-3) | Low (0-1) |
| 6 | Technical Complexity and Implementation | Team | PO1, PO2, PO3, PO5 | Advanced techniques, strong implementation, and well-executed design. | Some complexity, but basic implementation or lack of technical depth. | Minimal complexity or poorly implemented design. |
| 7 | Results, Analysis and Interpretation | Team | PO1, PO2, PO4, PO5 | Well-documented, meaningful results with clear analysis and validation. | Results partially analyzed but lack depth or validation. | Weak or missing result interpretation with no clear insights. |
| 8 | Conclusions and References | Team | PO1, PO2, PO3, PO9 | Strong conclusions based on findings; well-cited references following proper citation guidelines. | Some conclusions present, but lack support or clarity. | Weak conclusions with inadequate references. |
| 9 | Report Quality and Documentation | Team | PO10 | Well-structured report with technical clarity, proper formatting, and detailed documentation. | Report is mostly complete but lacks clarity or proper formatting. | Poorly written or incomplete report with missing documentation. |
| 10 | Manuscript Publication | Team | PO1, PO9, PO10 | Manuscript accepted/published in a reputed journal/conference. | Manuscript under review or at an initial stage of submission. | No manuscript submitted or reviewed. |
| 11 | Communication and Presentation Skills | Individual | PO9, PO10 | Well-structured, clear, and engaging final presentation with strong delivery. | Some clarity issues or lack of engagement. | Poorly structured or ineffective presentation. |
| 12 | Response to Examiner's Questions | Individual | PO9, PO10 | Clear, confident responses with strong technical understanding. | Some gaps in responses or lack of depth. | Poor responses with weak understanding. |

### 6.4 Project Work Evaluation Rubrics

The Project Work is an essential component of the academic curriculum, designed to evaluate students' ability to apply theoretical knowledge to practical problems, enhancing their problem-solving, research, and technical skills. The Project Work for IV Year is carried out in two stages: Project Work Phase-I during IV Year I Semester and Project Work Phase-II during IV Year II Semester. The student has to submit Project Work Report at the end of each semester. The Project Work Phase-I shall be evaluated for 100 marks through **Continuous Internal Evaluation (CIE)** and Project Work Phase-II shall be evaluated for 100 marks out of which 40 marks are through **Continuous Internal Evaluation (CIE)** and 60 marks through **Semester End Examination (SEE)**.

### Project Work Phase-I Evaluation Rubrics

The Project Work Phase-I is carried out in IV Year I Semester is evaluated through a **CIE** of 100 marks. The evaluation process involves the Project Review Committee (PRC) and the respective supervisors. The evaluation components are structured to measure the quality of the project and ensure alignment with the Program Outcomes (POs) and relevant Sustainable Development Goals (SDGs).

The **Continuous Internal Evaluation (CIE)** focuses on the systematic assessment of the project's progress, quality, and overall contribution to learning. This evaluation is carried out for 100 marks and is divided into three key components, Abstract Level Review (ALR) is evaluated for 25 marks, Implementation Level Review (ILR) is evaluated for 50 marks, Report Preparation and Presentation (RPP) is evaluated for 25 marks and aims to assess different stages and aspects of the project:

5. **Abstract Level Review (25 Marks)**
   This component evaluates the clarity, relevance, and novelty of the project's concept, idea, and research objectives. The quality of the problem statement, initial hypothesis, and proposed approach will be critically examined. The review will ensure that the project is aligned with the intended learning outcomes and addresses a relevant real-world problem or academic challenge.
6. **Implementation Level Review (50 Marks)**
   In this component, the project is evaluated based on the initial progress in translating the design into a working system, focusing on the development of core modules, adherence to the proposed architecture, proper use of technologies, and alignment with the project timeline.
7. **Report Preparation and Presentation Review (25 Marks)**
   This component assesses the students' ability to effectively communicate their research and project outcomes. The clarity, structure, and completeness of the written report, including proper documentation of methodology, results, and conclusions and communication skills, and the ability to answer questions confidently will be evaluated. Additionally, the adherence to academic writing standards, proper citations, and overall report quality will be considered. including communication skills, visual aids, time management,

These evaluation parameters are carefully mapped to **Program Outcomes (POs)** to ensure that students meet the expected learning objectives of the program. Additionally, the projects are mapped with relevant **Sustainable Development Goals (SDGs)**, ensuring that the projects contribute to global sustainability efforts and address pressing societal challenges. By following the rubrics, the Project Work Phase-I evaluation process strives to holistically measure both the technical and academic competencies of students, preparing them for future academic or professional endeavors.

## II. Continuous Internal Evaluation (CIE)-100 Marks

### *E.* PRC Review: Abstract Level Review (ALR)-25 Marks

| # | Parameter | Assessment Activity | POs Mapped | Descriptors and Scoring Criteria in Marks | | |
|---|---|---|---|---|---|---|
| | | | | High (4-5) | Medium (2-3) | Low (0-1) |
| 1 | Topic Relevance and Novelty | Team | PO1, 2, 6 | Topic is highly relevant, clearly defined, and presents a novel research idea with strong motivation. | Topic is somewhat relevant but lacks novelty or clear motivation. | Topic is not relevant or lacks novelty, with an unclear research motivation. |
| 2 | Literature Review (Initial) | Team | PO2, 4, 11 | Well-referenced review identifying key works and research gaps that justify the need for the project. | Brief literature review with minimal references; gaps not clearly identified. | No literature review or research gaps identified. |
| 3 | Problem Statement and Objectives | Team | PO2, 3, 6 | Clear problem statement with well-defined objectives aligned with the project's goals. | Problem statement is somewhat vague; objectives are partially defined. | No clear problem statement or objectives, making the proposal unfocused. |
| 4 | Methodology Overview | Team | PO4, 5, 10 | Clear and feasible approach with preliminary methodology details. | Methodology is somewhat vague, lacking clarity in execution. | No methodology or impractical approach. |
| 5 | Presentation, Proposal Clarity and Response | Individual | PO7, 8, 9, 10, 11 | The proposal is clear, well-organized, confidently presented and well-structured responses | The proposal is somewhat clear but lacks structure, and some responses are unclear or depth. | The proposal is unclear and responses are weak, showing a lack of understanding. |

**Justification for ALR Rubric Elements Mapping with POs:**

| ALR Rubric Elements | Mapped POs with Justification |
|---|---|
| **Topic Relevance and Novelty** | **PO1**: Engineering Knowledge (Understanding the relevance of the topic and applying engineering knowledge to develop solutions) |
| | **PO2**: Problem Analysis (Assessing the problem's relevance and novelty while formulating and analyzing complex engineering problems) |
| | **PO6**: The Engineer and The World (Considering the societal and environmental impact, as well as the sustainability aspect, of the chosen topic) |
| **Literature Review (Initial)** | **PO2**: Problem Analysis (Reviewing research literature to identify gaps and inform the solution to complex engineering problems) |
| | **PO4**: Conduct Investigations of Complex Problems (Using existing knowledge to inform the investigation and developing a foundation for the solution) |
| | **PO11**: Life-Long Learning (Recognizing the need for continuous learning and adaptability by reviewing existing literature) |
| **Problem Statement and Objectives** | **PO2**: Problem Analysis (Formulating and analyzing the problem, reaching substantiated conclusions) |
| | **PO3**: Design/Development of Solutions (Defining the problem clearly for creative design solutions) |
| | **PO6**: The Engineer and The World (Considering societal, environmental, and sustainability aspects in defining the problem and objectives) |
| **Methodology Overview** | **PO4**: Conduct Investigations of Complex Problems (Describing the methodology for investigating complex problems, including experiments and analysis) |
| | **PO5**: Engineering Tool Usage (Selecting appropriate techniques, tools, and methodologies for the project) |
| | **PO10**: Project Management and Finance (Planning and presenting the methodology with clear steps, timeline, and resource allocation) |
| **Presentation, Proposal Clarity and Response** | **PO7**: Ethics (Responding ethically and respectfully in discussions, showcasing adherence to professional ethics in communication) |
| | **PO8**: Individual and Collaborative Teamwork (Demonstrating teamwork and individual contribution in the presentation process, addressing questions from the audience) |
| | **PO9**: Communication (Communicating effectively and clearly presenting the proposal and responding to queries) |
| | **PO10**: Project Management and Finance (Demonstrating effective communication and organization of the proposal in a clear and concise manner) |
| | **PO11**: Life-Long Learning (Displaying the ability to respond to questions and adapt ideas based on feedback, showing adaptability and critical thinking) |

### F. Supervisor Review: Implementation Level Review (ILR)-50 Marks

| # | Parameter | Assessment Activity | POs Mapped | Descriptors and Scoring Criteria in Marks | | |
|---|---|---|---|---|---|---|
| | | | | High (4-5) | Medium (2-3) | Low (0-1) |
| 1 | Topic Relevance and Novelty | Team | PO1, 2, 6 | Strong relevance and novelty with clear project direction. | Topic is relevant but lacks a strong innovative element. | Topic is not well-defined or lacks novelty. |
| 2 | Problem Statement and Objectives | Team | PO2, 3, 6 | Problem statement and objectives remain well-aligned with progress. | Some refinement needed in problem definition or objectives. | Objectives unclear or not aligned with implementation. |
| 3 | Methodology and Feasibility | Team | PO4, 5, 10 | Detailed methodology with a feasible and systematic approach. | Some gaps in methodology or feasibility concerns. | No clear methodology or implementation plan. |
| 4 | Results and Discussions | Team | PO1, 4, 6 | Clear and well-interpreted results, with meaningful discussions. | Results are present but lack depth in interpretation. | No results or inadequate discussion of findings. |
| 5 | Innovation and Creativity | Team | PO3, 5, 11 | Highly creative solution or approach. | Moderate creativity. | Lacks innovation. |
| 6 | Use of Modern Tools | Team | PO1, 5 | Effective and appropriate tool usage. | Limited or partial use. | Tools not used or misused. |
| 7 | Project Planning and Management | Team | PO8, 10 | Clear planning, task distribution, and time management. | Partial planning visible. | Poor planning or coordination. |
| 8 | Societal, Environmental & Ethical Considerations | Team | PO6, 7 | Clear awareness and integration of these aspects. | Some attempt made. | Largely ignored or irrelevant. |
| 9 | Communication and Presentation | Individual | PO8, 9 | Well-organized, clear, and effective presentation. | Presentation is somewhat clear but needs improvement. | Poorly structured presentation with unclear delivery. |
| 10 | Response to Questions | Individual | PO7, 8, 9, 11 | Clear, insightful responses to panel questions. | Some responses lack clarity or depth. | Inadequate responses with poor understanding. |

**Justification of ILR Rubric Elements Mapping with POs:**

| ILR Rubric Elements | Mapped POs with Justification |
|---|---|
| **Topic Relevance and Novelty** | **PO1**: Engineering Knowledge (Understanding and applying engineering knowledge to select a relevant and novel topic) |
| | **PO2**: Problem Analysis (Analyzing and assessing the novelty and relevance of the problem in the context of engineering solutions) |
| | **PO6**: The Engineer and The World (Considering the societal, environmental, and sustainability aspects of the topic) |
| **Problem Statement and Objectives** | **PO2**: Problem Analysis (Formulating a clear problem statement and defining objectives based on research and analysis) |
| | **PO3**: Design/Development of Solutions (Defining clear objectives for designing solutions to the identified problems) |
| | **PO6**: The Engineer and The World (Ensuring objectives consider societal, environmental, and sustainable factors) |
| **Methodology and Feasibility** | **PO4**: Conduct Investigations of Complex Problems (Designing and implementing a robust methodology to solve the problem, including feasibility analysis) |
| | **PO5**: Engineering Tool Usage (Selecting appropriate methods, tools, and techniques for problem-solving and design) |
| | **PO10**: Project Management and Finance (Evaluating the feasibility of the methodology in terms of resources, budget, and time management) |
| **Results and Discussions** | **PO1**: Engineering Knowledge (Applying engineering knowledge to assess the results and draw meaningful conclusions) |
| | **PO4**: Conduct Investigations of Complex Problems (Analyzing and interpreting results to provide valid conclusions) |
| | **PO6**: The Engineer and The World (Considering the societal and environmental implications of the results and conclusions) |
| **Innovation and Creativity** | **PO3**: Design/Development of Solutions (Demonstrating creative and innovative approaches in problem-solving and solution development) |
| | **PO5**: Engineering Tool Usage (Applying innovative tools and methods to address complex engineering problems) |
| | **PO11**: Life-Long Learning (Adapting to new technologies and innovative solutions) |
| **Use of Modern Tools** | **PO1**: Engineering Knowledge (Using engineering tools that align with the knowledge of engineering fundamentals) |
| | **PO5**: Engineering Tool Usage (Utilizing appropriate modern engineering tools, techniques, and IT resources in the project) |
| **Project Planning and Management** | **PO8**: Individual and Collaborative Teamwork (Managing project tasks as an individual and within a team, including time management and delegation) |
| | **PO10**: Project Management and Finance (Demonstrating effective planning, resource management, and budgeting) |
| **Societal, Environmental & Ethical Considerations** | **PO6**: The Engineer and The World (Evaluating and addressing the societal, environmental, and sustainability impacts of the project) |
| | **PO7**: Ethics (Demonstrating adherence to ethical principles and considering the moral implications of engineering decisions) |

| ILR Rubric Elements | Mapped POs with Justification |
|---|---|
| **Communication and Presentation** | **PO8**: Individual and Collaborative Teamwork (Collaborating with the team and presenting as part of a cohesive group) |
| | **PO9**: Communication (Effectively presenting the project, documenting results, and communicating clearly with stakeholders and peers) |
| **Response to Questions** | **PO7**: Ethics (Addressing questions with professional integrity, demonstrating ethical decision-making in responses) |
| | **PO8**: Individual and Collaborative Teamwork (Engaging in productive discussions and responding appropriately as an individual and team member) |
| | **PO9**: Communication (Responding to questions effectively, showing the ability to discuss ideas clearly) |
| | **PO11**: Life-Long Learning (Demonstrating adaptability and critical thinking when responding to new or unexpected questions) |

