

**JSPM'S  
RAJARSHI SHAHU COLLEGE OF ENGINEERING,  
TATHWADE, PUNE**



**OUTCOME BASED EDUCATION(OBE)  
HANDBOOK UG**



**DEPARTMENT OF CIVIL ENGINEERING**

## Outcome Based Education

Outcomes based education (OBE) is a process that involves the restructuring of curriculum, assessment and reporting practices in education to reflect the achievement of high order learning and mastery rather than the accumulation of course credits” (Tucker, 2004).



# About Us



01

## Vision of Institute

“To satisfy the aspirations of youth force, who wants to lead the nation towards prosperity through techno-economic development.”

02

## Mission of Institute

“To provide, nurture, and maintain an environment of high academic excellence, research and entrepreneurship for all aspiring students, which will prepare them to face global challenges maintaining high ethical and moral standards.”

03

## Quality Policy

We, at Rajarshi Shahu College of Engineering, are committed to maximize student's satisfaction through improved performance by imparting value based quality education.

# Department of Civil Engineering

## Vision of Department

To provide an excellent academic environment for students to become competent Civil Engineer

## Mission of Department

M1: To reinforce the students with fundamentals in Civil Engineering by providing scholarly and vibrant environment for successful careers

M2: To explore and develop innovations that contributes to higher education, research and entrepreneurship development in applied domains of Civil Engineering

M3: To serve society through knowledge and expertise in Civil Engineering

## Program Outcomes (POs)

Program outcomes describe what students are expected to know and would be able to do by the time of graduation. These relate to the skills, knowledge, and behaviors that students acquire as they progress through the program.

1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern Tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

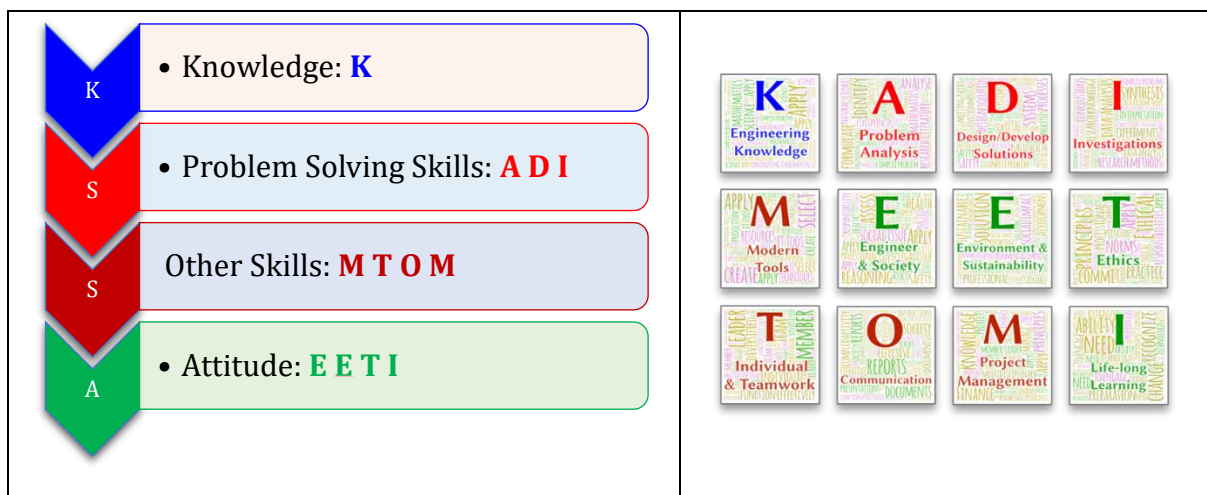
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.





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**LIST of ABBREVIATIONS**

<b>OBE</b>	Outcome Based Education	<b>BTL</b>	Bloom's Taxonomy Level
<b>LOT</b>	Lower Order of Thinking	<b>HOT</b>	Higher Order of Thinking
<b>PEO</b>	Program Educational Objectives	<b>PO</b>	Program Outcome
<b>CO</b>	Course Outcome	<b>PSO</b>	Program Specific Outcome
<b>UE</b>	University Theory Exam	<b>POE</b>	Practical Oral Exam
<b>CES</b>	Course Exit Survey	<b>HoD</b>	Head of Department
<b>PC</b>	Program Coordinator	<b>DAB</b>	Department Advisory Board
<b>PAC</b>	Program Assessment Committee	<b>AY</b>	Academic Year
<b>CG</b>	Curriculum gap	<b>CBS</b>	Content Beyond Syllabus



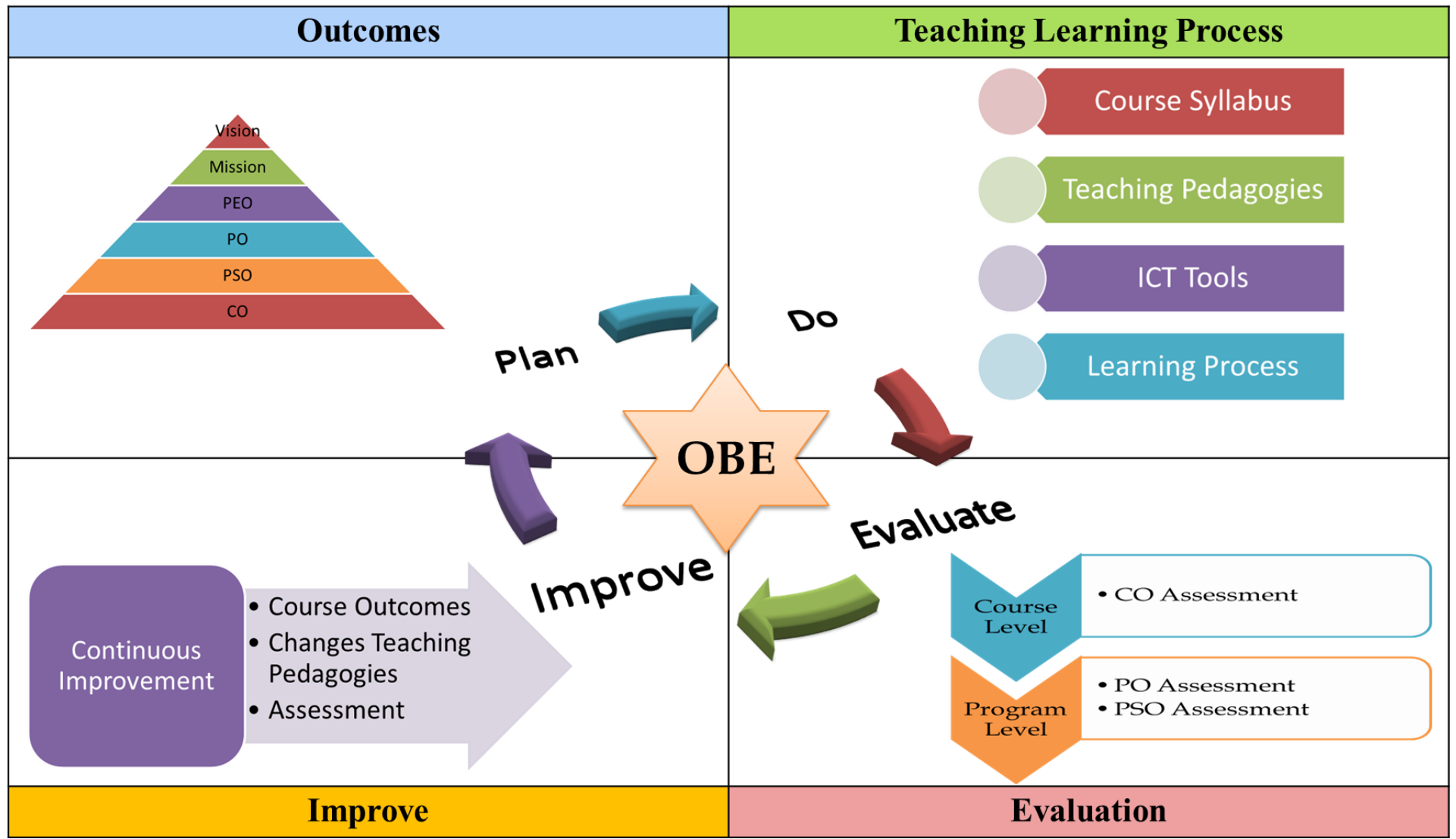
## Preamble

Outcome Based Education (OBE) is an educational model that forms the base of a quality education system. There is no single specified style of teaching or assessment in OBE. All educational activities carried out in OBE should help the students to achieve the set goals. The faculty may adapt the role of instructor, trainer, facilitator, and/or mentor, based on the outcomes targeted. OBE enhances the traditional methods and focuses on what the Institute provides to students. It shows the success by making or demonstrating outcomes using statements "able to do" in favor of students. OBE provides clear standards for observable and measurable outcomes.

### Benefits of OBE

- **Clarity:** The focus on outcome creates a clear expectation of what needs to be accomplished by the end of the course.
- **Flexibility:** With a clear sense of what needs to be accomplished, instructors will be able to structure their lessons around the students' needs.
- **Comparison:** OBE can be compared across the individual, class, batch, program and institute levels.
- **Involvement:** Students are expected to do their own learning. Increased student involvement allows them to feel responsible for their own learning, and they should learn more through this individual learning

OBE Framework @ RSCOE



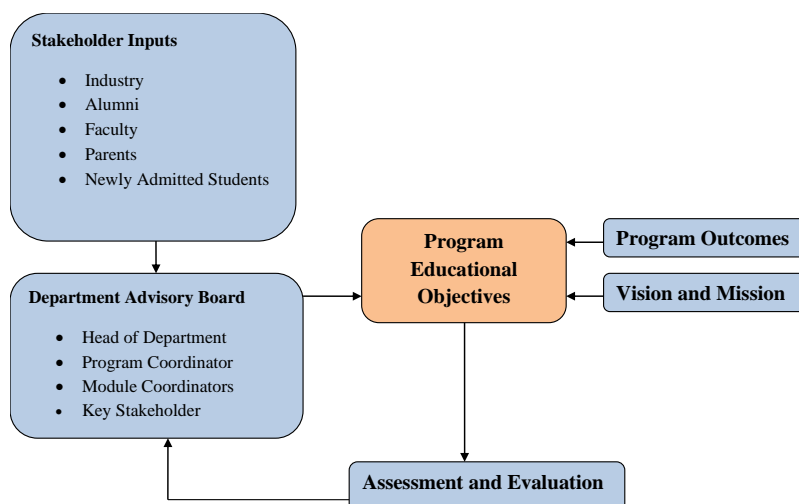
# Outcome Based Education Framework for UG Civil Engineering

## Program Educational Objectives (PEOs)

Program educational objectives are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve.

### Process for establishing PEOs

The process of establishing PEO is based on Graduate Attributes defined by the NBA in conjunction with mission of institute and inputs received from a committee constituting representatives of all stakeholders. PEOs were created by the DAB during previous accreditation in 2012 as per the input-output model of the NBA. Suggestions were sought from all stakeholders using modern tools for establishing of PEOs. The employer's survey was taken using ICT tools by sending requisite rubrics to the industries. An entry survey of the newly admitted students was taken to understand their career objectives. Suggestions from parents were taken during Parent-Teacher meetings. Inputs from the alumni were collected and analyzed. PEOs were established based on various inputs received from stakeholders and brainstorming sessions conducted by DAB.