### *G.* Supervisor Review: Report Preparation and Presentation Review (RPPR)-25 Marks

| # | Parameter | Assessment Activity | POs Mapped | Descriptors and Scoring Criteria in Marks | | |
|---|---|---|---|---|---|---|
| | | | | High (4-5) | Medium (2-3) | Low (0-1) |
| 1 | Report Organization and Structure | Team | PO1, 2, 8, 9, 10 | Report is well-organized and logically structured. | Some structural flaws affecting readability. | Poor organization; lacks logical flow. |
| 2 | Writing Clarity and Content Quality | Team | PO1, 2, 7, 9 | Clear, error-free writing with accurate content. | Minor unclear or inaccurate sections. | Poorly written; major content issues. |
| 3 | Data Interpretation and Conclusion | Team | PO1, 3, 4, 5, 6 | Strong analysis with well-supported conclusions. | Analysis present but lacks depth. | Weak or incorrect interpretation. |
| 4 | Individual Involvement and Effort | Individual | PO7, 8, 9, 10 | Clear individual contributions throughout. | Some effort shown but lacks clarity. | No evident individual contribution. |
| 5 | Communication and Presentation | Individual | PO8, 9 | Well-organized, clear, and effective presentation. | Presentation is somewhat clear but needs improvement. | Poorly structured presentation with unclear delivery. |

**Justification of RPPR Rubric Elements Mapping with POs:**

| RPPR Rubric Elements | Mapped POs with Justification |
|---|---|
| **Report Organization and Structure** | **PO1**: Engineering Knowledge (Ensuring the report reflects a coherent understanding of engineering principles and knowledge) |
| | **PO2**: Problem Analysis (Organizing and structuring the problem statement, objectives, and analysis clearly in the report) |
| | **PO8**: Individual and Collaborative Teamwork (Ensuring the report reflects effective teamwork, proper documentation, and clear roles within the group) |
| | **PO9**: Communication (Organizing the report with clarity, structure, and logical flow for effective communication of ideas) |
| | **PO10**: Project Management and Finance (Demonstrating project management skills through clear organization of the report) |
| **Writing Clarity and Content Quality** | **PO1**: Engineering Knowledge (Writing with technical accuracy and relevance to the engineering discipline and problem at hand) |
| | **PO2**: Problem Analysis (Demonstrating high-quality, evidence-based analysis in the writing) |
| | **PO7**: Ethics (Maintaining integrity and clarity in writing, ensuring that all content is original, well-cited, and ethically sound) |
| | **PO9**: Communication (Writing clearly and concisely, ensuring that the content is well-structured, accurate, and relevant to the project) |
| **Data Interpretation and Conclusion** | **PO1**: Engineering Knowledge (Applying knowledge of engineering fundamentals to interpret data and draw conclusions) |
| | **PO3**: Design/Development of Solutions (Using data to refine or improve the design or solution for the identified problem) |
| | **PO4**: Conduct Investigations of Complex Problems (Interpreting experimental data, modeling results, and drawing valid, substantiated conclusions) |
| | **PO5**: Engineering Tool Usage (Using engineering tools to analyze data and derive conclusions from the results) |
| | **PO6**: The Engineer and The World (Considering the societal and environmental impact of the data analysis and conclusions) |
| **Individual Involvement and Effort** | **PO7**: Ethics (Maintaining personal accountability and integrity in contributing to the project) |
| | **PO8**: Individual and Collaborative Teamwork (Demonstrating effective individual contribution to the project and collaboration within the team) |
| | **PO9**: Communication (Contributing effectively to team discussions and ensuring individual contributions are communicated clearly) |
| | **PO10**: Project Management and Finance (Taking responsibility for specific project tasks, timelines, and deliverables) |
| **Communication and Presentation** | **PO8**: Individual and Collaborative Teamwork (Collaborating with teammates for a cohesive group presentation and response) |
| | **PO9**: Communication (Effectively presenting and communicating ideas, designs, and results to various stakeholders in a clear and professional manner) |

## Project Work Phase-II Evaluation Rubrics

The Project Work Phase-II is carried out in IV Year II Semester and is evaluated through a **Continuous Internal Evaluation (CIE)** for 40 marks and a **Semester End Examination (SEE)** for 60 marks. The evaluation process involves the Project Review Committee (PRC), the respective supervisors, and an external examiner. These evaluation components are structured to measure the quality of the project and ensure alignment with the Program Outcomes (POs) and relevant Sustainable Development Goals (SDGs).

The **Continuous Internal Evaluation (CIE)** focuses on the systematic assessment of the project's progress, quality, and overall contribution to learning. This evaluation is carried out for 40 marks and is divided into four key components, each evaluated for 10 marks, and aims to assess different stages and aspects of the project:

1. **Implementation Level Review-1 (10 Marks)**
   In this phase, the progress of the project is evaluated ensuring that key milestones, timelines, and deliverables are on track. This phase typically involves reviewing the technical aspects of the project, such as system architecture, designs, prototypes, or initial builds, ensuring that they align with the project requirements and objectives.
2. **Implementation Level Review-2 (10 Marks)**
   In this phase, the project's design and implementation process will be scrutinized. This evaluation focuses on the technical execution, methodology, tools, and frameworks employed to solve the identified problem. Emphasis is placed on how effectively the project meets its requirements, readiness for final deployment or demonstration. Students will be assessed on their ability to demonstrate proficiency in project execution, adherence to the timeline, and practical application of theoretical concepts.
3. **Report and Manuscript Review (10 Marks)**
   This component assesses the students' ability to effectively communicate their research and project outcomes. The clarity, structure, and completeness of the written report, including proper documentation of methodology, results, and conclusions, will be evaluated. Additionally, the adherence to academic writing standards, proper citations, and overall manuscript quality will be considered.
4. **Project Completion Review (10 Marks)**
   The final stage evaluates the completion of the project, including its functionality, scalability, and presentation. Students are assessed on the project's overall coherence, the achievement of the project goals, and the level of innovation. This review also considers the preparedness of the student to present and defend their project outcomes in a professional manner.

The **Semester End Examination (SEE)**, worth 60 marks, serves as a comprehensive evaluation of the student's ability to apply theoretical knowledge and practical skills acquired throughout the project work. It assesses the final outcome of the project, focusing on the originality, implementation, and overall presentation of the work. The SEE evaluates the depth of understanding demonstrated by the student in the project's execution, analysis, and conclusion, as well as the clarity and professionalism of the final presentation. The SEE also provides an opportunity for students to defend their work, justifying their approach, methods, and results, while demonstrating their ability to critically analyze and articulate the significance of their findings.

The evaluation parameters are carefully mapped to **Program Outcomes (POs)** to ensure that students meet the expected learning objectives of the program. Additionally, the projects are mapped with relevant **Sustainable Development Goals (SDGs)**, ensuring that the projects contribute to global sustainability efforts and address pressing societal challenges.

## I. Continuous Internal Evaluation (CIE)-40 Marks

### *A.* PRC Review: Implementation Level Review-1 (ILR-1)-10 Marks *(30 Marks scaled down to 10 Marks)*

| # | Parameter | Assessment Activity | POs Mapped | Descriptors and Scoring Criteria in Marks | | |
|---|---|---|---|---|---|---|
| | | | | High (4-5) | Medium (2-3) | Low (0-1) |
| 1 | Topic Relevance and Novelty | Team | PO1, 2, 6 | Topic is highly relevant, clearly defined, and presents a novel research idea with strong motivation. | Topic is somewhat relevant but lacks novelty or clear motivation. | Topic is not relevant or lacks novelty, with an unclear research motivation. |
| 2 | Problem Statement and Objectives | Team | PO2, 3, 6 | Clear problem statement with well-defined objectives aligned with the project's goals. | Problem statement is somewhat vague; objectives are partially defined. | No clear problem statement or objectives, making the proposal unfocused. |
| 3 | Literature Review | Team | PO2, 4, 11 | Well-referenced review identifying key works and research gaps that justify the need for the project. | Brief literature review with minimal references; gaps not clearly identified. | No literature review or research gaps identified. |
| 4 | Methodology Overview | Team | PO4, 5, 10 | Clear and feasible approach with preliminary methodology details. | Methodology is somewhat vague, lacking clarity in execution. | No methodology or impractical approach. |
| 5 | Presentation and Clarity of Proposal | Individual | PO7, 8, 9, 10, 11 | Proposal is clear, well-organized, and effectively conveys project details. | Proposal is somewhat clear but needs better structure. | Proposal is unclear, making evaluation difficult. |
| 6 | Response to Questions | Individual | PO7, 8, 9, 11 | Confident and well-structured answers to panel questions. | Some responses lack clarity or depth. | Inadequate responses, lacking understanding. |

**Justification of ILR-1 Rubric Elements Mapping with POs:**

| ILR-1 Rubric Element | Mapped POs with Justification |
|---|---|
| **Topic Relevance and Novelty** | **PO1:** Engineering Knowledge (Applies core engineering principles to choose a technically sound and relevant topic.<br>**PO2:** Problem Analysis (Requires evaluating novelty and formulating the problem.<br>**PO6:** The Engineer and The World (Considers societal and environmental relevance of the topic. |
| **Problem Statement and Objectives** | **PO2:** Problem Analysis (Involves analysis and articulation of the problem.<br>**PO3:** Design/Development of Solutions (Sets clear, achievable objectives to guide solution development.<br>**PO6:** The Engineer and The World (Ensures alignment with sustainability and public impact. |
| **Literature Review** | **PO2:** Problem Analysis (Engages with literature to analyze the state of the art.<br>**PO4:** Conduct Investigations of Complex Problems (Builds foundation for investigation using credible sources.<br>**PO11:** Life-Long Learning (Promotes independent research and adaptability to emerging trends. |
| **Methodology Overview** | **PO4:** Conduct Investigations of Complex Problems (Involves planning and implementing an investigative approach.<br>**PO5:** Engineering Tool Usage (Applies appropriate modern tools and techniques.<br>**PO10:** Project Management and Finance (Reflects effective planning, resource allocation, and timeline management. |
| **Presentation and Clarity of Proposal** | **PO7:** Ethics (Demonstrates ethical presentation practices.<br>**PO8:** Individual and Collaborative Team Work (Reflects contribution and coordination in a team setting.<br>**PO9:** Communication (Assesses ability to present technical content clearly.<br>**PO10:** Project Management and Finance (Indicates role in project planning and clarity.<br>**PO11**: Life-Long Learning (Demonstrates learning agility and responsiveness to input. |
| **Response to Questions** | **PO7:** Ethics (Upholds ethical standards in professional interaction.<br>**PO8:** Individual and Collaborative Team Work (Acknowledges individual responsibility within team responses.<br>**PO9:** Communication (Evaluates clarity and effectiveness in verbal responses.<br>**PO11:** Life-Long Learning (Shows adaptability and critical thinking. |

**B. Supervisor Review: Implementation Level Review-2** (ILR-2)-10 Marks ***(30 Marks scaled down to 10 Marks)***

| # | Parameter | Assessment Activity | POs Mapped | Descriptors and Scoring Criteria in Marks | | |
|---|---|---|---|---|---|---|
| | | | | High (4-5) | Medium (2-3) | Low (0-1) |
| 1 | Topic Relevance and Novelty | Team | PO1, 2, 6 | Strong relevance and novelty with clear project direction. | Topic is relevant but lacks a strong innovative element. | Topic is not well-defined or lacks novelty. |
| 2 | Problem Statement and Objectives | Team | PO2, 3, 6 | Problem statement and objectives remain well-aligned with progress. | Some refinement needed in problem definition or objectives. | Objectives unclear or not aligned with implementation. |
| 3 | Methodology and Feasibility | Team | PO4, 5, 10 | Detailed methodology with a feasible and systematic approach. | Some gaps in methodology or feasibility concerns. | No clear methodology or implementation plan. |
| 4 | Results and Discussions | Team | PO1, 4, 6 | Clear and well-interpreted results, with meaningful discussions. | Results are present but lack depth in interpretation. | No results or inadequate discussion of findings. |
| 5 | Communication and Presentation | Individual | PO8, 9 | Well-organized, clear, and effective presentation. | Presentation is somewhat clear but needs improvement. | Poorly structured presentation with unclear delivery. |
| 6 | Response to Questions | Individual | PO7, 8, 9, 11 | Clear, insightful responses to panel questions. | Some responses lack clarity or depth. | Inadequate responses with poor understanding. |