## **Program Educational Objectives (PEOs) for UG Program of Civil Engineering Department**

PEO I: Graduate shall have successful career in Civil Engineering, exhibit leadership and teamwork ability.

PEO II: Graduate shall possess an ability to work in diversified professional environment with functional and disciplinary skills in social context.

PEO III: Graduate shall have an ability and skill to address research, professional challenges and be a lifelong learner.

## **Program Specific Outcomes**

**Program Specific Outcomes** are statements that describe what the graduates of a specific engineering program should be able to do.

### **Program Specific Outcomes (PSOs) for UG Program of Civil Engineering Department**

Engineering Graduates will be able to;

**PSO1:** Satisfy the essentials in planning, analysis, design and maintenance of Civil Engineering Structures by incorporating latest technologies and modern tools.

**PSO2: Problem-Solving Skills:** Proficient in identifying and solving complex infrastructural problems, applying management and engineering techniques.

**PSO3: Professional Career and Entrepreneurship:** Provide sustainable solutions to environmental and water resources challenges.

## Administrative System for Implementation of OBE

Course Coordinator

Module Coordinator

Programme Coordinator

Programme Assessment Committee

Department Advisory Board

Internal Quality Assurance Cell (IQAC)

### 1. Course coordinator:

- i) Plan, implement, monitor and review Topic Learning Outcomes (TLOs) and Course Outcomes (COs).
- ii) Evaluation of COs.
- iii) Suggest improvements based on attainment of COs.

### 2. Module coordinator:

- i) Coordinate and supervise the faculty teaching the courses in the module
- ii) Assessment of COs.
- iii) Recommends and facilitates workshop/guest lectures/seminar/FDP to meet the COs.
- iv) Analyze the attainment of COs of a particular course and recommends Programme Coordinator to take appropriate action for improvements.

v) Interact with students, faculty, Programme Coordinator and Head of Department to determine priorities and policies for improvements.

### **3. Program Coordinator:**

i) Schedule programme work in accordance with PEOs and POs.

ii) Oversees daily operations and coordinate activities of programme interrelated with activities of other programmers to ensure optimum efficiency and compliance with appropriate policies and specifications given by HOD.

iii) Monitor and reviews activities of each day

### **4. Program Assessment Committee**

The Program Assessment Committee (PAC) has been formed for monitoring of Civil Engineering departmental activities. The PAC consists of the module coordinators, who periodically monitor departmental activities and evaluate various parameters.

#### **Roles and Responsibilities**

- Track the results of Program Outcomes (POs) and Program Specific Outcomes (PSOs), and plan the steps required to achieve POs and PSOs.
- Scheduling of inspection period to ensure assessment of POs and PSOs in a valid time period.
- Preparing periodic program activity reports, progress reports, status reports or other special management reports.
- Motivate the faculty and students to attend conferences, create programs, job models, publish papers and participate in research activities.
- Interact with stakeholders and DAB to facilitate the achievement of POs and PSOs, maintain track record and current status.

## **5. Department Advisory Board**

- The Department Advisory Committee interacts and maintains liaison with key stakeholders.
- The Department Advisory Committee is chaired by HOD who receives the report of the Program Assessment Committee and monitors the progress of the program.
- The committee develops and recommends new or revised goals and objectives of the program.
- The committee also reviews and analyzes the gap between curriculum and Industry requirement and gives necessary feedback or advice actions.
- NPTEL, Spoken tutorial , FDP, STTP / Guest lecturers monitoring
- Suggest improvement in academic plans and recommend standard practices/systems for attainment of PEOs &
- Encourage for industry-institute interactions to bridge up curriculum/industry gap and suggest quality improvement initiatives to enhance employability.
- Redefine existing PEO's, aligning of PEO's to the mission statements and defining program specific outcomes PSOs.
- To propose necessary action plan for skill development of students, required for entrepreneurship development and quality improvement.
- To identify and suggest thrust areas to conduct various activities (final year projects, training courses and additional experiments to meet PSOs and PEOs.
- Submission of report to the IQAC in the prescribed format.

## **6. Internal Quality Assurance Cell**

- Development and application of quality benchmarks/parameters for various academic and administrative activities of the institution;
- Facilitating the creation of a learner-centric environment conducive to quality education and faculty maturation to adopt the required knowledge and technology for participatory teaching and learning process;



- Arrangement for feedback response from students, parents and other stakeholders on quality-related institutional processes;
- Dissemination of information on various quality parameters of higher education;
- Organization of inter and intra institutional workshops, seminars on quality related themes and promotion of quality circles;
- Documentation of the various programs/activities leading to quality improvement;
- Acting as a nodal agency of the Institution for coordinating quality-related activities, including adoption and dissemination of best practices;
- Development of Quality Culture in the institution.

## OBE Awareness for Stakeholders

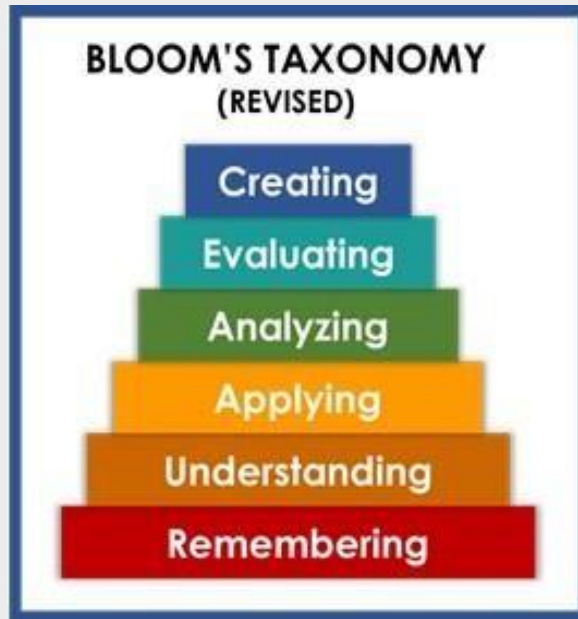
### Bloom's Taxonomy

Revised Bloom's taxonomy in the cognitive domain includes thinking, knowledge, and application of knowledge. It is a popular framework in engineering education to structure the assessment as it characterizes complexity and higher-order abilities.

According to revised Bloom's taxonomy, the levels in the cognitive domain are as follows:

Level	Descriptor	Level of attainment
1	Remembering	Recalling from the memory of the previously learned material
2	Understanding	Explaining ideas or concepts
3	Applying	Using the information in another familiar situation
4	Analysing	Breaking information into the part to explore

		understandings and relationships
5	Evaluating	Justifying a decision or course of action
6	Creating	Generating new ideas, products or new ways of viewing things



**The Cognitive Process Dimensions -Categories**

Lower Order of thinking (LOT)			Higher Order of Thinking (HOT)		
Remember	Understand	Apply	Analyze	Evaluate	Create
Recognizing (identifying) Recalling (retrieving)	Interpreting Illustrating Classifying Summarizing Inferring (concluding) Comparing Explaining	Executing Implementing	Differentiating Organizing Attributing	Checking (coordinating, detecting, testing, monitoring) Critiquing (judging)	Planning Generating Producing (constructing)

**The Knowledge DIMENSION**

**Concrete Knowledge**

**Abstract knowledge**

<b>Factual</b>	<b>Conceptual</b>	<b>Procedural</b>	<b>Metacognitive</b>
<ul style="list-style-type: none"> <li>• Knowledge of terminologies</li> <li>• Knowledge of specific details &amp; elements</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of classifications and categories</li> <li>• Knowledge of principles &amp; generalizations</li> <li>• Knowledge of theories, models &amp; structures</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of subject specific skills and algorithms</li> <li>• Knowledge of subject specific techniques and methods</li> <li>• Knowledge of criteria for determining when to use appropriate procedures</li> </ul>	<ul style="list-style-type: none"> <li>• Strategic Knowledge</li> <li>• Knowledge about cognitive task, including appropriate contextual and conditional Knowledge</li> <li>• Self- Knowledge</li> </ul>

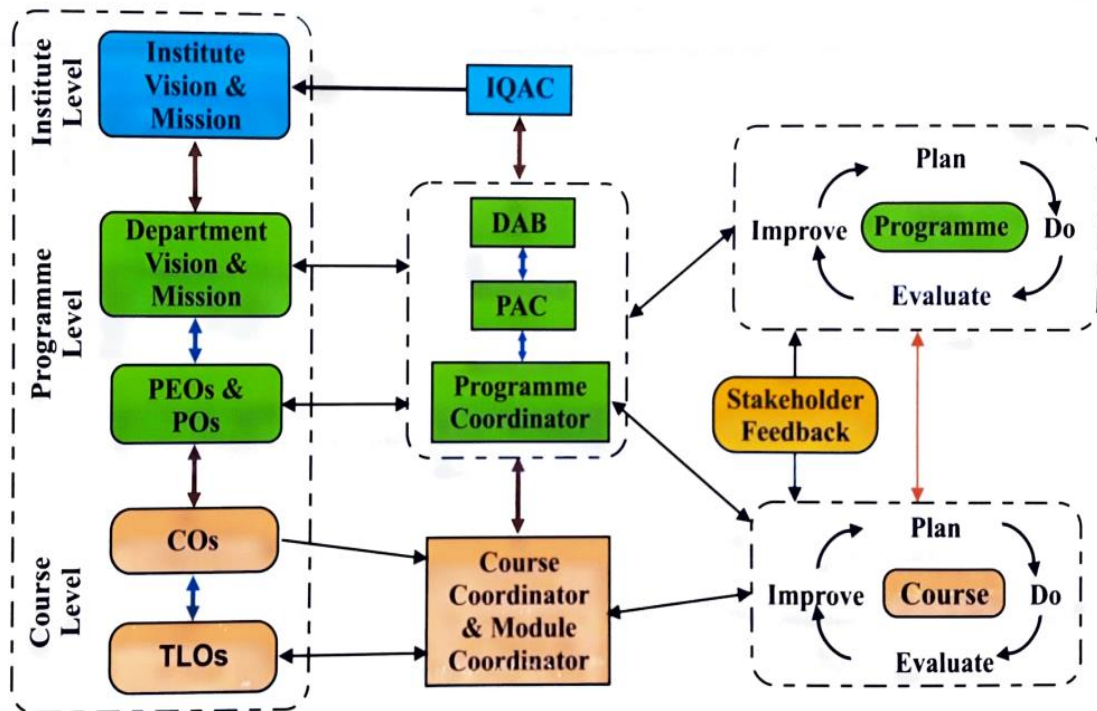
## Action Verb for Course Outcomes

Lower Order of Thinking (LOT)			Higher Order of Thinking (HOT)		
Remember	Understand	Apply	Analyze	Evaluate	Create
Define	Explain	Solve	Analyse	Reframe	Design
Describe	Describe	Apply	Compare	Criticize	Create
List	Interpret	Illustrate	Classify	Judge	Plan
State	Summaries	Calculate	Distinguish	Recommend	Formulate
Match	Compare	Sketch	Explain	Grade	Invent
Tabulate	Discuss	Prepare	Differentiate	Measure	Develop
Record	Estimate	Chart	Appraise	Test	Organize
Label	Express	Choose	Conclude	Evaluate	Produce