**Justification of ILR-2 Rubric Elements Mapping with POs:**

| ILR-2 Rubric Element | Mapped POs with Justification |
|---|---|
| **Topic Relevance and Novelty** | **PO1:** Engineering Knowledge (Applies core engineering knowledge to choose a technically sound and relevant topic.<br>**PO2:** Problem Analysis (Involves analyzing the relevance, complexity, and scope of the proposed topic.<br>**PO6:** The Engineer and The World (Considers societal, environmental, and sustainability impacts in topic selection. |
| **Problem Statement and Objectives** | **PO2:** Problem Analysis (Involves critically analyzing and articulating the problem.<br>**PO3:** Design/Development of Solutions (Sets clear, innovative, and achievable objectives aligned with design thinking. |

| ILR-2 Rubric Element | Mapped POs with Justification |
|---|---|
| | **PO6:** The Engineer and The World (Ensures the problem and objectives address real-world needs and sustainable development goals. |
| **Methodology and Feasibility** | **PO4**: Conduct Investigations of Complex Problems (Develops a systematic and research-based plan to investigate the problem.<br>**PO5**: Engineering Tool Usage (Applies modern tools and techniques in designing and analyzing methodology.<br>**PO10:** Project Management and Finance (Evaluates feasibility in terms of resources, time, and cost. |
| **Results and Discussions** | **PO1:** Engineering Knowledge (Applies technical knowledge to analyze and interpret results.<br>**PO4:** Conduct Investigations of Complex Problems (Draws conclusions based on sound analysis, experimentation, and modeling.<br>**PO6:** The Engineer and The World (Evaluates the impact of results on society, environment, and sustainability. |
| **Communication and Presentation** | **PO8:** Individual and Collaborative Team Work (Demonstrates individual contribution and collaboration in preparing and delivering the presentation.<br>**PO9:** Communication (Effectively communicates technical content through oral and visual means, considering diverse audiences. |
| **Response to Questions** | **PO7:** Ethics (Displays professionalism and integrity in responding to questions.<br>**PO8:** Individual and Collaborative Team Work (Responds with understanding of both individual and team contributions.<br>**PO9:** Communication (Communicates clearly, confidently, and accurately in real-time.<br>**PO11:** Life-Long Learning (Demonstrates adaptability, critical thinking, and willingness to engage with feedback. |

### *C.* Supervisor Review: Report and Manuscript Review (RMR)-10 Marks *(30 Marks scaled down to 10 Marks)*

| # | Parameter | Assessment Activity | POs Mapped | Descriptors and Scoring Criteria in Marks | | |
|---|---|---|---|---|---|---|
| | | | | High (4-5) | Medium (2-3) | Low (0-1) |
| 1 | Organization and Structure | Team | PO1, 2, 8, 9, 10 | Well-organized and structured report with logical flow. | Some structure issues affecting readability. | Poor organization with no logical structure. |
| 2 | Clarity, Writing Quality and Content Accuracy | Team | PO1, 2, 7, 9 | Clear, well-written report with no errors. | Some sections unclear, requiring minor corrections. | Poorly written with major content issues. |
| 3 | Data Interpretation and Conclusions | Team | PO1, 3, 4, 5, 6 | Comprehensive analysis with well-supported conclusions. | Some interpretation presents but lacks depth. | No meaningful analysis or incorrect conclusions. |

| # | Parameter | Assessment Activity | POs Mapped | Descriptors and Scoring Criteria in Marks | | |
|---|---|---|---|---|---|---|
| | | | | High (4-5) | Medium (2-3) | Low (0-1) |
| 4 | References and Citations | Team | PO7, 11 | Properly formatted references with relevant sources cited. | Some citations missing or incorrect formatting. | No proper citations or references. |
| 5 | Originality and Novelty of Work | Team | PO1, 2, 3, 7, 8, 11 | Work demonstrates significant originality and novel contributions. | Some novel aspects, but minor contributions. | No originality or lacks significant contributions. |
| 6 | Individual Involvement and Effort | Individual | PO7, 8, 9, 10 | Strong individual contributions evident in the report. | Some individual effort present but unclear. | No clear individual contributions. |

**Justification for RMR Rubric Elements Mapping with POs:**

| RMR Rubric Element | Mapped POs with Justification |
|---|---|
| **Organization and Structure** | **PO1:** Engineering Knowledge (Demonstrates understanding of engineering concepts through logical report structure)<br>**PO2:** Problem Analysis (Structures content to reflect proper problem analysis and development)<br>**PO8:** Individual and Collaborative Team Work (Reflects team coordination and role clarity in report organization)<br>**PO9:** Communication (Presents content in a coherent and logically flowing format)<br>**PO10:** Project Management and Finance (Demonstrates planning and time management through structured documentation) |
| **Clarity, Writing Quality and Content Accuracy** | **PO1:** Engineering Knowledge (Ensures technical accuracy and relevance of the written content)<br>**PO2:** Problem Analysis (Presents ideas clearly and logically, reflecting analytical clarity)<br>**PO7:** Ethics (Maintains academic integrity and avoids misrepresentation)<br>**PO9:** Communication (Assesses effective written communication, grammar, and articulation of ideas) |
| **Data Interpretation and Conclusions** | **PO1:** Engineering Knowledge (Applies subject knowledge to derive meaningful conclusions)<br>**PO3:** Design/Development of Solutions (Uses interpreted data to validate or improve solutions)<br>**PO4:** Conduct Investigations of Complex Problems (Analyzes and interprets data to provide substantiated conclusions)<br>**PO5:** Engineering Tool Usage (Uses tools for analysis and visualization)<br>**PO6:** The Engineer and The World (Evaluates the societal/environmental relevance of findings) |

| RMR Rubric Element | Mapped POs with Justification |
|---|---|
| **References and Citations** | **PO7:** Ethics (Demonstrates ethical academic behavior through proper citations and avoiding plagiarism)<br>**PO11:** Life-Long Learning (Reflects the ability to research, explore and integrate relevant sources independently) |
| **Originality and Novelty of Work** | **PO1:** Engineering Knowledge (Applies concepts innovatively within the chosen domain)<br>**PO2:** Problem Analysis (Critically approaches problems to develop unique solutions)<br>**PO3:** Design/Development of Solutions (Creates novel approaches to meet identified needs)<br>**PO7:** Ethics (Ensures originality and proper acknowledgment of others' work)<br>**PO8:** Individual and Collaborative Team Work (Reflects contributions in innovative idea generation)<br>**PO11:** Life-Long Learning (Demonstrates curiosity and self-driven innovation) |
| **Individual Involvement and Effort** | **PO7:** Ethics (Reflects responsibility, integrity, and ownership of individual tasks)<br>**PO8:** Individual and Collaborative Team Work (Demonstrates active participation and team contribution)<br>**PO9:** Communication (Evidences the individual's ability to articulate contributions)<br>**PO10:** Project Management and Finance (Shows accountability and planning in individual task execution) |

### *D.* PRC Review: Project Completion Review (PCR)-10 Marks *(40 Marks scaled down to 10 Marks)*

| # | Parameter | Assessment Activity | POs Mapped | Descriptors and Scoring Criteria in Marks | | |
|---|---|---|---|---|---|---|
| | | | | High (4-5) | Medium (2-3) | Low (0-1) |
| 1 | Topic Relevance | Team | PO1, 2, 6 | Highly relevant topic with clear project impact. | Relevant topic but lacks strong impact. | Weak topic relevance or misalignment with goals. |
| 2 | Novelty | Team | PO1, 2, 6 | Clearly innovative aspects with contributions to research. | Some innovative aspects, but not well articulated. | No novelty or contribution evident. |
| 3 | Literature Review | Team | PO2, 4, 11 | Comprehensive literature review highlighting gaps and contributions. | Some research gaps identified, but not fully developed. | No proper literature review or research gaps identified. |

| # | Parameter | Assessment Activity | POs Mapped | Descriptors and Scoring Criteria in Marks | | |
|---|---|---|---|---|---|---|
| | | | | High (4-5) | Medium (2-3) | Low (0-1) |
| 4 | Problem Statement and Objectives | Team | PO2, 3, 6 | Well-defined problem statement and successfully met objectives. | Objectives met partially, but some gaps remain. | Objectives unclear or not achieved. |
| 5 | Methodology and Feasibility | Team | PO4, 5, 10 | Well-structured, justified methodology with practical feasibility. The methodology considers cost analysis, safety, environmental impact, sustainability, and ethical concerns. | Methodology is present but lacks clarity or justification. Feasibility aspects are not fully addressed. The factors were not fully addressed | No clear methodology or feasibility analysis, and important factors like safety, environment, or ethics are ignored or absent. |
| 6 | Conclusions and References | Team | PO1, 4, 5, 6, 7 | Strong conclusions based on findings; well-cited references. | Some conclusions present, but lack support or clarity. | Weak conclusions with inadequate references. |
| 7 | Communication and Presentation | Individual | PO8, 9 | Well-structured, clear, and engaging final presentation. | Some clarity issues or lack of engagement. | Poorly structured or ineffective presentation. |
| 8 | Response to Questions | Individual | PO7, 8, 9, 11 | Clear, confident responses with strong understanding. | Some gaps in responses or lack of depth. | Poor responses with weak understanding. |

**Justification for PCR Rubric Elements Mapping with POs:**

| PCR Rubric Element | Mapped POs with Justification |
|---|---|
| **Topic Relevance** | **PO1:** Engineering Knowledge (Demonstrates application of foundational engineering knowledge in choosing a technically sound and appropriate topic.<br>**PO2:** Problem Analysis (Involves identifying a relevant, real-world problem that can be analyzed using engineering principles.<br>**PO6:** The Engineer and The World (Considers sustainability, ethical, and societal relevance of the selected topic. |
| **Novelty** | **PO1:** Engineering Knowledge (Applies domain-specific knowledge to identify innovative engineering concepts. |

| PCR Rubric Element | Mapped POs with Justification |
|---|---|
| | **PO2:** Problem Analysis (Evaluates uniqueness of the problem in terms of gaps in current knowledge or technology.<br>**PO6:** The Engineer and The World (Assesses how novel ideas contribute to societal, environmental, or industrial development. |
| **Literature Review** | **PO2:** Problem Analysis (Involves critical review and synthesis of existing research to identify knowledge gaps.<br>**PO4:** Conduct Investigations of Complex Problems (Utilizes literature as a research foundation for deeper technical investigation.<br>**PO11:** Life-Long Learning (Encourages continuous learning and exploration of evolving technologies and practices. |
| **Problem Statement and Objectives** | **PO2:** Problem Analysis (Frames and articulates a complex engineering problem based on research and real-world context.<br>**PO3:** Design/Development of Solutions (Defines clear, structured objectives that support solution design.<br>**PO6:** The Engineer and The World (Ensures objectives reflect consideration for societal, cultural, and environmental needs. |
| **Methodology and Feasibility** | **PO4:** Conduct Investigations of Complex Problems (Designs an investigative or experimental approach to solving the problem.<br>**PO5:** Engineering Tool Usage (Applies modern tools, techniques, and simulations in planning and feasibility analysis.<br>**PO10:** Project Management and Finance (Assesses project viability in terms of cost, resources, and timeline. |
| **Conclusions and References** | **PO1:** Engineering Knowledge (Draws logical conclusions grounded in technical knowledge.<br>**PO4:** Conduct Investigations of Complex Problems (Validates conclusions through data analysis and investigation.<br>**PO5:** Engineering Tool Usage (Interprets results using engineering tools and methodologies.<br>**PO6:** The Engineer and The World (Considers broader implications of findings.<br>**PO7:** Ethics (Acknowledges sources accurately and upholds academic honesty. |
| **Communication and Presentation** | **PO8:** Individual and Collaborative Team Work (Shows active contribution and team coordination.<br>**PO9:** Communication (Presents clearly to diverse audiences using visual and verbal tools. |
| **Response to Questions** | **PO7:** Ethics (Shows professional integrity and respectful engagement during Q&A.<br>**PO8:** Individual and Collaborative Team Work (Reflects awareness of one's contributions and team context.<br>**PO9:** Communication (Demonstrates clarity and effectiveness in impromptu responses.<br>**PO11:** Life-Long Learning (Applies critical thinking, adaptability, and continuous learning in responses. |

**II. Semester End Examination (SEE)-60 Marks *(Evaluation by External Examiner, PRC and Supervisor)***

| # | Parameter | Assessment Activity | POs Mapped | Descriptors and Scoring Criteria in Marks | | |
|---|---|---|---|---|---|---|
| | | | | High (4-5) | Medium (2-3) | Low (0-1) |
| 1 | Topic Relevance and Societal Impact | Team | PO1, 2, 6, 7 | Highly relevant topic with clear societal/industrial impact and alignment with SDGs. | Relevant topic but lacks strong impact or sustainability focus. | Weak topic relevance or misalignment with goals. |
| 2 | Novelty and Innovation | Team | PO1, 2, 3, 5, 6, 11 | Clearly innovative aspects with unique contributions using modern tools. | Some innovative aspects, but not well-articulated. | No novelty or contribution evident. |
| 3 | Literature Review and Research Gap Identification | Team | PO2, 4, 11 | Comprehensive literature review highlighting gaps and contributions. | Some research gaps identified, but not fully developed. | No proper literature review or research gaps identified. |
| 4 | Problem Statement and Objectives | Team | PO2, 3, 6 | Well-defined problem statement with successfully met objectives. | Objectives met partially, but some gaps remain. | Objectives unclear or not achieved. |
| 5 | Methodology and Feasibility | Team | PO4, 5, 10 | Well-structured, justified methodology with practical feasibility considering cost, safety, environmental impact, and ethical concerns. | Methodology is present but lacks clarity or justification. Feasibility aspects are not fully addressed. | No clear methodology or feasibility analysis, ignoring critical factors. |
| 6 | Technical Complexity and Implementation | Team | PO1, 2, 3, 4, 5 | Advanced techniques, strong implementation, and well-executed design. | Some complexity, but basic implementation or lack of technical depth. | Minimal complexity or poorly implemented design. |
| 7 | Results, Analysis and Interpretation | Team | PO1, 3, 4, 5, 6 | Well-documented, meaningful results with clear analysis and validation. | Results partially analyzed but lack depth or validation. | Weak or missing result interpretation with no clear insights. |

| # | Parameter | Assessment Activity | POs Mapped | Descriptors and Scoring Criteria in Marks | | |
|---|---|---|---|---|---|---|
| | | | | High (4-5) | Medium (2-3) | Low (0-1) |
| 8 | Conclusions and References | Team | PO1, 4, 5, 6, 7 | Strong conclusions based on findings; well-cited references following proper citation guidelines. | Some conclusions present, but lack support or clarity. | Weak conclusions with inadequate references. |
| 9 | Report Quality and Documentation | Team | PO5, 7, 8, 9, 10 | Well-structured report with technical clarity, proper formatting, and detailed documentation. | Report is mostly complete but lacks clarity or proper formatting. | Poorly written or incomplete report with missing documentation. |
| 10 | Manuscript Publication | Team | PO5, 7, 8, 9 | Manuscript accepted/published in a reputed journal/conference. | Manuscript under review or at an initial stage of submission. | No manuscript submitted or reviewed. |
| 11 | Communication and Presentation Skills | Individual | PO8, 9 | Well-structured, clear, and engaging final presentation with strong delivery. | Some clarity issues or lack of engagement. | Poorly structured or ineffective presentation. |
| 12 | Response to Examiner's Questions | Individual | PO7, 8, 9, 11 | Clear, confident responses with strong technical understanding. | Some gaps in responses or lack of depth. | Poor responses with weak understanding. |

**Justification for SEE Rubric Elements Mapping with POs:**

| SEE Rubric Element | Mapped POs with Justification |
|---|---|
| **Topic Relevance and Societal Impact** | **PO1:** Engineering Knowledge (Ensures selection of a technically appropriate and relevant engineering topic)<br>**PO2:** Problem Analysis (Analyzes real-world issues for engineering relevance)<br>**PO6:** The Engineer and The World (Reflects awareness of the problem's societal, environmental, and sustainability implications)<br>**PO7:** Ethics (Aligns the work with ethical responsibilities and public welfare) |
| **Novelty and Innovation** | **PO1:** Engineering Knowledge (Applies engineering principles to propose new ideas)<br>**PO2:** Problem Analysis (Identifies gaps and formulates innovative approaches) |

| SEE Rubric Element | Mapped POs with Justification |
|---|---|
| | **PO3:** Design/Development of Solutions (Designs unique solutions to meet identified needs)<br>**PO5:** Engineering Tool Usage (Integrates modern tools to develop novel solutions)<br>**PO6:** The Engineer and The World (Considers innovation's impact on society and environment)<br>**PO11:** Life-Long Learning (Reflects adaptability and exploration of new technologies) |
| **Literature Review and Research Gap Identification** | **PO2:** Problem Analysis (Critically evaluates existing literature to identify gaps)<br>**PO4:** Conduct Investigations of Complex Problems (Builds research direction through literature insights)<br>**PO11:** Life-Long Learning (Encourages continuous learning through review of current research trends and advancements) |
| **Problem Statement and Objectives** | **PO2**: Problem Analysis (Clearly formulates a real-world engineering problem)<br>**PO3:** Design/Development of Solutions (Defines achievable and measurable objectives for solving the problem)<br>**PO6:** The Engineer and The World (Ensures objectives address societal needs, ethics, and sustainability) |
| **Methodology and Feasibility** | **PO4:** Conduct Investigations of Complex Problems (Establishes a systematic approach for problem investigation)<br>**PO5:** Engineering Tool Usage (Applies modern tools and simulations to test and validate the methodology)<br>**PO10:** Project Management and Finance (Assesses feasibility with respect to timeline, resource management, and cost-effectiveness) |
| **Technical Complexity and Implementation** | **PO1:** Engineering Knowledge (Applies in-depth engineering knowledge to address complex issues)<br>**PO2:** Problem Analysis (Demonstrates advanced problem-solving capability)<br>**PO3:** Design/Development of Solutions (Implements effective and scalable solutions)<br>**PO4:** Conduct Investigations of Complex Problems (Analyzes technical depth in design and development)<br>**PO5:** Engineering Tool Usage (Utilizes appropriate tools and technologies in implementation. |
| **Results, Analysis and Interpretation** | **PO1:** Engineering Knowledge (Uses engineering concepts to interpret results)<br>**PO3:** Design/Development of Solutions (Analyzes outcomes to validate the designed solution)<br>**PO4:** Conduct Investigations of Complex Problems (Applies statistical or analytical techniques for result interpretation)<br>**PO5:** Engineering Tool Usage (Uses software/simulations for data processing)<br>**PO6:** The Engineer and The World (Reflects societal or environmental implications of the findings) |

| SEE Rubric Element | Mapped POs with Justification |
|---|---|
| **Conclusions and References** | **PO1:** Engineering Knowledge (Summarizes outcomes based on sound engineering reasoning)<br>**PO4:** Conduct Investigations of Complex Problems (Draws conclusions from validated investigation)<br>**PO5:** Engineering Tool Usage (Reflects tool-supported insights in the conclusion)<br>**PO6:** The Engineer and The World (Relates findings to broader societal impact)<br>**PO7:** Ethics (Cites references properly and upholds academic honesty) |
| **Report Quality and Documentation** | **PO5:** Engineering Tool Usage (Includes use of software tools for formatting and compiling the report)<br>**PO7:** Ethics (Maintains originality and avoids plagiarism)<br>**PO8:** Individual and Collaborative Team Work (Reflects coordinated group effort in the report)<br>**PO9:** Communication (Assesses clarity, coherence, and formatting quality)<br>**PO10:** Project Management and Finance (Shows time and task planning in report compilation) |
| **Manuscript Publication** | **PO5:** Engineering Tool Usage (Uses technical tools for manuscript preparation and formatting)<br>**PO6:** The Engineer and The World (Addresses relevance to the engineering community and societal benefit)<br>**PO7:** Ethics (Upholds publication ethics, citations, and originality.<br>**PO8:** Individual and Collaborative Team Work (Reflects team effort in technical writing)<br>**PO9:** Communication (Assesses ability to write and present for academic publication) |
| **Communication and Presentation Skills** | **PO8:** Individual and Collaborative Team Work (Reflects team collaboration and role clarity)<br>**PO9:** Communication (Assesses oral and visual presentation effectiveness) |
| **Response to Examiner's Questions** | **PO7:** Ethics (Displays respectful and honest interaction with examiners)<br>**PO8:** Individual and Collaborative Team Work (Responds from the perspective of both personal and team contributions)<br>**PO9:** Communication (Communicates technical responses confidently and clearly)<br>**PO11:** Life-Long Learning (Demonstrates ability to think critically and apply knowledge beyond prepared content) |

### Factors to Evaluate the Quality of Capstone Project

#### Preamble:

A capstone project is a significant academic milestone, often serving as the culmination of a student's educational journey. It allows students to demonstrate the knowledge, skills, and competencies they have acquired over the course of their studies. Given its importance, a capstone project must be evaluated through a comprehensive and multi-faceted approach that accounts for

not only academic and theoretical merit but also practical, ethical, and societal considerations. Evaluating a capstone project helps ensure that students meet the learning outcomes of their program, while also preparing them for professional environments that require critical thinking, creativity, and the ability to address real-world challenges.

**Purpose:**

The purpose of evaluating a capstone project is to assess the student's ability to integrate knowledge and apply it to solving a complex problem or producing a meaningful outcome. The evaluation ensures that the project is of high quality, meets academic standards, and demonstrates a well-rounded approach to issues such as ethics, sustainability, safety, and cost. Moreover, it ensures that students are prepared to contribute effectively to their chosen fields, taking into account the broad spectrum of considerations that shape successful and responsible professional work.

**Objectives:**

1. Assess the clarity and relevance of the project objectives or problem.
2. Evaluate the methodological approach used to address the project goals.
3. Examine the quality of research or background work in the context of the project.
4. Consider the environmental, safety, and ethical implications of the project.
5. Assess the creativity and innovation demonstrated in the project.
6. Evaluate the communication of results, including clarity and professional presentation.
7. Analyze the cost-efficiency and sustainability of the proposed solutions.
8. Ensure adherence to industry standards, regulations, and best practices.
9. Determine the potential real-world impact and contribution of the project.

**Factors to Evaluate the Quality of the Project:**

The quality of a capstone or major project is typically evaluated based on various factors that ensure its relevance, feasibility, and impact. These factors not only demonstrate the technical and intellectual rigor of the project but also reflect its real-world implications.

Here's a breakdown of the key factors that influence the quality of such projects:

1. **Environment**: Consideration of environmental impacts is crucial, especially in projects related to construction, product development, energy, and manufacturing. A high-quality project would address how it interacts with or affects the natural environment, proposing ways to minimize harm, such as waste reduction or energy efficiency.
2. **Sustainability**: This refers to the project's long-term viability and its ability to operate without depleting resources or causing harm to the future. Projects that incorporate renewable resources, reduce carbon footprints, and promote environmental responsibility are seen as higher quality in today's world.
3. **Safety**: A quality project must prioritize safety, ensuring that all components, systems, and processes are designed to protect individuals and communities. This is especially significant in fields like engineering, healthcare, construction, and transportation.

4. **Ethics**: Ethical considerations focus on the moral implications of the project. A well-executed capstone project will demonstrate awareness of ethical issues, such as fairness, transparency, and respect for privacy and human rights. This includes addressing potential risks, biases, or any form of exploitation.
5. **Cost**: The financial aspect is critical to ensuring the project is feasible. Quality projects balance cost-effectiveness with functionality and scope, providing practical solutions within budget constraints. A project that is over-budget or lacks a solid financial plan may be viewed as less robust.
6. **Type (Application, Product, Research, Review, etc.)**: The type of project influences its scope and evaluation criteria. For instance:
    - **Application-based projects** (like software or system development) are evaluated based on their functionality, usability, and scalability.
    - **Product-based projects** are judged on innovation, design, marketability, and practicality.
    - **Research projects** are assessed based on the significance of the research question, methodology, data analysis, and contribution to the field.
    - **Review projects** are often judged on how well they synthesize existing literature, providing new insights or perspectives on the topic.
7. **Standards**: Adherence to established industry, academic, or regulatory standards ensures that the project meets certain benchmarks of quality and reliability. This includes international standards, safety regulations, and technical specifications relevant to the field.

Incorporating all of these factors into a project not only improves its overall quality but also aligns it with broader societal goals and industry needs, making it more impactful and meaningful.