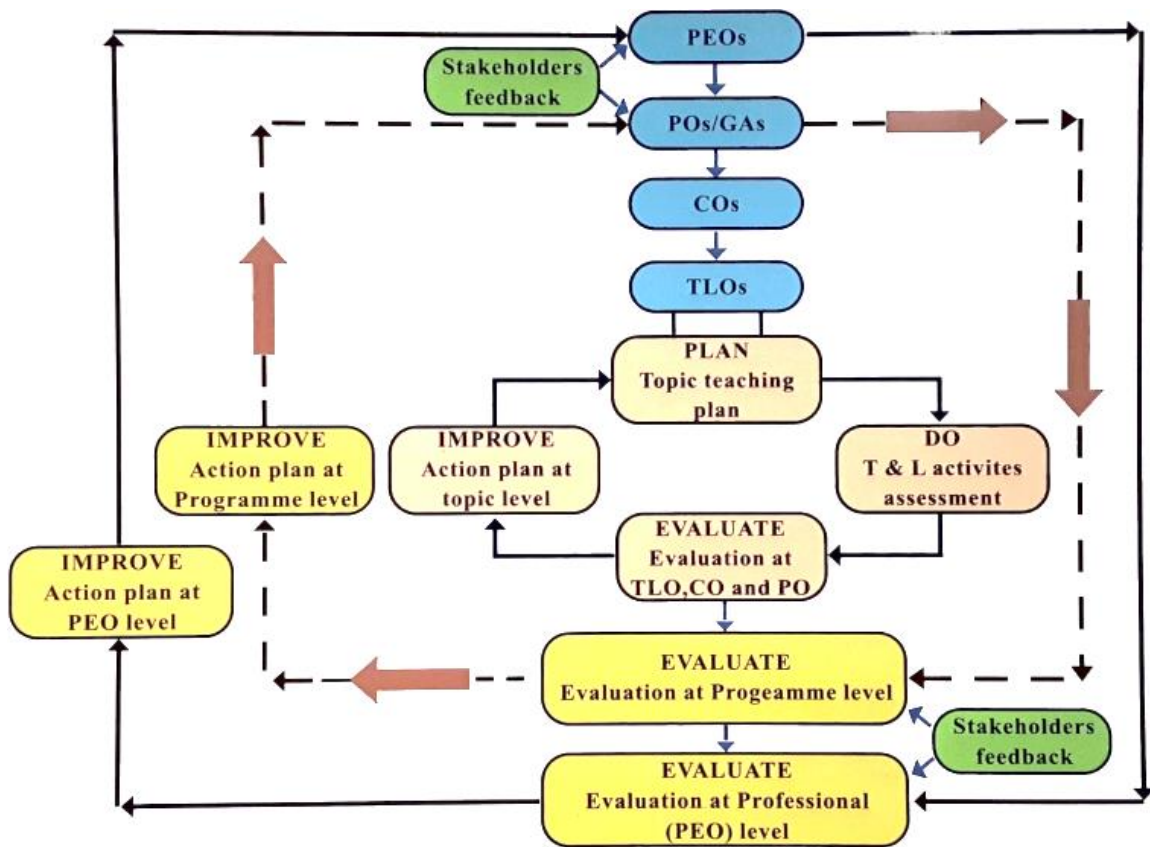
Illustration (USE of action verb w.r.t knowledge DIMENSION and order of thinking):

USE of action verbs	Factual	Conceptual	Procedural	Metacognitive
<b>Remember</b>	<b>List</b> properties of soil	<b>Recognize</b> characteristic of material	<b>Explain</b> working of pump	<b>Identify</b> strategies for report writing
<b>Understand</b>	<b>Summarize</b> features of a new product.	<b>Classify</b> adhesives by toxicity.	<b>Explain</b> assembly instructions.	<b>Predict</b> the behavior of member
<b>Apply</b>	<b>Respond</b> to frequently asked questions.	<b>Provide</b> advice to team members	<b>Carry out</b> pH tests of water samples.	<b>Use</b> modern techniques to get solution
<b>Analyse</b>	<b>Explain</b> the selection of tool/ activity.	<b>Differentiate</b> LOT and HOT	<b>Integrate</b> compliance with regulations.	<b>Assess</b> the project work
<b>Evaluate</b>	<b>Select</b> the appropriate tool	<b>Determine</b> relevance of results.	<b>Judge</b> efficiency of sampling techniques.	<b>Reflect</b> on one's progress.
<b>Create</b>	<b>Generate</b> a log of daily activities.	<b>Assemble</b> a team of experts.	<b>Design</b> efficient project workflow.	<b>Create</b> a learning portfolio.

## OBE Framework for Department



POs in OBE Process Cycle



POs in OBE Process Cycle

## Steps for Outcomes Assessment

### Step 1: Define the mission of your department or program

### Step 2: Identify the most important outcomes of the department or program.

Learning outcomes are the knowledge, skills, values, and attitudes that students gain from a learning experience.

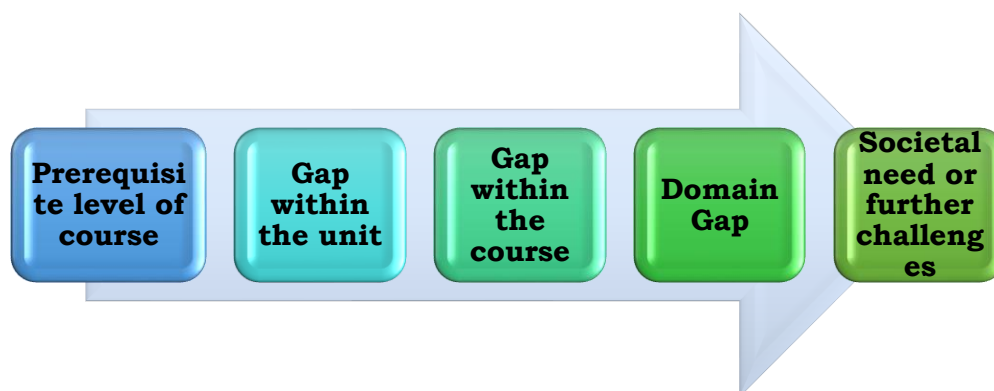
- What should students know and be able to do when they have finished their particular program?
- What knowledge, skills, or attitudes distinguish graduates from your program from other students?
- How do these outcomes tie in with the university's mission and educational goals?

### Step 3: Ensure that students have adequate opportunities to achieve these outcomes.

Map outcomes with the curriculum. Identify curriculum gap and measures to bridge the gap.

#### I. Bridge the Knowledge Gap

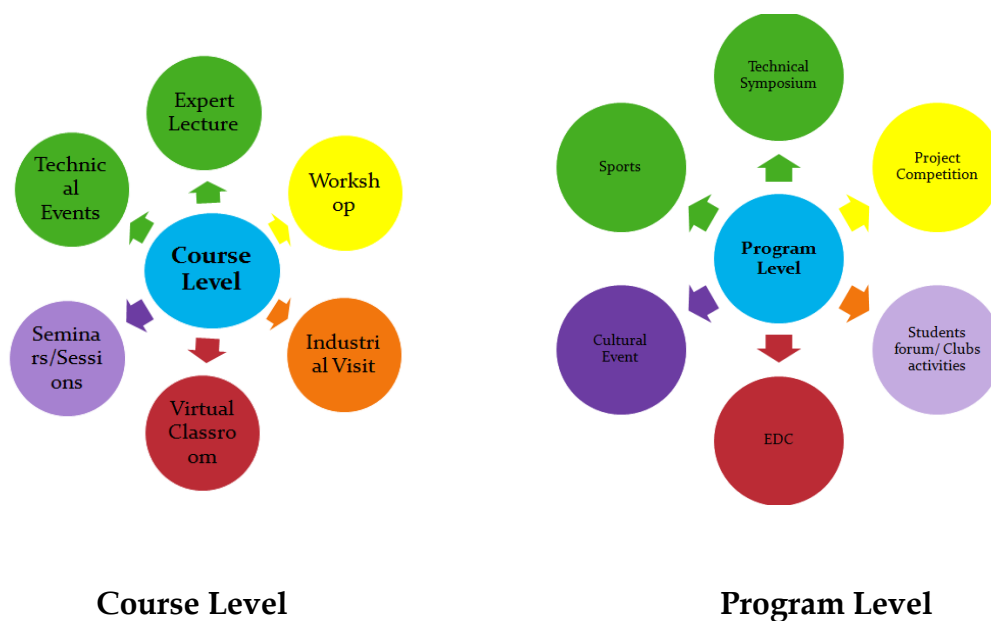
The knowledge gap is identified by Focus Group and addressed at five levels throughout the course as shown in following Figure



- a) **Prerequisite level of course** - This is the fundamental knowledge required before the commencement of the course. The first lecture is the overview of the course contents and focuses on the pre-requisite to understand the subsequent concepts.

- b) **Gap within the unit** – This is the knowledge required for understanding the unit. The faculty member provides additional knowledge (if required) for thorough understanding of the concepts through online course and reference materials. Innovative teaching practices like quizzes and role play are conducted.
- c) **Gap within the course** – This is the knowledge required for transition from one unit to other. Variety of topics is covered under a single course. So, additional knowledge is imparted for linking of units.
- d) **Domain Gap** – It bridges the gap between courses and engineering practices/ processes which is not addressed in the syllabus. The department conducts various expert lectures, session, workshops through experts from academics as well as industry to bridge the gap. Expert sessions are organized on various topics covering inventions, innovations and research articles.
- e) **Societal need or further challenges** – The social needs, environmental concerns for sustainable solution, recent trends in tools and technologies is addressed. Social/field visits/ Guest Lectures are conducted to create awareness about upcoming challenges in the field and sensitizing them about the social needs.

Apart from addressing the gaps in curriculum, additional activities are conducted at course level and program level to address program outcomes.



The Department has initiated the following measures to bridge the identified curricular gaps.



- **Guest lecturers:** Experts from industry and academia are invited to deliver lectures on the latest trends and thrust areas in Civil Engineering.
- **Technical talk:** Students are kept updated about the advances in technologies through technical seminars.
- **Workshops & Training Programs:** The Department has introduced a novel initiative for students, wherein they are encouraged to participate in hands-on workshops, and project training programs, thereby enhancing their application skills.
- **Soft Skill Training:** The department emphasizes personality development through soft skills training programs to improve the employability of students.
- **Industrial visits:** Visits to industries of repute are organized every year to keep the students abreast with applications of Civil Engineering.
- **Internships:** Students are encouraged to take up short-term internships in industries and recognized R&D centers to understand industry practices.
- **Mini Projects:**

Students can obtain practical experience by completing mini-projects. It is a group activity in which a group of students works on a specific problem statement in the engineering domain to gain problem-solving experience using the information and resources available and under the guidance of a course coordinator.

- **Technical Competitions & Conferences:**

Various competitions and technical events, such as project competitions, quizzes, coding competitions, and international conferences, are organized by the department.

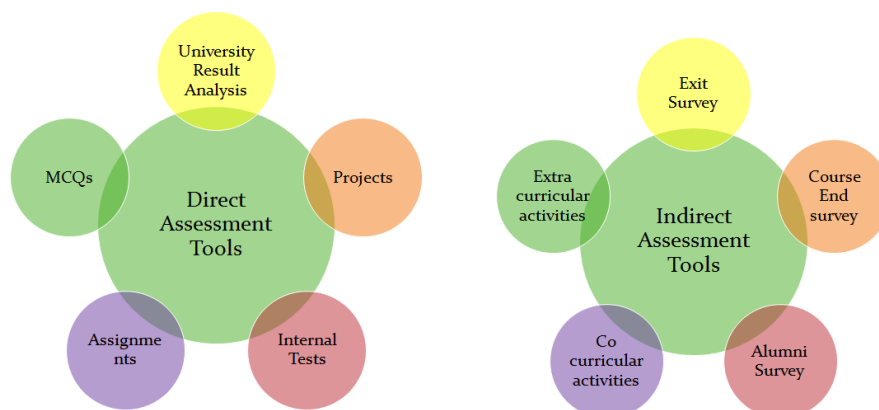
- **Extra Classes to bridge course Gap/Topic Gap:**

Extra lectures are conducted by faculty members to bridge the course and topic gaps, and to ensure that the curricula are covered by the POs.

**Step 4: Define assessment procedure towards these outcomes.** Assessment is done by direct and indirect means.

**Direct methods** of evaluating student learning provide tangible evidence that a student has acquired a skill, demonstrates a quality, understands a concept, or holds a value tied to a specific outcome.

**Indirect methods** provide more intangible evidence, demonstrating characteristics associated with learning but only implying that learning has occurred.



**Step 5: Develop the assessment plan.**

**Step 6: Carry out the assessment**

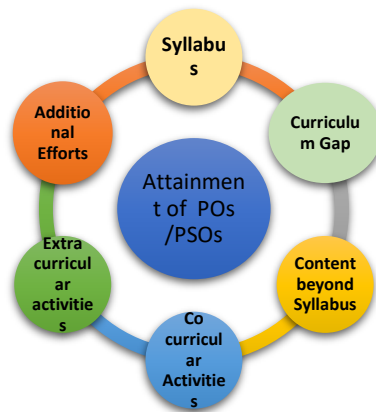
Direct assessment is undertaken by conducting Midterm test (covering 3 COs), End term test (covering 3 COs), two assignments (covering 3 COs each) and MCQ on every CO. Indirect assessment is carried out by conducting course end survey, lab end survey, exit survey, employers survey, co curricular activities, extracurricular activities etc.

**Step 7: Collect, analyze, communicate, and report on your findings.**

After assessment information is collected, the results need to be analyzed and communicated in useful ways to the faculty, who can consider changes to teaching methods, the curriculum, resource availability and scheduling, course content, and other factors. At the end of the year, faculty members should complete an assessment report, similar in format to the plan, stating each course's learning outcomes, assessment tools used, results of the assessment, and how the results were used to make changes to help students and improve learning

**Step 8: Take action based on those findings**

Assessment results are meant to be used: to improve teaching and inform decision-making and resource allocation.



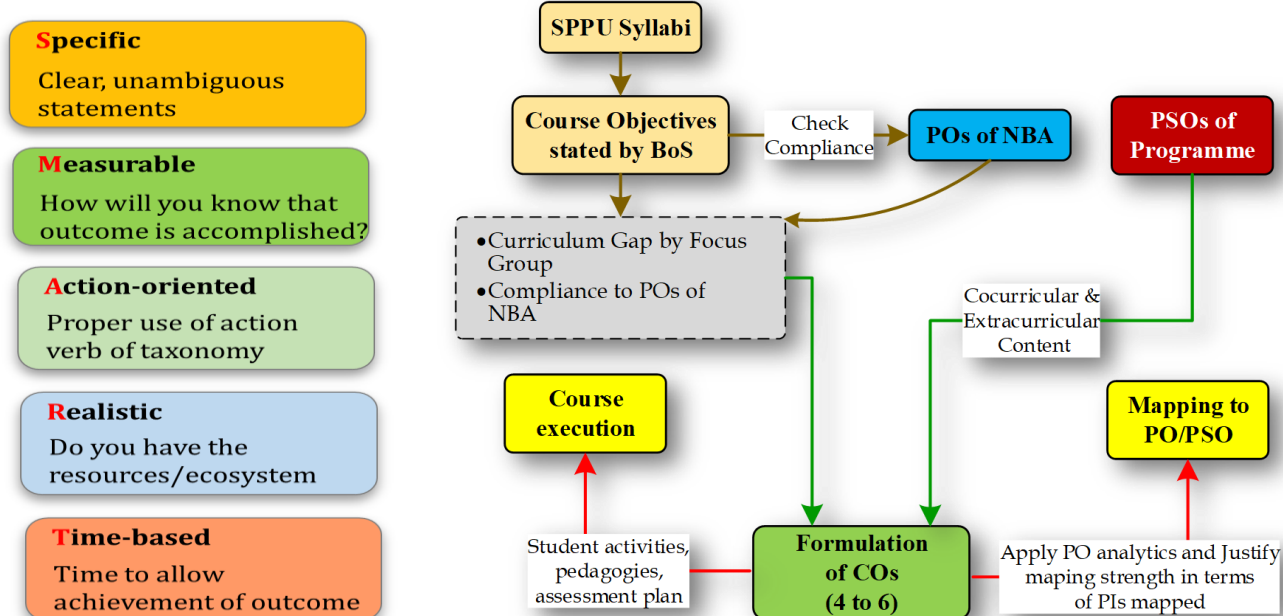
### Course Outcomes

“Statements of observable student actions that serve as evidence of the Knowledge, Skills and Attitudes acquired in a course”. Each course is designed to meet (about 6). The Course Outcomes are stated in such a way that they can be actually measured. They are framed considering the BLOOM’s Taxonomy and covering course objectives. POs are attained through program specific Core Courses. Course Outcome statement may be broken down into two main components: Action Words and Learning statement.

- **Action Word:** An action word that identifies the performance to be demonstrated; It represents a cognitive/ affective/ psychomotor activity the learner should perform. An action is indicated by an action verb, occasionally two, representing the concerned cognitive process(es).
- **Cognitive Process (Action Verb):** Remember, Understand, Apply, Analyze, Evaluate, Create
- **Knowledge:** Represents the specific knowledge from any one or more of the eight knowledge categories viz Factual, Conceptual, Procedural, Metacognitive, Fundamental Design Principles, Criteria & Specifications, Practical Constraints, Design instrumentalities

- **Condition:** Represents the process the learner is expected to follow or the condition under which to perform the action (This is an optional element of CO)
- **Criteria:** Represent the parameters that characterize the acceptability levels of performing the action (This is an optional element of CO)
- **Learning statement :** Learning statement that specifies what learning will be demonstrated in the performance;

**Note:** If Laboratory is given as separate course (with course code) then there should be separate course outcomes for Laboratory.



## CO-PO Relationship

Each CO can be identified to address a subset of POs. Based on the number of COs and the sessions dedicated to them it is possible to identify the strength of mapping (1, 2 or 3) to POs. Based on these strengths of selected POs a CO matrix can be established. The mapping is a matrix with rows as COs and columns as POs. Each element/cell of the matrix has a value in {--, 1, 2, 3}. The meaning associated with the values are as follows:

-- this CO (row) has nil/very small/insignificant contribution to the PO(column)

1 → relevant and small significance

2 → medium or moderate and

3 → strong

These values have to be justified in the T-L-A of the course, particularly in terms of the BLOOM Level of the questions/Problems

### **Two-step Process for Bringing Clarity to POs**

- Real observability and measurability of the POs at course level is very difficult. To connect high-level learning outcomes (POs) with course content, course outcomes and assessment, there is a necessity to bring further clarity and specificity to the program outcomes.

### **Competencies and Performance Indicators (PI).**

1. **Identify Competencies to be attained:** For each PO define competencies – different abilities implied by program outcome statement that would generally require different assessment measures.
2. **Define Performance Indicators:** For each of the competencies identified, define performance Indicators (PIs) that are explicit statements of expectations of the student learning. They can act as measuring tools in assessment to understand the extent of attainment of outcomes. They can also be designed to determine the appropriate achievement level or competency of each indicator so that instructors can target and students can achieve the acceptable level of proficiency.

## Competencies and Performance Indicators (PIs)

### Civil Engineering Programs

<b>PO 1: Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialisation for the solution of complex engineering problems.			
	<b>Competency</b>		<b>Indicators</b>
1.2	Demonstrate competence in mathematical Modelling	1.2.1	Apply the knowledge of discrete structures, linear algebra, statistics and numerical techniques to solve problems
		1.2.2	Apply the concepts of probability, statistics and queuing theory in modelling of civil-based projects.
1.5	Demonstrate competence in basic sciences	1.5.1	Apply laws of natural science to an engineering problem
1.6	Demonstrate competence in engineering fundamentals	1.6.1	Apply engineering fundamentals
1.7	Demonstrate competence in specialized engineering knowledge to the program	1.7.1	Apply theory and principles of the Civil engineering domain to solve an engineering problem.
<b>PO 2: Problem analysis:</b> Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.			
	<b>Competency</b>		<b>Indicators</b>
2.1	Demonstrate an ability to identify and formulate complex engineering		Evaluate problem statements and identifies objectives
			Identify processes /modules of Civil

	problem		based system and parameters to solve a problem
			Identify mathematical algorithmic knowledge that applies to a given problem
2.2	Demonstrate an ability to formulate a solution plan and methodology for an engineering problem		Reframe the civil-based system into interconnected subsystems
			Identify functionalities and computing resources.
			Identify existing solution/methods to solve the problem, including forming justified approximations and assumptions
			Compare and contrast alternative solution/methods to select the best methods
			Compare and contrast alternative solution processes to select the best process.
2.3	Demonstrate an ability to formulate and interpret a model		Able to apply civil engineering principles to formulate modules of a system with required applicability and performance.
			Identify design constraints for required performance criteria.
2.4	Demonstrate an ability to execute a solution process and analyze results		<ul style="list-style-type: none"> <li>• Applies engineering mathematics to implement the solution.</li> <li>• Analyze and interpret the results</li> </ul>



			<p>using contemporary tools.</p> <ul style="list-style-type: none"> <li>• Identify the limitations of the solution and sources/causes.</li> <li>• Arrive at conclusions with respect to the objectives</li> </ul>
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- The assessment of COs for all the courses is designed by connecting assessment questions (used in various assessment tools) to the PIs. By following this process, where examination questions map with PIs, we get clarity and better resolution for the assessment of COs and POs.