### Development of Quality Evaluation Rubrics:

Creating a development quality evaluation rubric for the factors mentioned requires a clear and structured approach to assess each parameter. Below is a suggested rubric that addresses the key factors—environment, sustainability, safety, ethics, cost, type, and standards—each with criteria and scoring levels. This will help to evaluate a capstone or major project comprehensively:

Table 1: *Evaluation Rubrics for Assessing the Quality of the Project Work*

| Parameter | Criteria | Excellent (4) | Good (3) | Fair (2) | Poor (1) | Weight |
|---|---|---|---|---|---|---|
| **Environment** | Consideration of environmental impact, resource usage, and waste management | Thorough analysis and measures to minimize environmental impact. Sustainable material use and waste management | Good understanding of environmental impact with some measures for mitigation. | Some consideration of environmental impact, but lacks comprehensive mitigation measures. | No clear consideration or action to address environmental concerns. | 10% |

| Parameter | Criteria | Excellent (4) | Good (3) | Fair (2) | Poor (1) | Weight |
|---|---|---|---|---|---|---|
| | | protocols in place. | | | | |
| **Sustainability** | Long-term viability, resource conservation, renewable energy use | Clear, actionable plan for long-term sustainability, incorporating renewable energy and resource conservation. | Sustainable practices incorporated, but some aspects may not be fully developed. | Basic understanding of sustainability, with limited application. | No clear sustainability measures or practices. | 15% |
| **Safety** | Risk assessment, safety protocols, hazard mitigation | Comprehensive risk analysis and robust safety measures implemented, aligned with industry standards. | Clear safety measures in place, though some areas could be improved. | Safety measures are basic or incomplete; potential risks not fully addressed. | No clear safety measures or consideration of risks. | 15% |
| **Ethics** | Ethical considerations, stakeholder impact, transparency | Fully addresses ethical implications; transparent, fair, and socially responsible. | Addresses ethical issues, but lacks full clarity or depth. | Minimal ethical considerations; some aspects of fairness or transparency may be overlooked. | Ethical concerns are ignored or inadequately addressed. | 10% |
| **Cost** | Budget adherence, cost-effectiveness, value for investment | Well-defined budget, adheres to financial limits, with clear justification for all expenses. | Budget is generally adhered to; some minor adjustments needed. | Over-budget or lacks clear financial planning. Limited consideration of cost-effectiveness. | No clear budget or cost considerations. | 15% |
| **Type** | Suitability of the project type (Application, Product, Research, Review) | Project type is excellently chosen and well-executed with clear relevance to objectives. | Project type is appropriate and largely meets the intended goals. | Project type is somewhat suitable but could benefit from better focus or clarity. | Project type is not aligned with objectives or is poorly executed. | 15% |
| **Standards** | Compliance with industry, regulatory, or academic standards | Fully complies with all relevant standards; demonstrates | Follows most relevant standards with minor deviations. | Partially adheres to standards; some important | Does not meet required standards; significant | 20% |

| Parameter | Criteria | Excellent (4) | Good (3) | Fair (2) | Poor (1) | Weight |
|---|---|---|---|---|---|---|
| | | high technical quality. | | ones are neglected. | deviations from norms. | |

### Scoring Scale Explanation:

- **Excellent (4)**: The project exceeds expectations in this area, showing thorough understanding and well-executed strategies. All aspects are covered comprehensively.
- **Good (3)**: The project meets expectations with minor weaknesses or areas where further development could improve it.
- **Fair (2)**: The project shows an understanding of the topic but falls short in some key areas, requiring significant improvements.
- **Poor (1)**: The project fails to meet basic expectations and lacks depth or focus on critical elements.

### Total Score Calculation:

The total score is calculated by multiplying the score for each parameter by the weight, then summing the results.

**Example Calculation:**

- **Environment:** Excellent (4) × 10% = 0.4
- **Sustainability:** Good (3) × 15% = 0.45
- **Safety:** Fair (2) × 15% = 0.3
- **Ethics:** Good (3) × 10% = 0.3
- **Cost:** Excellent (4) × 15% = 0.6
- **Type:** Excellent (4) × 15% = 0.6
- **Standards:** Fair (2) × 20% = 0.4

**Total Score** = 0.4 + 0.45 + 0.3 + 0.3 + 0.6 + 0.6 + 0.4 = **3.05 (Good)**

**Interpretation of Total Score:**

- **3.5-4.0:** Excellent quality – Demonstrates thorough understanding and effective implementation of all parameters.
- **2.5-3.4:** Good quality – Meets expectations with minor improvements required in certain areas.
- **1.5-2.4:** Fair quality – Needs substantial revisions to meet full expectations.
- **1.0-1.4:** Poor quality – Fails to address key components or requirements adequately.

This rubric can be adapted and used to evaluate various types of capstone projects or major projects across disciplines.

**A comprehensive evaluation of a capstone project ensures that the work reflects not only academic rigor but also real-world considerations such as ethics, sustainability, safety, and cost. By addressing these broad factors, we help prepare students for professional success in their chosen fields while ensuring that their work contributes meaningfully to society and industry.**

**PART B – CAT & SEE QUESTION PAPER PATTERN (UG) FROM AY 2022–2023**

**1. Introduction:**

The Continuous Internal Evaluation (CIE) system is designed to assess students' academic performance through a structured and diversified assessment framework, tailored to the nature of each course. For theory courses, a total of 50 marks is allotted under CIE, comprising 40 marks from Continuous Assessment Tests (CAT), calculated as the average of two mid-term examinations, and 10 marks from Alternate Assessment Tools (AAT). The AAT component includes assignments, viva-voce, presentations, posters, case studies, or any other innovative assessment methods approved by the department, thereby encouraging continuous learning and skill development beyond written examinations.

For practical courses, the CIE carries a total of 50 marks, distributed across multiple components to ensure comprehensive evaluation of laboratory performance. Day-to-day laboratory work accounts for 10 marks, emphasizing regular participation and consistency. Viva-voce carries 10 marks to assess conceptual understanding and experimental knowledge. Another 10 marks are allotted for internal practical examinations, calculated as the average of two Continuous Assessment Tests (CAT-1 and CAT-2). The remaining 10 marks are allocated to laboratory projects, encouraging application-oriented learning and experimentation.

In the case of internships and mini-projects, a total of 50 marks is assigned under CIE to evaluate both academic and practical engagement. Of these, 20 marks are awarded based on departmental review, focusing on progress, documentation, and outcomes, while the remaining 20 marks are awarded through supervisor review, reflecting industry or field-based performance and professional conduct.

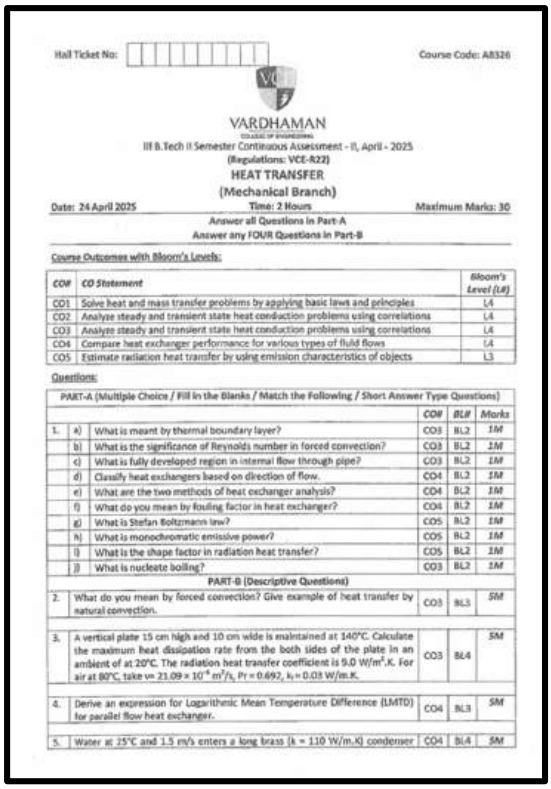
Project Work Phase–I carries a higher weightage of 100 marks under continuous evaluation, reflecting its significance in the curriculum. These marks are evenly divided between departmental review and supervisor review, with 50 marks allotted to each component. This dual evaluation ensures balanced assessment of academic rigor, project planning, literature review, and execution.

Project Work Phase–II is assessed for 50 marks under CIE, with equal weightage given to departmental review and supervisor review, each carrying 20 marks. This phase primarily focuses on project implementation, results, analysis, and professional presentation of outcomes.

Overall, the CIE framework emphasizes continuous assessment, transparency, and holistic evaluation by combining written tests, practical performance, project work, and alternative assessment methods. This approach ensures alignment with outcome-based education principles and supports comprehensive evaluation of students' knowledge, skills, and professional competencies.

| Type of Course | CIE | |
|---|---|---|
| Theory | 40 Marks for CAT | Average of Two Mid Term Examinations |
| | 10 Marks for AAT | Assignment, Viva-Voce/ PPT/ Poster/ Case Study or any other |
| Practical | 50 Marks | 10M Day-to-Day Evaluation<br>10M Viva-Voce<br>10M Internal Exam (Average of CAT1 and CAT2)<br>10M Lab Project |
| Internship/ Mini-Project | 50 Marks | 20 Marks – Department Review<br>20 Marks – Supervisor Review |
| Project Work Phase-I | 100 Marks | 50 Marks – Department Review<br>50 Marks – Supervisor Review |
| Project Work Phase - II | 50 Marks | 20 Marks – Department Review<br>20 Marks – Supervisor Review |

**1.1 CAT Model Question Paper Pattern:**



Hall Ticket No: Course Code: A8326

VARDHAMAN

III B.Tech II Semester Continuous Assessment - II, April - 2025

(Regulations: VCE-R22)

HEAT TRANSFER

(Mechanical Branch)

Date: 24 April 2025 Time: 2 Hours Maximum Marks: 30

Answer all Questions in Part-A

Answer any FOUR Questions in Part-B

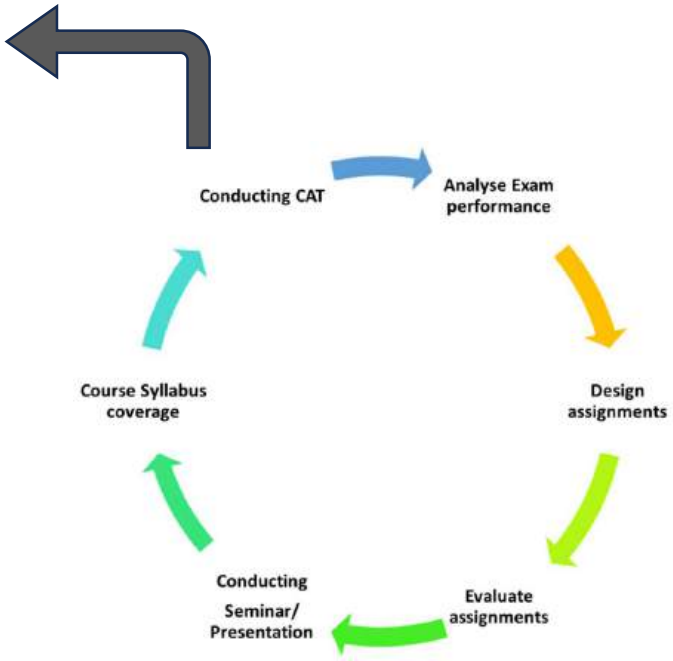
Course Outcomes with Bloom's Levels:

| CO# | CO Statement | Bloom's Level (LX) |
|---|---|---|
| CO1 | Solve heat and mass transfer problems by applying basic laws and principles | L4 |
| CO2 | Analyze steady and transient state heat conduction problems using correlations | L4 |
| CO3 | Analyze steady and transient state heat conduction problems using correlations | L4 |
| CO4 | Compare heat exchanger performance for various types of fluid flows | L4 |
| CO5 | Estimate radiation heat transfer by using emission characteristics of objects | L3 |

Questions:

PART-A (Multiple Choice / Fill in the Blanks / Match the Following / Short Answer Type Questions)

| | | | CO# | BL# | Marks |
|---|---|---|---|---|---|
| 1. | a) | What is meant by thermal boundary layer? | CO3 | BL2 | 1M |
| | b) | What is the significance of Reynolds number in forced convection? | CO3 | BL2 | 1M |
| | c) | What is fully developed region in internal flow through pipe? | CO3 | BL2 | 1M |
| | d) | Classify heat exchangers based on direction of flow. | CO4 | BL2 | 1M |
| | e) | What are the two methods of heat exchanger analysis? | CO4 | BL2 | 1M |
| | f) | What do you mean by fouling factor in heat exchanger? | CO4 | BL2 | 1M |
| | g) | What is Stefan Boltzmann law? | CO5 | BL2 | 1M |
| | h) | What is monochromatic emissive power? | CO5 | BL2 | 1M |
| | i) | What is the shape factor in radiation heat transfer? | CO5 | BL2 | 1M |
| | j) | What is nucleate boiling? | CO3 | BL2 | 1M |
| | | PART-B (Descriptive Questions) | | | |
| 2. | | What do you mean by forced convection? Give example of heat transfer by natural convection. | CO3 | BL3 | 5M |
| 3. | | A vertical plate 15 cm high and 10 cm wide is maintained at 140°C. Calculate the maximum heat dissipation rate from the both sides of the plate in an ambient of at 20°C. The radiation heat transfer coefficient is 9.0 W/m².K. For air at 80°C, take ν= 21.09 × 10⁻⁶ m²/s, Pr = 0.692, $k_f$= 0.03 W/m.K. | CO3 | BL4 | 5M |
| 4. | | Derive an expression for Logarithmic Mean Temperature Difference (LMTD) for parallel flow heat exchanger. | CO4 | BL3 | 5M |
| 5. | | Water at 25°C and 1.5 m/s enters a long brass (k = 110 W/m.K) condenser | CO4 | BL4 | 5M |




The institution conducts **End Semester Examinations (SEE)** as a summative assessment to evaluate students' comprehensive understanding of the course content at the end of each semester. The SEE is conducted in a structured, transparent, and standardized manner in accordance with the approved academic regulations and examination calendar. The conduct of examinations is supervised by the Examination Section to ensure fairness, confidentiality, discipline, and compliance with institutional and regulatory norms.

For **theory courses**, the End Semester Examination is conducted for a total of **60 marks** with a duration of **three hours**. The question paper is divided into two parts to ensure balanced assessment across all units of the syllabus. **Part–A** consists of a compulsory question carrying **10 marks**, comprising **10 short sub-questions drawn from all units with equal weightage**, thereby ensuring comprehensive syllabus coverage. **Part–B** carries **50 marks** and consists of **five descriptive questions, one from each unit, with an either/or choice**, allowing students to demonstrate in-depth understanding, analytical ability, and problem-

solving skills. This structure ensures assessment across multiple cognitive levels in alignment with outcome-based education principles.

For **practical courses**, the End Semester Examination is designed to evaluate hands-on skills, experimental competence, and conceptual understanding. The SEE for practicals includes assessment through multiple components such as **written record or write-up (10 marks)**, **execution of experiment or program (15 marks)**, **evaluation of results (15 marks)**, **presentation on an alternate experiment or program (10 marks)**, and **viva-voce (10 marks)**. This multi-component evaluation ensures a comprehensive assessment of procedural skills, analytical interpretation, and communication abilities.

For **internships and mini-projects**, the End Semester Examination carries **60 marks** and is conducted through a **viva-voce examination by an external examiner**, ensuring objectivity and industry or application-oriented assessment. **Project Work Phase–I** does not have an End Semester Examination component and is assessed through continuous evaluation as per regulations. **Project Work Phase–II** carries **60 marks**, assessed through a **viva-voce conducted by an external examiner**, focusing on project implementation, results, analysis, and professional presentation. The structured conduct of End Semester Examinations across all course types ensures uniformity, academic rigor, and credibility in the evaluation process.

| **Type of Course** | **SEE Marks** | **Examination Components / Structure** | **Duration / Mode** |
|---|---|---|---|
| **Theory** | 60 | **Part–A:** Compulsory question with 10 sub-questions from all units (equal weightage) – 10 Marks **Part–B:** Descriptive questions (5 questions, one from each unit with either/or choice) – 50 Marks | 4 Hours |
| **Practical** | 60 | Write-up / Record – 10 Marks Experiment / Program Execution – 15 Marks Evaluation of Results – 15 Marks Presentation on another experiment / program – 10 Marks Viva-Voce – 10 Marks | As notified |

| | | | |
|---|---|---|---|
| **Internship / Mini-Project** | 60 | Viva-Voce examination conducted by External Examiner | Viva-Voce |
| **Project Work Phase–I** | — | Assessed through Continuous Internal Evaluation only (No SEE component) | — |
| **Project Work Phase–II** | 60 | Viva-Voce examination conducted by External Examiner | Viva-Voce |

**1.2 SEE Model Question Paper Pattern:**

**Hall Ticket No:** | | | | | | | | | | |

**Question Paper Code: A8509**

# VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

II B. Tech I Semester Regular/Supplementary Examinations, December – 2024

**(Regulations: VCE-R22)**

## DISCRETE MATHEMATICAL STRUCTURES

**(Common to Computer Science and Engineering, Information Technology, Computer Science and Engineering (AIML), Computer Science and Engineering (Data Science), Artificial Intelligence and Machine Learning & Artificial Intelligence and Data Science)**

**Date: 10 December, 2024 FN** **Time: 3 hours** **Max Marks: 60**

**Answer All Questions**

**PART – A**

| | | | | | |
|---|---|---|---|---|---|
| 1. | a) | Construct a truth table for the "Conditional Statement". | CO 1 | L 1 | ***1M*** |
| | b) | Express the following statement in premises, "If you send me an e-mail message, then I will finish writing the program". | CO 1 | L 1 | ***1M*** |
| | c) | Let X = {1,2,3,4} and R = {(x,y) \| x > y} give its Matrix form. | CO 2 | L 2 | ***1M*** |
| | d) | Differentiate between Poset and Lattice. | CO 2 | L 2 | ***1M*** |
| | e) | If a, b ∈ group G, then prove that $(ab)^{-1} = b^{-1} a^{-1}$. | CO 3 | L 1 | ***1M*** |
| | f) | What is different between semi-group and monoid. Give an example for semi-group but not a monoid. | CO 3 | L 2 | ***1M*** |
| | g) | How many different outcomes are possible by tossing 10 similar coins? | CO 4 | L 2 | ***1M*** |
| | h) | In how many ways can 12 of the 14 people be distributed into 3 teams of 4 each? | CO 4 | L 2 | ***1M*** |
| | i) | Define bipartite graph. | CO 5 | L 1 | ***1M*** |
| | j) | In the following graph, is there any Hamilton circuits if yes, draw it. | CO 5 | L 2 | ***1M*** |

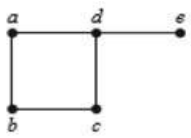



**Fig.1**

**PART – B**

| | | | | | |
|---|---|---|---|---|---|
| 2. | a) | i. Define two types of quantifiers with example.<br>ii. What are the negations of the statements<br>$\forall x\left(x^2 > x\right)\ and\ \exists x\left(x^2 = 2\right)$ | CO 1 | L 3 | ***5M*** |
| | b) | Show that $\neg(P \wedge Q) \rightarrow (\neg P \vee (\neg P \vee Q)) \Leftrightarrow (\neg P \vee Q)$. | CO 1 | L 3 | ***5M*** |
| | | **(OR)** | | | |
| | c) | Translate these statements into English, where C(x) is "x is a comedian" and F(x) is "x is funny" and the domain consists of all people:<br>i. ∀x(C(x) → F(x))<br>ii. ∀x(C(x) ∧ F(x))<br>iii. ∀x(C(x) V F(x))<br>iv. ∃x(C(x) → F(x))<br>v. ∃x(C(x) ∧ F(x)) | CO 1 | L 3 | ***5M*** |
| | d) | Show that the premises "It is not sunny this afternoon and it is colder than yesterday," "We will go swimming only if it is sunny," "If we do not go swimming, then we will take a canoe trip," and "If we take a canoe trip, then we will be home by sunset" lead to the conclusion "We will be home by sunset". | CO 1 | L 3 | ***5M*** |
| 3. | a) | Define Lattice. Discuss about the types of Lattices. | CO 2 | L 2 | ***5M*** |
| | b) | Let Z be the set of integers and let R be the relation called "congruence modulo 3" defined by<br>R = {(x, y) \| x∈ Z and y ∈ Z, (x-y) is divisible by 3}.<br>Determine whether R is an equivalence relation generated by the elements of Z or not. | CO 2 | L 3 | ***5M*** |

***Cont…2***



**(OR)**

| | | | | | |
|---|---|---|---|---|---|
| | c) | Let X ={2,3,6,12,24,36} and the relation ≤ be such that x≤y if x divides y. Draw Hasse diagram of ( X, ≤). Find Least Element, Greatest Element, Greatest Lower Bound, Least Upper Bound. | CO 2 | L 3 | ***5M*** |
| | d) | Consider the following relations on {1, 2, 3, 4}: Which of these relations are reflexive?<br>R1 = {(1, 1), (1, 2), (2, 1), (2, 2), (3, 4), (4, 1), (4, 4)},<br>R2 = {(1, 1), (1, 2), (2, 1)},<br>R3 = {(1, 1), (1, 2), (1, 4), (2, 1), (2, 2), (3, 3), (4, 1), (4, 4)},<br>R4 = {(2, 1), (3, 1), (3, 2), (4, 1), (4, 2), (4, 3)},<br>R5 = {(1, 1), (1, 2), (1, 3), (1, 4), (2, 2), (2, 3), (2, 4), (3, 3), (3, 4), (4, 4)}, | CO 2 | L 2 | ***5M*** |
| 4. | a) | Determine the set Q + of all positive rational numbers forms a group under operation * defined by $a * b = \frac{ab}{2}, \forall a, b \in Q +$. | CO 3 | L 3 | ***5M*** |
| | b) | Prove or disprove the set | CO 3 | L 3 | ***5M*** |

$S = \{\begin{pmatrix} x & x \\ x & x \end{pmatrix} : x \text{ is real number}\}$ is a group under matrix multiplication.

**(OR)**

| | | | | | |
|---|---|---|---|---|---|
| | c) | Define monoid and give two examples of monoid. | CO 3 | L 2 | ***5M*** |
| | d) | Show that the set of {1, -1, i, -i). Will form a group under multiportion where i* i = $i^2$= -1. | CO 3 | L 3 | ***5M*** |
| 5. | a) | In a group of 6 boys and 4 girls, four children are to be selected. In how many different ways can they be selected such that at least one boy should be there? | CO 4 | L 3 | ***5M*** |
| | b) | Out of 7 consonants and 4 vowels, how many words of 3 consonants and 2 vowels can be formed? | CO 4 | L 3 | ***5M*** |

**(OR)**

| | | | | | |
|---|---|---|---|---|---|
| | c) | In how many ways can we select three students from a group of five students to stand in line for a picture? In how many ways can we arrange all five of these students in a line for a picture?<br>How many ways are there to select a first-prize winner, a second-prize winner, and a third-prize winner from 100 different people who have entered a contest? | CO 4 | L 3 | ***5M*** |
| | d) | Find the coefficients of $X^{20}$ in $(X^3+X^4+X^5+\ldots)^5$. | CO 4 | L 3 | ***5M*** |
| 6. | a) | Solve the recurrence relation $a_{n+2}-2a_{n+1}+a_n=5^n$ for n>=0 and $a_0=1$, $a_1=2$. | CO 5 | L 2 | ***5M*** |
| | b) | Solve the recurrence relation<br>$a_n - 5a_{n-1} + 6a_{n-2} = 0 \ with \ a_0 = 2, a_1 = 5.$ | CO 5 | L 3 | ***5M*** |

**(OR)**

| | | | | | |
|---|---|---|---|---|---|
| | c) | Write the incidence matrix of the following graph. | CO 5 | L 2 | ***5M*** |

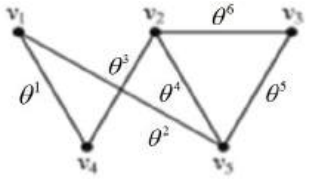



**Fig.2**

| | | | | | |
|---|---|---|---|---|---|
| | d) | Find the following graph is planar or not, if planar, draw the graph. | CO 5 | L 3 | ***5M*** |

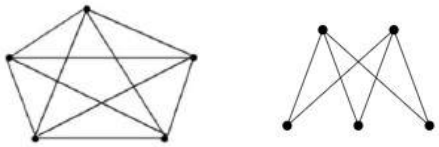
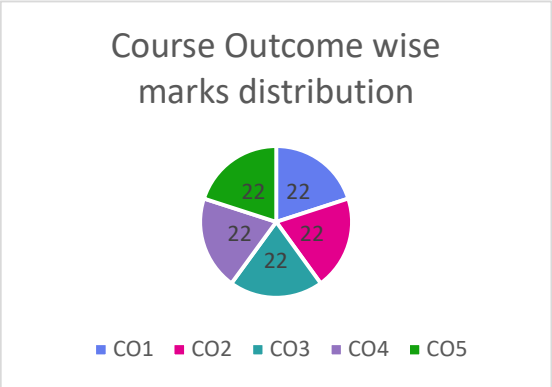


**Fig.3**

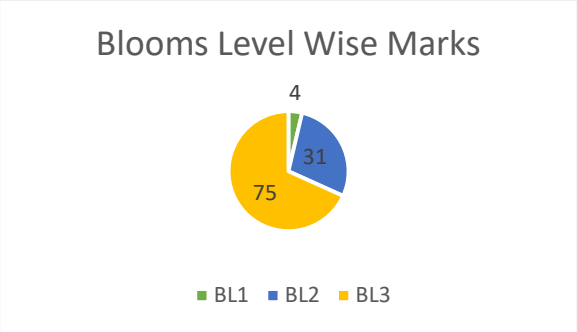
**SEE (COURSE OUT COME WISE MARKS DISTRIBUTION MARKS)**

| COURSE OUTCOMES | MARKS |
|---|---|
| CO1 | 22 |
| CO2 | 22 |
| CO3 | 22 |
| CO4 | 22 |
| CO5 | 22 |




**SEE (BLOOM'S LEVEL WISE MARKS DISTRIBUTION)**

| BLOOMS LEVEL | MARKS |
|---|---|
| BL1 | 4 |
| BL2 | 31 |
| BL3 | 75 |

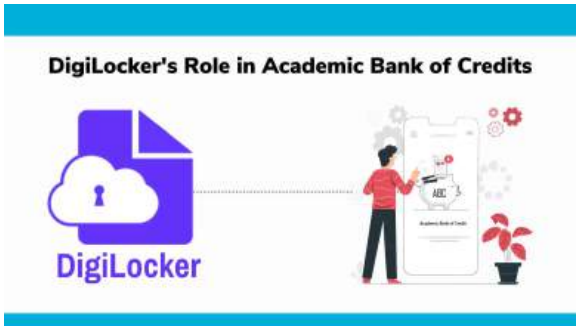


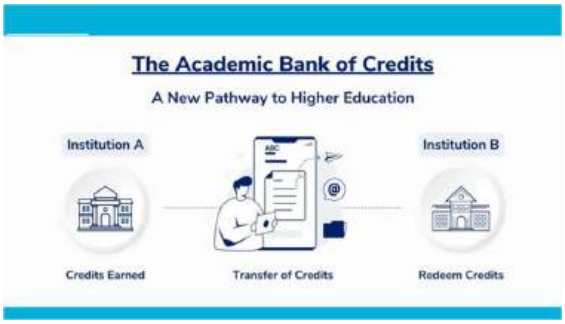
## PART C – ACADEMIC BANK CREDITS AND AUTOMATION