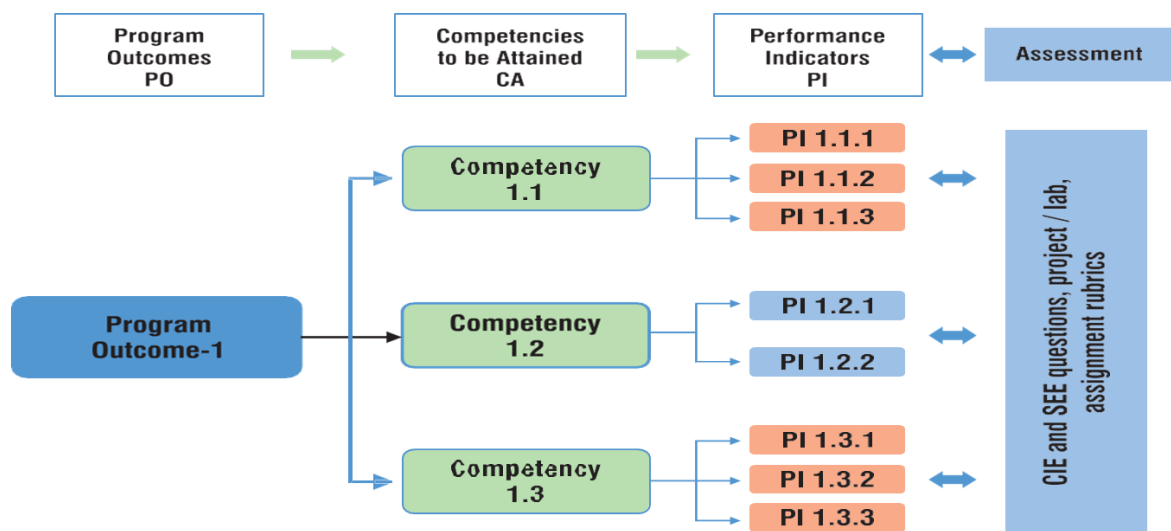


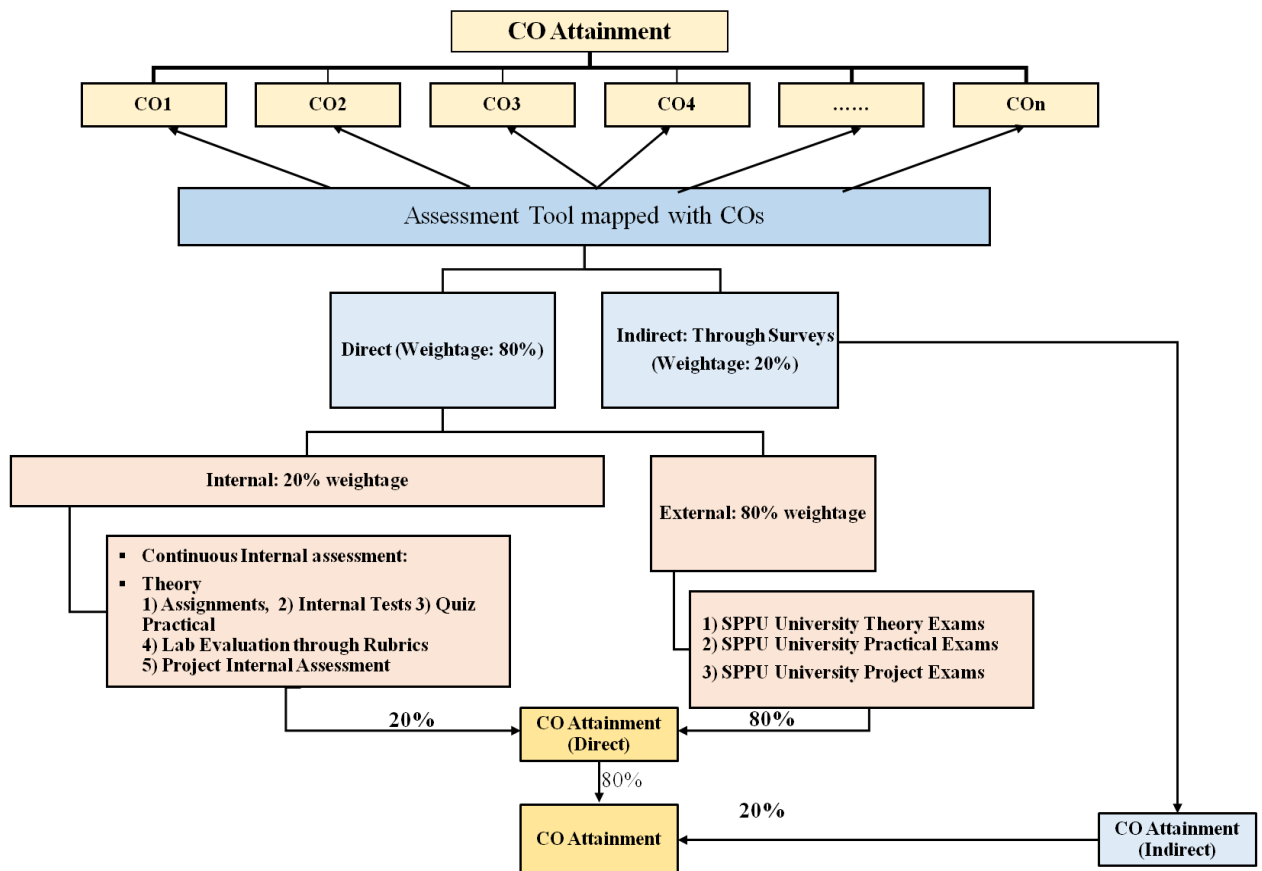
Figure: Assessment of attainment of Outcomes

## Assessment Tools for COs

Direct and indirect tools measure the attainment of the COs. The process for Course outcome attainment is articulated in figure 3.2.1.

**Direct Method:** Direct attainment displays the student's knowledge and skills from their performance. It can be determined from the students' performance in all the relevant assessment tools – like internal assessments, assignments, quizzes,

and university examinations. These methods provide a sampling of what students know and/or can do and provide strong evidence of student learning.



### List of Assessment Tools

#### Sample CO Assessment Tools

- Mid Term Test
- End Term Test
- Quiz
- Assignment
- Practical/ Lab work
- Industrial Visit, Workshop
- Other Task/ Activity

- University Exam
- Oral/POE
- Course Exit Survey
- External Feedback (External Examiner/Trainer, Campus Placement Technical Expert, Parent Feedback, Exit Feedback, Faculty feedback, Employer and Industry Feedback)

Direct TOOLS: (Measurable in terms of marks and w.r.t. CO) Assessment done by faculty at Institute level

Indirect TOOLS: (Non measurable in terms of marks and w.r.t. CO) Assessment done at University Level

### Direct Assessment Tools

- **Internal Tests:** The theory exams are conducted twice in a semester, one at mid-term and the second at end-term. The questions of the test paper are mapped with CO and Blooms Level. The CO-wise obtained question marks are collected for each student and processed to get the attainment of CO.

Q.No	Questions	Marks	CO	BL	PO												
1(a)	The noise levels at a particular location are 65dB, 70dB and 78dB measured during an hour of the day. Find out the average noise levels at the location	04	CO1	L3	1.2.4												
1(b)	Describe with sketches, how different atmospheric conditions give rise to various kinds of plume	06	CO1	L2	1.2.4												
2(a)	What is Design period & what are the factors affecting it?	04	CO2	L2	1.3.5												
2(b)	Estimate the water demand for a city with per capita demand 200lpcd by 2031 with the following data, Use incremental increase method.	06	CO2	L3	1.3.5												
	<table border="1"> <thead> <tr> <th>Year</th> <th>1971</th> <th>1981</th> <th>1991</th> <th>2001</th> <th>2011</th> </tr> </thead> <tbody> <tr> <td>Population in</td> <td>125</td> <td>158</td> <td>192</td> <td>240</td> <td>290</td> </tr> </tbody> </table>	Year	1971	1981	1991	2001	2011	Population in	125	158	192	240	290				
Year	1971	1981	1991	2001	2011												
Population in	125	158	192	240	290												

	thousands									
--	-----------	--	--	--	--	--	--	--	--	--

• **Quiz /Online Exam:** The MCQ type online internal test and its mapping with CO are conducted during the semester. The CO-wise obtained question marks are collected for each student and processed to get the attainment of CO.

• **Assignment:** Two assignments per course are given and their mapping with CO and Blooms Level. The CO-wise obtained question marks are collected for each student and processed to get the attainment of CO.

### Sample of Assignment

#### Assignment No: 1

Maximum marks for Assignment: 30

Assignment Declaration Date:10/8/2020

Assignment Submission Date (on or before):10/8/2020

Que. No.	Question Statement	Level of mapping and Number			Blooms Level	Marks
		CO	PO	PSO		
1	Discuss the different systems of sewerage commonly used in India with their relative merits and demerits.	1	3 & 7	3	2	3
2	Write a short note on pumping of sewage.	1	3 & 7	3	2	3
3	Calculate the velocity of flow and corresponding discharge in a sewer of circular section having diameter equal to 1m, laid at a gradient of 1 in 500. The sewer runs at 0.6 depth. Use Manning's formula taking $N=0.012$	1	3 & 7	3	3	3
4	Design a sanitary sewer for the following data: i) Population = 100000 persons ii) Rate of water supply = 200 l/c/d iii) $N=0.013$ iv) Peak factor = 3 v) Slope = 1 in 700	1	3 & 7	3	6	3

• **University Exam:** The SPPU conducts two theory exams in the semester and end-semester. University also conducts practical, oral, project, seminar, and term work examinations. As the university does not provide the question-wise marks obtained by students, the total marks obtained are analyzed to get course attainment.

• **Project Work:** The attainment of COs through project work is done at two levels. The internal assessment is done through a rubric. The project

assessment and review details are mentioned in criteria 2.2.3 C. At the end of the course, the external evaluator assesses the project work and assigns the mark. CO attainment is calculated based on the rubric and marks obtained in the final examination.

**Lab Rubric:** The continuous assessment of lab practical is carried out using lab rubric after every lab assignment is conducted. The CO-wise obtained question marks are collected for each student and processed to get the attainment of CO.

**Indirect Method:** Indirect methods such as surveys and interviews ask the stakeholders to reflect on students' learning. They assess opinions or thoughts about the graduate's knowledge or skills. Indirect measures can provide information about graduates' perception of their learning and how different stakeholders value this learning.

#### Indirect Assessment Tools

- **Course end survey/Lab end survey:** The objectives and outcomes are defined for a course by the course coordinator. At the end, of course, feedback is taken from students about course outcome attainment through scoring rubrics. The analysis of feedback determines the achievement of COs.

In attaining COs, 80% weightage is for external assessment and 20% for internal. The internal assessment method involves both direct (80%) and indirect (20%). Refer to figure 3.2.1.

#### A) List & assessment process

Table : List & Assessment process

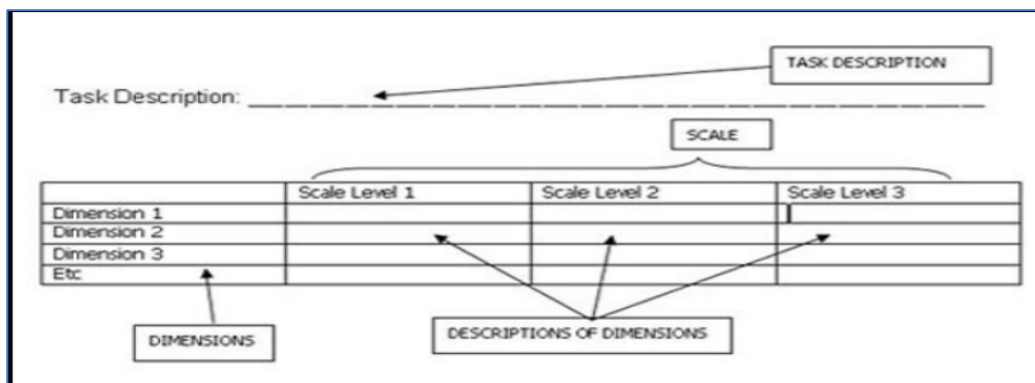
Type & Assessment	Assessment Tool	Frequency	Data Collected
Direct (Internal)	Test	Twice in semester	Marks obtained against maximum allocated for a CO.
	MCQ	After every	Marks obtained against maximum

		unit	allocated for a CO.
	Assignment	Twice a semester	Marks obtained against maximum allocated for a CO.
	Lab Experiment	For each exp. Performed	Analytical Rubric score of students against mapped CO
	Projects Rubrics	2 reviews/ semester.	Students will be divided into groups; wherein each group will have a maximum of 5 students. A faculty will mentor every group.
Direct (External )	University Exam	As per the course Structure Provided by BoS	Marks Obtained against maximum allotted for a course
Indirect (Internal )	Course end/Lab end Survey	At the end of each semester	Self-assessment rubric score mapped to each CO.
	Student Activity (Visit/mini.Proj.)	As per the Curriculum Requirement	Rubric score / Report assessment of a Student against mapped CO
	Seminar	At the end of each semester	Self-assessment rubric score mapped to each CO.