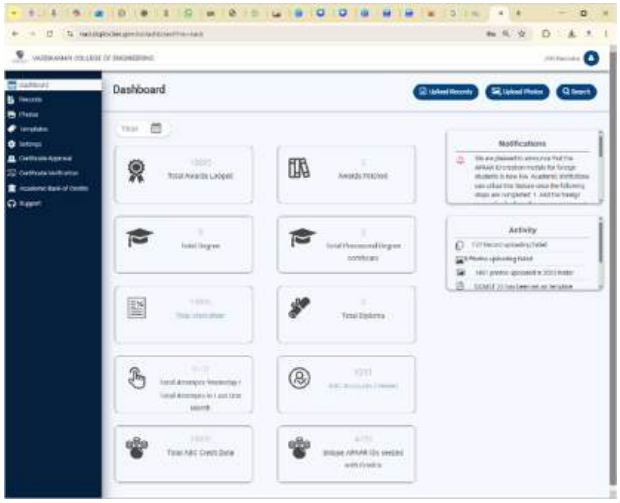
### 1. Introduction of ABC (Academic Bank of Credits)

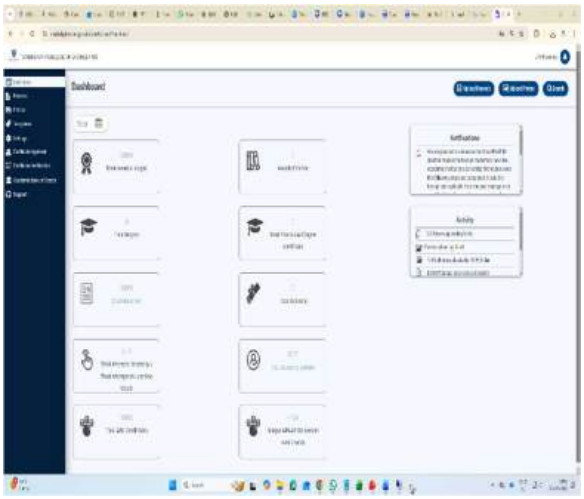
a. The Academic Bank of Credits (ABC) is a digital credit management system introduced as part of the National Education Policy (NEP) 2020 to promote flexibility, mobility, and lifelong learning in higher education.

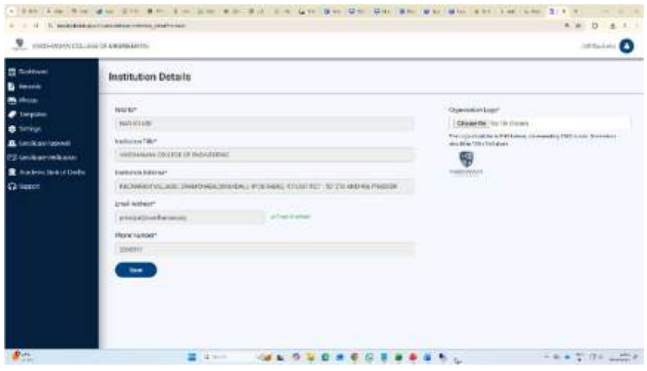
b. ABC functions as a digital repository (credit bank) where students can store, accumulate, transfer and redeem academic credits earned from recognized higher education institutions.

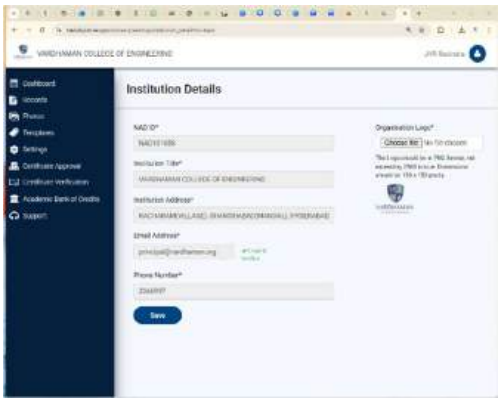




## 2. Examination Cell: Reforms & Automation

### 2.1. Student-Centric Policies

Provisions for revaluation, grievance redressal, multiple entry–exit, and Academic Bank of Credits (ABC) support flexibility and inclusiveness as recommended by NAAC and NEP-2020.

### 2.2. Feedback-Integrated Examination Cycle

a. Post-exam student feedback collected.
b. Used to refine:
    i. Question quality
    ii. Difficulty balance
    iii. Evaluation timelines
c. Forms a Continuous Quality Improvement (CQI) loop.

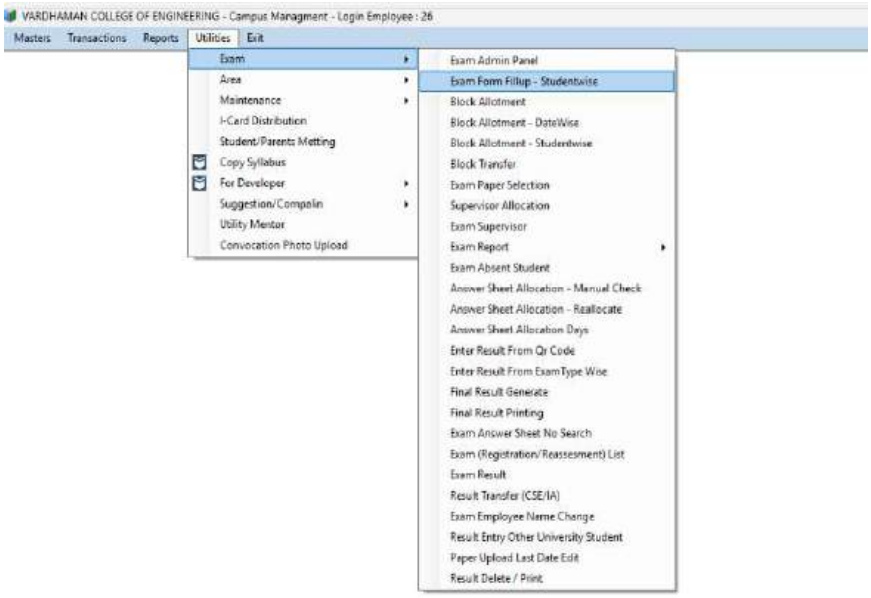
### 2.3. Digital Evaluation with Analytics

a. Answer scripts are scanned and evaluated digitally.
b. System generates **exam analytics** such as:
    i. CO-wise performance
    ii. Difficulty index
    iii. Pass percentage trends
c. Enables **data-driven academic decisions**.

### 2.4. Login Page:

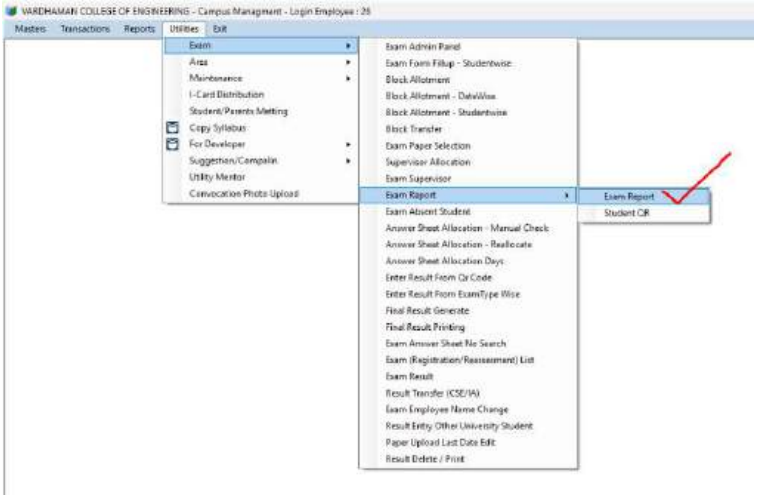

**Description:** "Login Page: The examination process begins with the login page, where authorized users are required to enter their unique login credentials (username and password) to access the system securely. This ensures that only authenticated personnel can proceed with examination-related tasks."

## 2.5. Examination Menu



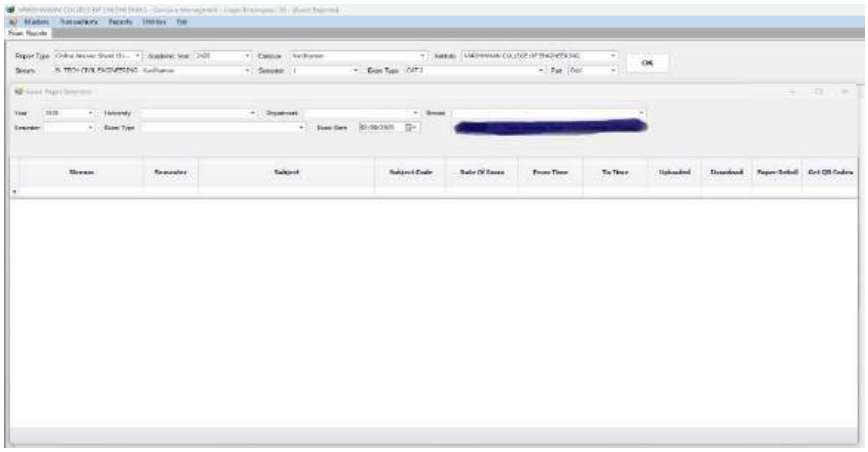

The **Examination Menu** is a centralized section of the system that provides access to all examination-related functions and modules. From this menu, users can manage and monitor the entire examination process.

## 2.6. Examinations Reports



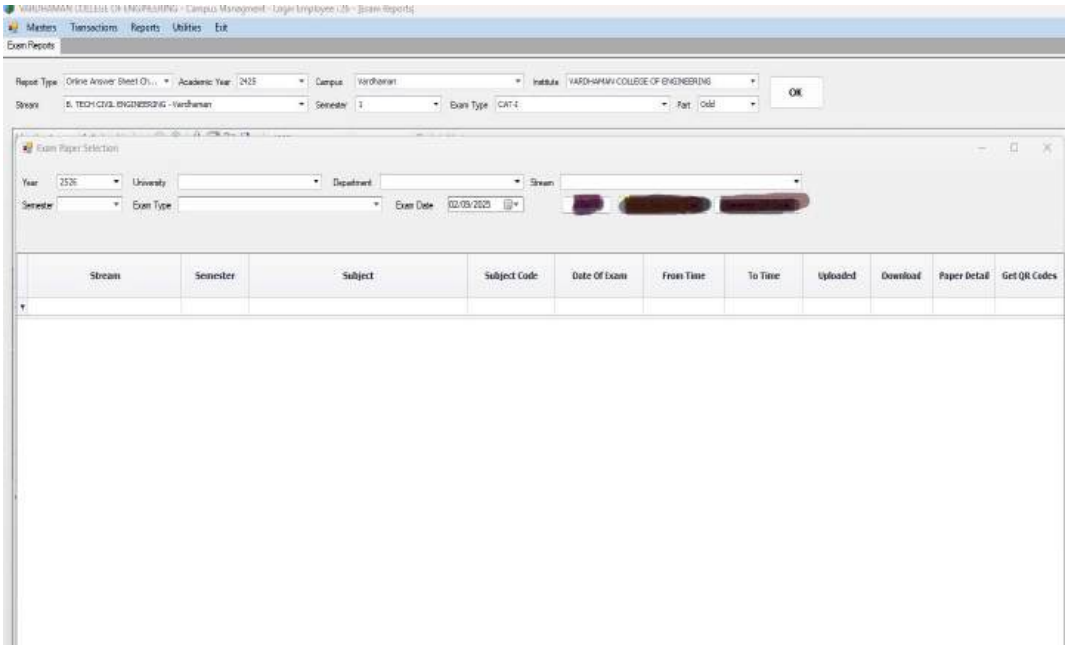

The **Examination Reports** section provides comprehensive data and summaries related to all aspects of the examination process. It helps administrators, faculty, and management review performance, track progress, and maintain academic records efficiently.

### 2.7. Answer booklets Checked Status:



The Answer Booklets Checked Status module is designed to track and monitor the evaluation process of student answer booklets after examinations. It ensures transparency, timely completion of evaluations, and easy access to status updates for administrators, faculty, and examination controllers.