### Use of Rubrics

- Components of Rubrics: Task, Scale, Dimension(knowledge/skills), Description
- Rubrics Can be used to grade essays, research reports, portfolios, works of art, recitals, oral presentations, performances and group activities •

- Can be used to provide formative feedback to students, to grade students, and to assess programs
- Encourages critical thinking, communication,
- Used to examine how well students have met CO or PO rather than how well they perform compared to their peers.
- Typically include measurable descriptors that define expectations at each level of performance for each criterion.



### Open-Book Examinations

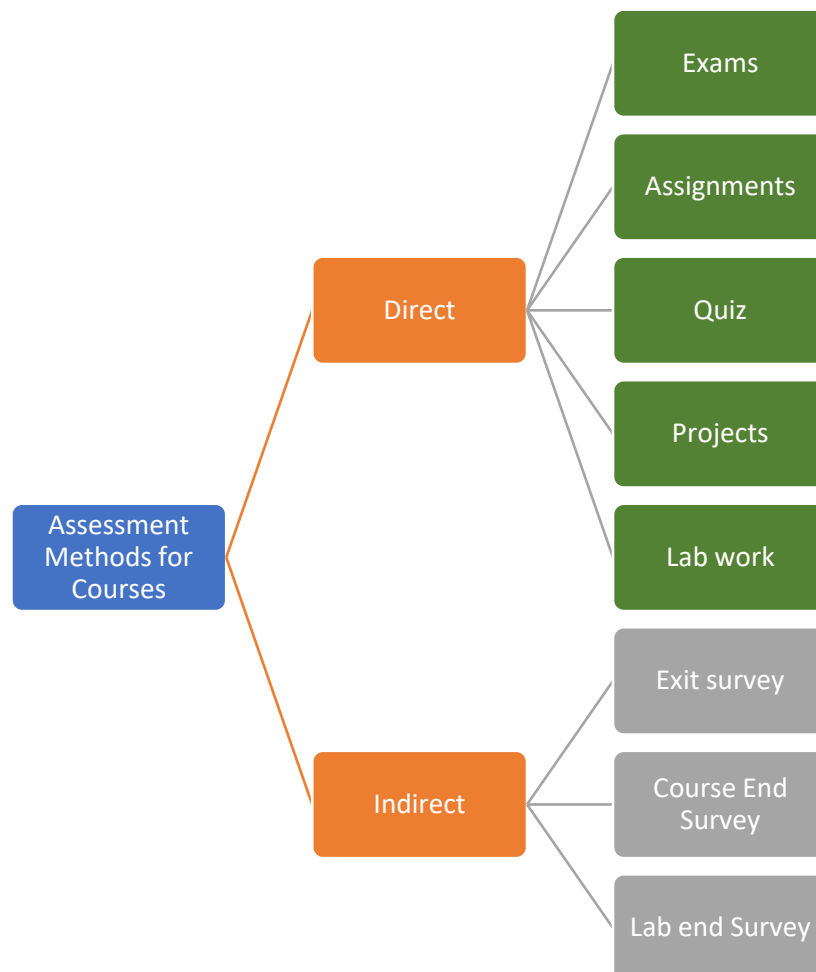
- Advantages
  - Less demanding on memory and hence less stressful
  - Emphasise more on problem-solving, application of knowledge and higher-order thinking.
  - Assessment questions can reflect real-life situations that require comprehension, information retrieval and synthesising skills of the students to solve.
- Designing a good open-book examination
  - Set questions that require students to do things with the information available to them, rather than to merely locate the correct information and then summarize or rewrite it. •



- More weightage to the application of knowledge, critical thinking and use of resources for solving real complex engineering problems.
- Provide enough time.
- Set less number of questions that encompass 2 or 3 concepts taught or allocate longer duration of time for the examinations.

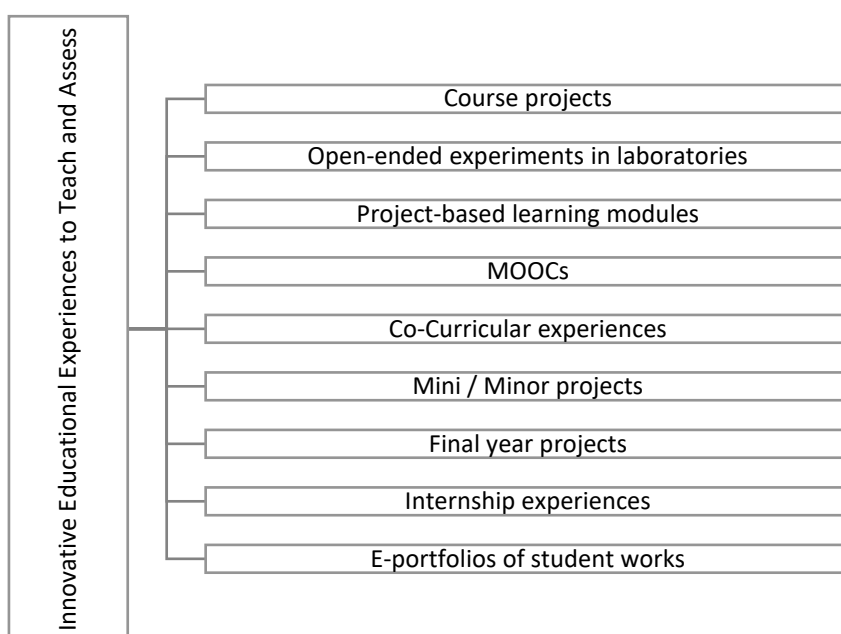
### Activity BASED LEARNING

MOOC, Flipped Classroom, Think Pair Share, Think Pair Solo, Four Corners, Round Robin, Collaborative Learning, Jig-Saw Puzzle, Matrix Method, Peer Learning, Work-Based Learning, Problem-Based Learning, Personalized Learning, Group Discussion, Debate, Case Studies, Fish Bowl, Reciprocal Teaching, etc.



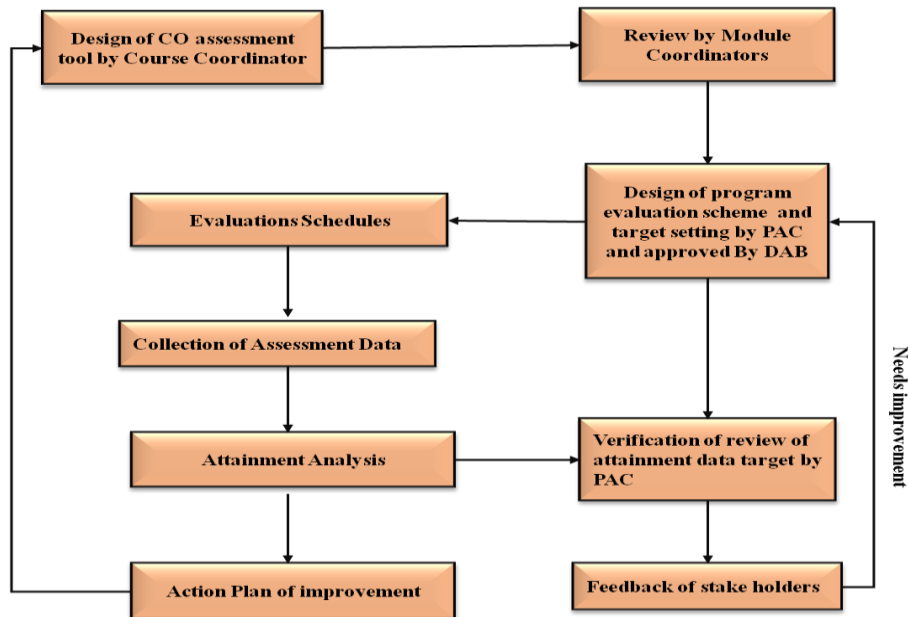
PO/Course Assessment Tool Types	PO/ Course Assessment Tool	1	2	3	4	5	6	7	8	9	10	11	12
Direct Tools	Tests	√	√	√	√								
	Assignments	√	√	√	√		√		√			√	√
	Lab/Seminars/Industrial Training/ Projects (Rubrics)	√	√	√	√	√		√	√	√	√	√	√
Indirect Tools	Course End Survey	√	√	√	√	√	√	√	√	√	√	√	√
	Exit Survey	√	√	√	√	√	√	√	√	√	√	√	√
	Faculty Survey	√	√	√	√	√	√	√	√	√	√	√	√
	Alumni Survey		√			√					√		
	Programme Statistics	√	√					√		√		√	√

### Assessment for HOTS



## The quality /relevance of the assessment process

The Module Coordinator and Program Coordinator ensure the effectiveness of the CO assessment process. The general process practice observed is shown in 3.2.1(a).



**Figure: Quality of assessment process**

Based on the results achieved and stakeholders' feedback, the assessment process is reviewed and refined in DAB.

- Instructors propose the assessment tools and the target marks /levels as per Bloom's taxonomy, content & criteria mentioned in the course outcome
- The module co-coordinators review the course evaluation tools & targets set by the instructor and suggest changes if required.
- Program Assessment Committee (PAC) prepares the detailed evaluation plan of the program by setting the targets for CO/PO attainment and subsequent approval from Department Advisory Board (DAB). Table (b) describe the target set for a course (410242) as a sample attainment level for CO/PO/PSO.
- The Department's academic Calendar is prepared & published for information to stakeholders.
- As per the academic plan, the course instructor implements the assessment tools at their level and carries out data analysis to get the following details.
  1. No. of students achieving the set target.

2. Questions not attempted by the majority of students.
3. Attainment level achieved by students.

Attainment is calculated only for the intersection of CO-PO/PSO, mapped with level 1/2/3.

### **CO Attainment**

Attainment is calculated only for the intersection of CO-PO/PSO, mapped with level 1/2/3.

**Threshold:** The minimum percentage of marks that a student needs to obtain in the course is threshold. For example, the threshold for all the courses under the Civil Engineering program is 50% for internal assessment and taken as class average marks for the external evaluation.

**The target for CO attainment**, set at the start of the course, is the average of direct CO attainment of previous two academic years or assigned by the program committee.

### **Attainment Levels:**

**Attainment Level 1:** More than 50% but less than 70% students scoring more than 50% marks out of the relevant maximum marks.