### 2.8. Internal and External Exam Paper Generation:

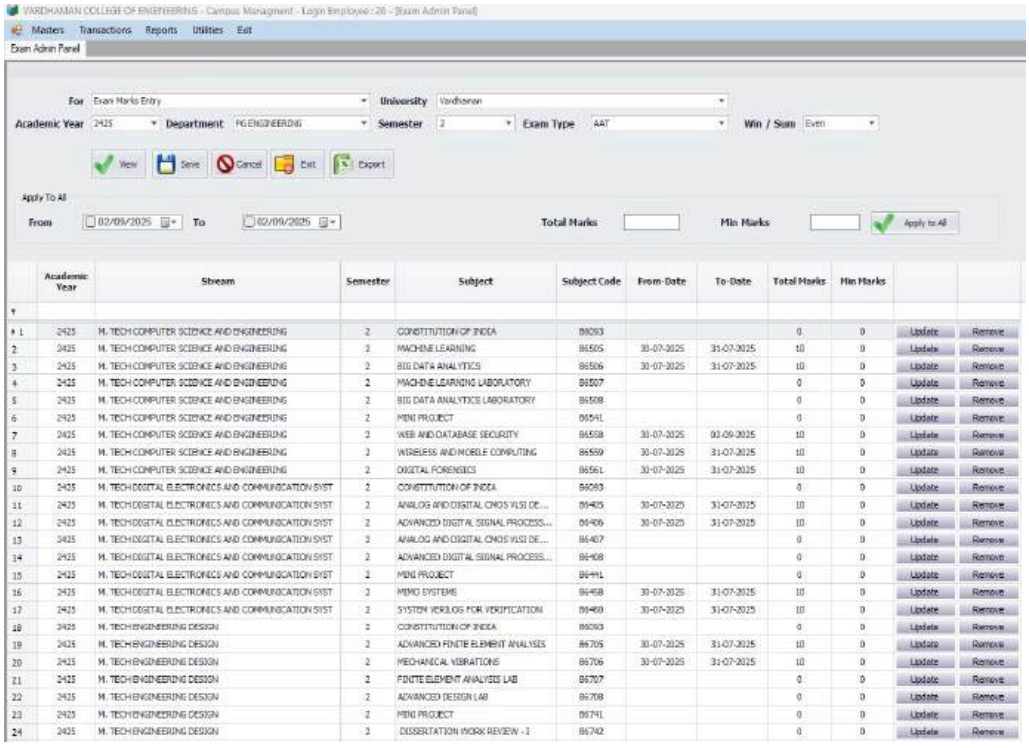



The Internal and External Examination Paper Generation process is a highly confidential and secure operation managed under strict institutional protocols to ensure fairness, accuracy, and data protection. It involves multiple stages of question paper preparation, verification, and distribution, all carried out with limited access to authorized personnel only.

### 2.9. Re-Assessment Request from Student (CAT Examinations):

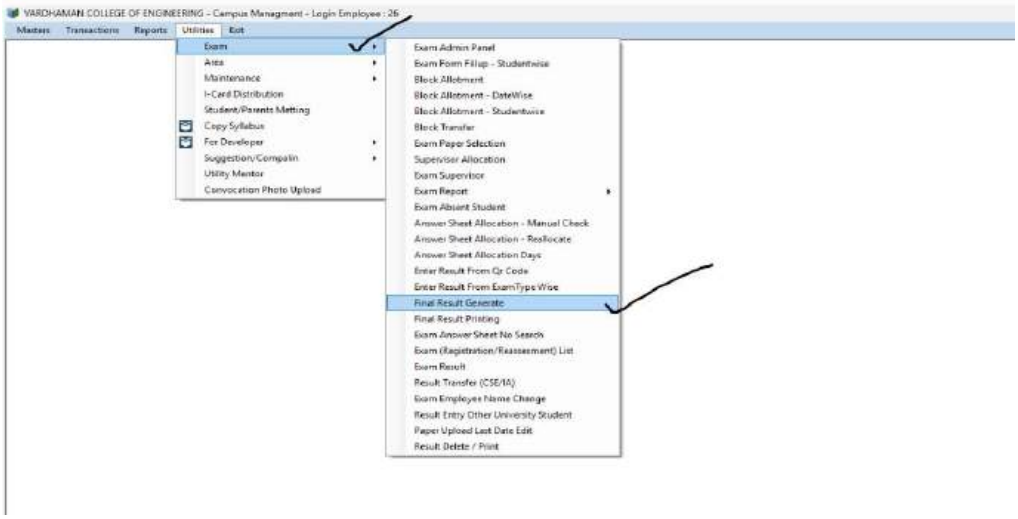

For CAT examination a students can apply re-assessment, if any discrepancy of marks.

### 2.10. Marks Entry Open for Faculty:



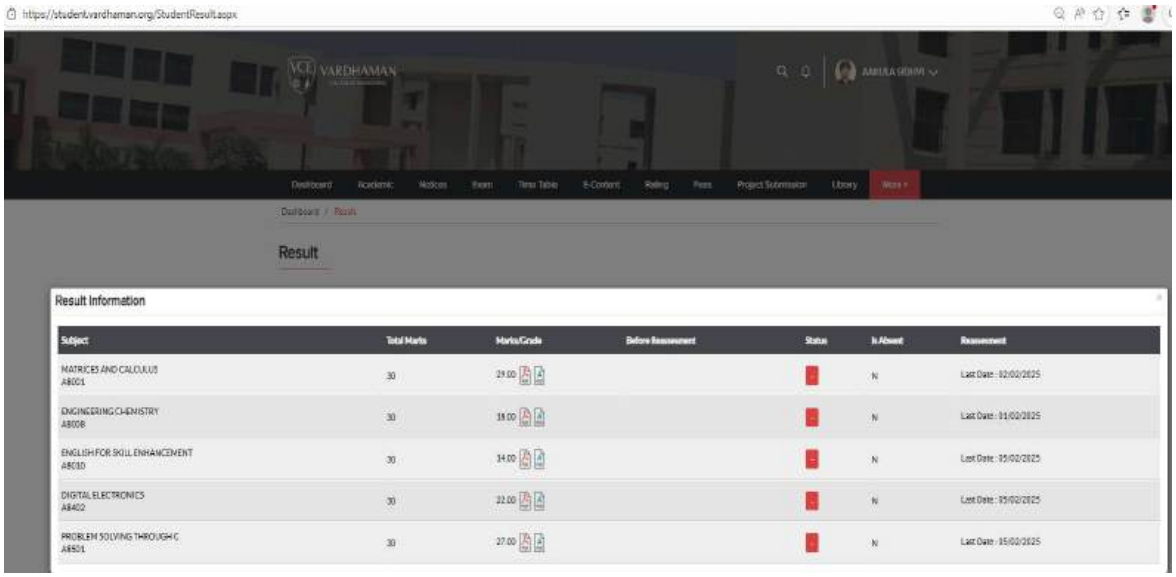

Through this module will enable marks entry in faculty login at the time of practical and internal assessment.

## 2.11. Result Process:



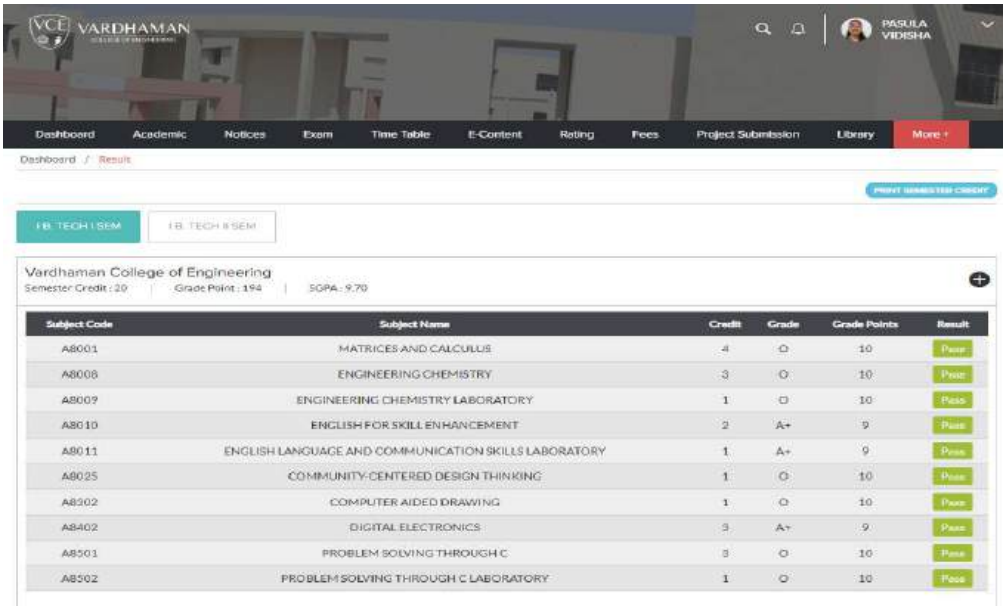

The Result Process Module is a key feature of an examination management system designed to **automate and streamline the preparation, calculation, and publication of results** for students.

## 2.12. Student Portal:




Student can check internal marks & can Apply Re-Assessment if required.

**2.13. Final Result Display**:




a. The final results screen shows the **overall exam outcome** Semester Credit, Grade Point & SGPA.
b. It displays **student and exam details**, such as course/semester, for easy identification.
c. **Subject-wise results** are listed below, showing individual performance.
d. Important sections are **highlighted in color** to quickly notice the final status.
e. This page serves as the **official confirmation of exam completion and result**.

**PART D – CONCLUDING REMARKS**

The **Examination Reform Policy of Vardhaman College of Engineering (Autonomous)** has been systematically formulated to strengthen the alignment between assessment practices and the principles of **Outcome-Based Education (OBE)**. This policy reflects the institution's long-standing commitment to academic excellence, quality assurance, transparency, and continuous improvement in teaching–learning and evaluation processes. By redefining examination systems in line with national regulatory frameworks and accreditation requirements, the policy ensures that student assessment is meaningful, reliable, and focused on measurable learning outcomes.

At the core of this policy is a structured and well-defined framework for **Course Outcome (CO), Program Outcome (PO), and Program Specific Outcome (PSO) attainment**. The examination and evaluation processes are carefully mapped to learning outcomes, ensuring coherence between curriculum design, delivery, and assessment. The policy emphasizes the use of **appropriate assessment tools**, including formative and summative evaluations, internal continuous assessment components, semester-end examinations, rubrics-based evaluations, and alternative assessment methods. This diversified assessment strategy ensures comprehensive measurement of students' cognitive, analytical, and application-oriented competencies.

The policy strongly promotes the assessment of **higher-order cognitive skills**, as defined in Bloom's Taxonomy, by encouraging problem-solving, analytical reasoning, design thinking, and critical evaluation in examination questions. In addition to theoretical knowledge, due emphasis is placed on the evaluation of **professional skills, ethical understanding, teamwork, communication abilities, and lifelong learning attributes**, which are essential for engineering graduates. Experiential learning components such as laboratories, mini projects, major projects, internships, industry-based assignments, and skill-oriented activities are systematically integrated into the assessment framework, enabling holistic evaluation of student performance.

To ensure fairness and uniformity, the examination system incorporates **clearly defined procedures for question paper setting, moderation, evaluation, grading, and result processing**. The involvement of both internal and external examiners, wherever applicable, enhances objectivity and credibility in evaluation. Standardized rubrics, model answer schemes, and moderation mechanisms are employed to minimize subjectivity and ensure consistency across evaluators. The grading system adopted under this policy is transparent, student-friendly, and aligned with national academic standards, thereby ensuring comparability and academic integrity.

The policy also establishes robust mechanisms for **confidentiality, security, and integrity** throughout the examination lifecycle. Clear protocols are defined for the handling of question papers, answer scripts, digital records, and sensitive examination data. Measures related to invigilation, malpractice prevention, and disciplinary action are explicitly documented to uphold the sanctity of examinations. A well-structured **grievance redressal mechanism** is an integral part of the policy, ensuring that students are provided with a fair opportunity to seek clarifications, re-evaluation, or resolution of examination-related concerns within stipulated timelines.

In recognition of the evolving role of digital transformation in higher education, the policy emphasizes the **strategic integration of technology** in examination management. The use of automation and digital platforms for processes such as registration, hall ticket generation, attendance tracking, marks entry, result processing, and data analysis enhances efficiency, accuracy, and traceability. Technology-driven systems also support faster dissemination of information, improved record management, and better compliance with regulatory and accreditation requirements.

The successful implementation of examination reforms is supported by **documented standard operating procedures (SOPs)**, defined roles and responsibilities, and periodic review mechanisms. Stakeholder involvement—including faculty members, students, academic committees, Boards of Studies, and examination authorities—ensures participative governance and shared accountability. Regular feedback from stakeholders is systematically collected, analyzed, and utilized to identify gaps and initiate corrective actions, thereby strengthening the effectiveness of the assessment system.

An important outcome of this policy is the systematic **analysis of assessment data and attainment levels**, which serves as a critical input for academic decision-making and curriculum enhancement. The insights derived from CO–PO attainment analysis, examination performance trends, and feedback mechanisms enable departments and academic bodies to initiate targeted improvements in curriculum design, pedagogy, and assessment strategies. This data-driven approach ensures compliance with **NBA requirements for continuous improvement** and reinforces a culture of evidence-based quality assurance.

In conclusion, the **Examination Reform Policy of Vardhaman College of Engineering (Autonomous)** establishes a comprehensive, outcome-oriented, and sustainable examination framework that balances academic rigor with fairness and transparency. By integrating OBE principles, robust governance structures, technological advancements, and continuous review mechanisms, the policy reinforces the institution's commitment to producing competent, ethical, and industry-ready engineering graduates. This policy not only strengthens the credibility of the examination system but also contributes significantly to the overall quality and excellence of engineering education at the institution.

VCE

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