**Attainment Level 2:** Equal to or more than 70% but less than 80% students scoring more than 50% marks out of the relevant maximum marks.

**Attainment Level 3:** More than 80% students scoring more than 50% marks out of the relevant maximum marks.

### **Process of Attainment of Course Outcomes (COs)**

1. Find total marks of CO through various assessment techniques like Question Papers, Assignments, MCQ tests etc.
2. Calculate 50% of total marks  
Eg. Consider total marks for CO1=10 marks  
Calculate 50% of total marks.  $CO1=10 \times 50 / 100 = 5$  marks

3. Calculate the total number of students scoring more than threshold value ie (50%)

Eg. No of students securing >5 marks= 95 students

4. Calculate percentage of students securing more than threshold value(50%)

Eg. Out of total strength calculate number of students securing more than 5 marks =95

Assume total strength of class 134. Then  $95/134 * 100 = 71\%$

5. Identify Attainment Level .

a. Attainment Level 1: 50 to 70% →1

b. Attainment Level 2: 70 to 80% →2

c. More than 80% →3

Eg. As attainment is 71% attainment level is 2

Course Outcomes	CO1
Total Marks of CO	10
50% of CO marks	05
No of students scored more than target value ie (50%)	95
Total Students in class	134
% of students securing more than threshold value(50)	71%
Attainment Level (50 to 70%) :1	2
Attainment Level (70% to 80% ) :2	
Attainment Level (more than 80%) :3	
% CO Attainment	71

### Measuring Course Outcomes attained through University Examinations

As university does not provide useful indicators, threshold is stated in terms of percentage of students getting more than the class average marks. University Examination consists of In-semester Exam and End Semester Exam for third year and final year and Online exam and End Semester Exam for second year.

### Step to be followed:

- Total Number of students appeared. Eg. 134 students
- Total university marks include In-semester Exam and End Semester Exam for third year and final year and Online exam for second year. Calculate average marks scored in university examination for a course. Eg. 62.9
- Find the number of students securing more than average marks.  
Assume 92 students scored more than average marks.
- Calculate the percentage of students securing more than average marks(62.9) :  
 $= 92/134*100 = 68\%$
- Identify Attainment Level
  - Attainment Level 1: 50 to 70% →1
  - Attainment Level 2: 70 to 80% →2
  - More than 80% →3

Eg. Percentage attained is 68% so attainment level is 1

### Overall Course Outcome Attainment:

- Calculate attainment through Internal assessment and University Examinations  
Assume CO1 attainment as follows:  
Attainment through University Examination: 68% = Substantial i.e. 2  
Attainment through Internal Assessment: 71% = Moderate i.e. 3
- Take average attainment = (80% of University level) + (20% of Internal level) i.e.  $0.80 * 68 + 0.2 * 71 = 68.6\%$   
So final Direct attainment of CO1 is 68.6%.
- Calculate Indirect CO attainment by internal tool "Course End Survey".

JSPM's								
Rajarshi Shahu College of Engineering Tathawde,Pune,411033.								
Department of Civil Engineering								
Academic Year:2019-20 Semester - VI								
CO Attainment								
Class: TE Subject: Environmental Engineering _ I Subject Teacher: Mrs. B V Mahajan								
Attainment of Course Outcome through Course End Survey								
Note - Attainment of COs through Course end survey shall be self-assessment of achievement of COs. Each student will grade four levels in self-assessment.								
(Level 1: Not competent, 2: Somewhat competent, 3:Competent, 4: Excellent).								
Sr.No.	Roll No.	Name of student	Attainment Level					
			CO1	CO2	CO3	CO4	CO5	CO6
118	35256	THORAT RUTUJA PRAMOD	4	3	3	3	3	3
119	35257	UMBARE PRASAD BASVESHWAR	4	3	3	4	3	4
120	35258	WAGHOLE HEMANT VIJAY	4	3	3	4	3	2
121	35259	WAGHARE ANIKET TANAJI	4	3	3	4	3	3
122	35260	WALKOLI SNEHA VIJAY	4	3	3	3	3	4
123	35261	WANI GANESH KAMALAKAR	3	4	3	3	3	3
124	35262	PATIL KHUSBU SUBHASH	3	4	3	3	3	3
125	35263	BAWANE ASHLESHA PRAKASHROA	3	4	4	3	4	3
126	35264	NAGARGOJE PRATIBHA GANGADHAR	3	3	4	3	4	3
127	35265	EKLARE VITHAL DNYANESHWAR	3	3	4	3	4	4
128	35266	ANTRE SHUBHAM	3	3	3	3	3	4
129	35267	GORNE TANUJ S.	3	3	3	4	3	4
130	35268	SHELKE MANTHAN	4	3	3	4	3	4
131	35269	KEWAL SINGH	4	3	3	4	3	4
132	35270	KARANDE VIRAJ	4	3	3	3	3	4
Total appeared students (B)			132	132	132	132	132	132
No. of Students getting L3 & L4 (A)			123	123	123	125	122	123
AL = % age No. of students achieving target								
AL 1: 50 – 70 %			3	3	3	3	3	3
AL 2: 70 – 80%								
AL 3: 80 – 90%								

4. Overall CO Attainment of Course is calculated as follows;

$$\text{Overall CO Attainment} = (0.8 \times \text{Direct Assessment}) + (0.2 \times \text{Indirect Assessment})$$

Eg. % CO Attainment through Indirect Tool (Course End Survey) for CO1 = 93%

$$\text{Overall CO Attainment for CO1} = (0.8 \times 68.6) + (0.2 \times 93) = 73.48\%$$

CO <sub>n</sub>	Direct Attainment	Indirect Attainment	Overall CO Attainment	AL
CO1	68.6	93	73.48	2
CO2	59	93	66	1
CO3	61	93	68	1
CO4	62	95	68	1
CO5	62	92	68	1
CO6	62	93	68	1

### Action Plan for Course

At the end of semester, course coordinator analyses the final attainment and make suggestions regarding improvement.

CO	Target	Attainment	Target fulfilment Status	Remark
1	61	59	No	More practise needed on Noise level numerical
2	61	59	No	More practise needed on population forecasting numerical
3	61	61	Yes	....
4	61	62	Yes	....
5	61	62	Yes	....
6	61	62	Yes	....

**CO Attainment Target Suggested for TE 20-21 - 63%**

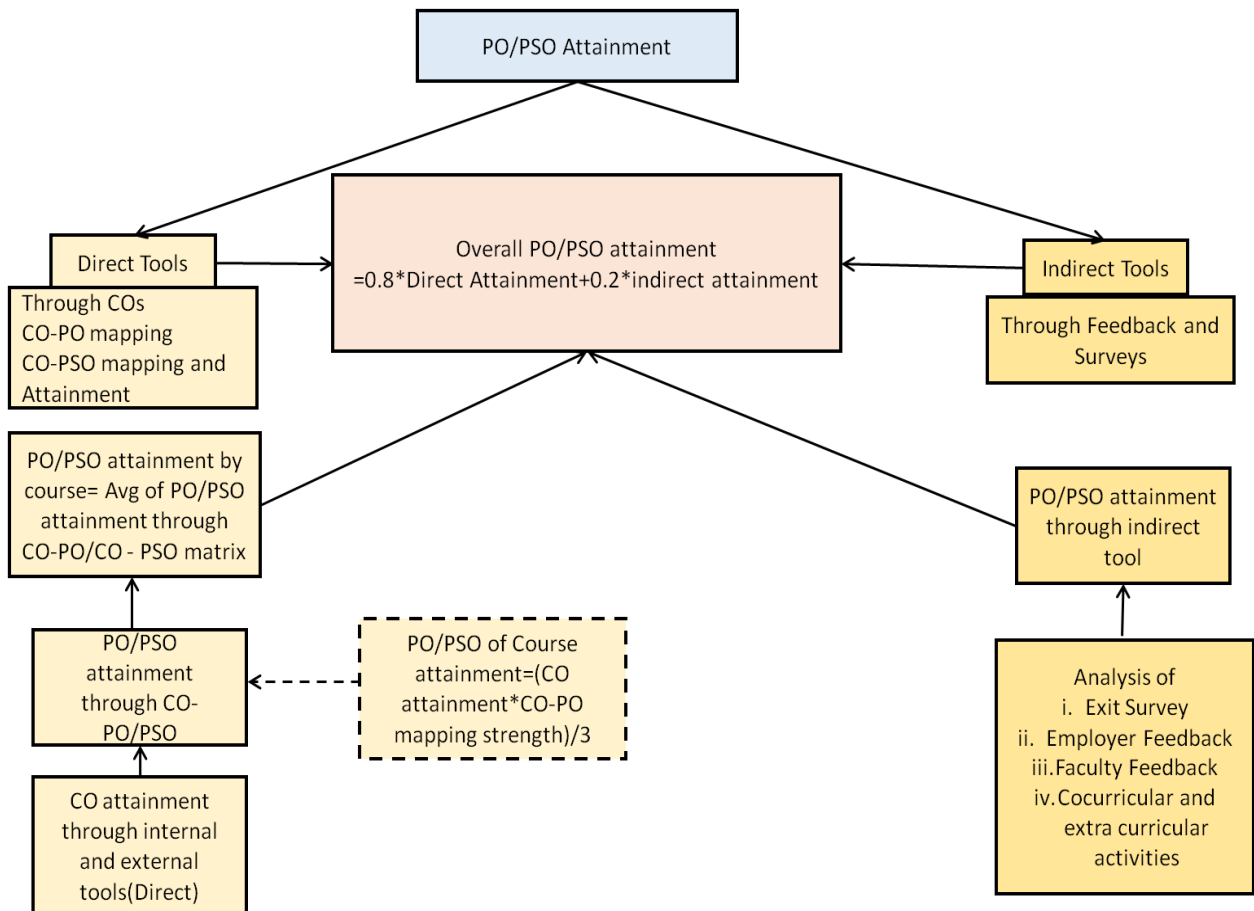
### PO Assessment Tools

Sample Indirect PO Assessment Tools

- Program Exit Survey
- Alumni Survey
- Employer Survey of Alumni

- Parent Feedback

The data collection processes for attaining the POs are based on direct and indirect tools. The attainment of the COs is linked to the attainment of the POs (Program Outcome). **Table 1** shows the linkage from COs to the POs.



**a) Direct methods:**

The performance of the students in internal assessments and university exams will lead to the attainment of Course Outcomes'. The direct tools employed are MCQ, Test, assignment, Quiz, lab, and project rubrics.

The attainment of each PO is calculated through the CO-PO mapping matrix and based on the level of CO attainment.

$$\text{PO/PSO attainment} = (\% \text{CO attainment level} / 100) * \text{CO-PO/PSO mapping level}$$

**b) Indirect methods**



Indirect methods involve feedback and surveys from stakeholders to get the perception level of learning. The opinion is sought in Richter scale rating from 1,2,3, for the questions based on performance indicators/POs/PSOs

- **Exit Survey**

The Exit survey is conducted on completion of the last semester of the program by Guardian Faculty Member (GFM). The rubric is formulated for the attainment of each PO. The questionnaire is set for self-assessment of the level to which each PO is achieved. The questions will be rated by the outgoing batch in the range of 3, 2, and 1, and the exit survey attainment will be calculated accordingly.

- **Employer Survey**

The employer feedback is sought from the industry representative associated with T&P. The rubric is formulated for the attainment of each PO however, the questionnaire involves the competency indicators of a graduate.

- **Faculty Feedback.**

The faculty gives feedback on the outgoing batch based on the students' performance during the four-year program. The rubric is formulated for the attainment of each PO. The questionnaire is set for self-assessment of the level to which each PO is achieved.

- **Co-Curricular activity**

At the end of each even semester, students give feedback on the learning and participation experience in various co and extra-curricular activities conducted during the semester at the course as well as program level.

### **List of assessment tools and frequency**

Broadly the data collection to measure attainment of PO and PSOs is done through a direct and indirect method. The list of the assessment tool is stated in table 3.3.1(a)

**Table 3.3.1(a) Data collection for each PO/PSO attainment**

<b>Tool</b>	<b>Frequency</b>	<b>Type</b>	<b>PO/PSO</b>	<b>Data Collected</b>
Test(Internal)	2	Direct	PO 1-5 PSO - 1,2,3	Actual
Assignment(Internal)	6	Direct	PO 1-5 PSO - 1,2,3	CO attainment based on % the age of students scoring the set target
Lab Assessment (Internal)	For every lab	Direct	PO 4-10 PSO - 1,2,3	
Project Assessment (Internal)	2	Direct	PO 2-12 PSO - 1,2,3	
Student Activity (Internal) (visits/CBS/mini project/case studies/scenario assignment/group presentations/extracurricular activities)	On need basis	Direct	PO2-12 PSO 1,2	
SPPU Exam (External)	1	Direct	PO 1-5, PSO 1-3	
Exit Summary	At the exit of the program	Indirect	All PO/PSO	Indirect Attainment level of each PO/PSO based on survey/feedback analysis
Employer	1	Indirect	Relevant PO/PSO	

The UG program of the department is affiliated with SPPU and follows the courses as defined by BOS. The curriculum is enriched by incorporating curriculum gaps and content beyond the syllabus. As per the guidelines of NBA (Tier II institutes), 80% weightage is given to direct measurement and 20% to indirect measurement, as shown in fig. 3.3.1(a)

The direct attainment is calculated through the CO-OP/PSO co-relation matrix and based on actual attainment of COs, while indirect attainment is obtained through exit survey, faculty feedback, and students' activity.

The curricular and extra-curricular activities are mapped to POs/PSOs, and data is recorded in the form of feedback from participating students. Hence these tools are considered indirect tools.

PAC verifies the attainment data & reviews of target achievement.

The program level report is prepared. The assessment results are published.

### List of assessment tools and frequency

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Lab Assessment (Internal)	For every lab	Direct	PO 4-10 PSO 1	
Project Assessment (Internal)	2	Direct	PO 2-12 PSO - 1,2,3	
Student Activity (Internal) (visits/CBS/mini project/case studies/scenario assignment/ group presentations/extracurricular activities)	On need basis	Direct	PO2-12 PSO 1,2	
SPPU Exam (External)	1	Direct	PO 1-5, PSO 1-3	
Exit Summary	At the exit of the program	Indirect	All PO/PSO	Indirect Attainment level of each PO/PSO based on survey/feedback analysis
Employer	1	Indirect	Relevant PO/PSO	

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PAC verifies the attainment data & reviews of target achievement.

The program level report is prepared. The assessment results are published.

### The Quality/relevance of assessment tool/process used

The POs stated by NBA generally has three learning domain is knowledge, skill, and attitude. Further, the skill domain is subdivided into problem-solving skills and supporting other skills. Based on the learning domain and associated POs the proper tool is employed to map and collect the data.

**Table 3.3.1(b): Relevance of assessment tool.**

Learning domain	POs	Tool	Data collection theme
Knowledge	PO1	i)Test ii)SPPU exam	Each question is mapped with CO PO BL and analysis of marks obtained set target
Problem-solving skill	PO 2 3 4 5	i)assignment ii)mini/ major project iii) Lab assessment iv)Co-curricular activities	A rubric is designed with performance indicators and analysis of rubric score obtained against the set target
Supporting Skill	PO 9 10 11	i)lab assessment ii)Project iii) Co-curricular activities ( Project Competitions, Technical Competitions, etc)	A rubric is designed with performance indicators and analysis of rubric score obtained against the set target
Attitude	PO 6 7 8 12	i)lab assessment ii)Project iii) Co-curricular activities(NSS, Road safety etc)	A rubric is designed with performance indicators and analysis of rubric score obtained against the set target

### PO Attainment

The PO/PSO attainment threshold is set considering the number of courses mapping PO/PSO and average mapping percentage. The attainment levels are increased if the said PO/PSO is attained for three years.

PO/PSO attainment = CO attainment percentage \* (CO-PO/PSO mapping level / 100)

Like-wise Direct PO attainment for all courses is calculated.

**Direct attainment** = {(Sum of various attainment levels obtained from courses which mapped with particular PO) / (Total number of courses which mapped with particular PO)}

Attainment level will be the summation of levels divided by the number of courses.

### Indirect Assessment

Surveys, analysis, customized to an average value as per levels 1, 2 & 3.

### Total PO attainment

PO Attainment level will be 80% of direct assessment + 20% of indirect assessment

Similar calculations are done for PSO attainment. As decided in PAC, PSO attainment level has been calculated as 80% of direct attainment and 20% of indirect attainment.

### Rules for calculation PO/PSO (Direct Assessment through Course)

Calculate percentage attainment of CO.

Eg. CO1= 68.6%

Find percentage of students receiving more than 50% marks. Refer to step 4 of CO attainment. Calculate % Attainment for each CO.

Class	CO1	CO2	CO3	CO4	CO5	CO6
TE	68.6	66.38	68.20	68.62	67.89	68.21

### PO and PSO attainment per Course:

Sub code	CO	% CO attainment	PO1 mapping level	Calculated Value
311	CO1	69	2	1.38

Environmental Engineering-I	CO2	66	1	0.66
	CO3	68	2	1.36
	CO4	68	1	0.68
	CO5	68	2	1.36
	CO6	68	1	0.68
Average			1.5	1.02
Percentage Attainment			1.02/1.5*100 = 68%	
Attainment Level (50 to 70%) :1			1	
Attainment Level (70% to 80% ) :2				
Attainment Level (more than 80%) :3				

#### PSO attainment per Course

Sub code	CO	% CO attainment	PSO1 mapping level	PSO1 expected attainment level
311 Environmental Engineering-I	CO1	69		
	CO2	66	1	66/100*1=0.66
	CO3	68	2	68/100*2=1.36
	CO4	68	3	68/100*3=2.04
	CO5	68		
	CO6	68		
Average		2.4		1.35
% PSO attainment for each element			1.35/2.4 = 56%	
Attainment Level (50 to 70%) :1		1		
Attainment Level (70% to 80% ) :2				
Attainment Level (more than 80%) :3				

#### Overall PO/PSO Attainment

- Prepare a table of CO-PO Attainment.

- Direct attainment level of a PO & PSO is determined by taking average across all courses addressing that PO and/or PSO.
- Indirect attainment level of PO & PSO is determined based on the student exit surveys, employer surveys, co-curricular activities, extracurricular activities etc.
- For overall attainment level, 80% weightage is given to direct assessment and 20% weightage to indirect assessment through surveys from students.

**Example: Direct Assessment**

C201 -High (3)

C302 - Medium (2)

C303 - Low (1)

C401 - High (3)

Attainment level will be summation of levels divided by no. of courses

$$3+2+1+3/4= 9/4=2.25$$

**Indirect Assessment**

Surveys, Analysis, customized to an average value as per levels 1, 2 & 3.

Assumed level - 2

PO Attainment level will be 80% of direct assessment + 20% of indirect assessment

i.e.

$$1.8 + 0.4 = 2.2.$$

# Sample list of activities with BTL

ACTIVITIES	POSSIBLE BTL	PO Mapping
Tutorial- Write-ups	Understand, Apply	Any relevant PO from 1 to 4
Practical-Experiments	Understand, Apply, Analyse, Evaluate, Create	Any Relevant PO
Test/Quiz	Understand, Apply, Analyse	Any relevant PO from 1 to 4
Students' Seminar	Understand, Apply, Analyse	Any PO from 1, 2, 8, 10
Case Study	Understand, Apply, Analyse	Any Relevant PO
Presentation/Oral	Understand	
Guest Lecture	Understand	
Visits	Understand	
Survey & Analysis	Apply & Analyse	
Workshop/Hands-on Training	Apply, Analyse, Evaluate	
Task	Evaluate, Create	
Minor Project	Create	

## Activity Planning GUIDELINES (PO5 to PO12)

Sr. No.	Activity	Contact Hours	Minimum Assessment Tool	Mapping Level
1	Seminar Presentation	1 to 6 hrs	Feedback or Quiz or Rubric Based Assessment	1
	Case Study			
	Guest Lecture			
	Visits			
	Survey & Analysis			
2	Visits	7 to 20 Hrs	i) Feedback or Quiz	2
	Survey & Analysis		ii) Rubric Based Assessment for Report, Presentation etc.	
	Workshop / Hands-on			



	Training			
	Task			
3	Workshop/Hands - on Training	More than 20 Hrs	i) Feedback or Quiz	3
	Task		ii) Rubric Based Assessment for each PO	
	Minor Project		iii) Impact analysis	

## Continuous Improvement

### a) Contribution of CO and PO attainment and continuous improvement (Faculty Level)

Outcome	Action to be taken by faculty
High attainment of all CO-PO (>2.5 out of 3)	Set new higher targets or attainment levels for next Academic Year (A.Y.).
Moderate attainment of all CO-PO (1.8 to 2.49 out of 3)	Record observations, Continue action plan of last A.Y. with plan for improvements.
Low attainment of all CO-PO (0.9 to 1.79 out of 3)	Record observations, assess the target set, revise/improve action plan of last A.Y. to achieve the attainment with plan for improvements.
CO-PO not attained, poor performance(<0.9 out of 3)	Record observations, Critical assessment of target with Program Assessment Committee (PAC), Revise action plan of last A.Y. at faculty/department level.

**b)PO attainment and Continuous Improvement (PAC)**

Category	Outcome	Action by PC andHoD
Course related	PO attained highly	Include activities with HOT.
	PO not attained highly	Identify concerned courses, plan for immediate improvements, guide, support and monitor its execution.
Activity related	Activities Conducted	Critical assessment, impact analysis to be done and revise as per the need for improvements.



Leadership (PO9)	responsibilities and individual efforts (CO6)	responsibilities and individual efforts capitalized on strengths of each team member.	division of responsibilities and individual efforts capitalized on strengths of each team member.	responsibilities and individual efforts capitalized on strengths of each team member.	
Multidisciplinary approach (PO12)	Project work is linked to the multidisciplinary field	The project work is clearly linked the multidisciplinary field	The project work is moderately linked the multidisciplinary field	The project work is partially linked the multidisciplinary field	
Communication skill (PO10)	Information management; Log book, status reports, documentation (CO5)	Detailed, appropriate and timely entries; collected and distributed to appropriate parties	Adequate entries in journal or log books; Only critical data/information collected and distributed	Insufficient data collection/recording. Existing documentation is not shared/utilized.	
Financial Aspect (PO11)	Budget (Appropriateness & Justification)	Budget is comprehensive, clearly explained, and appropriate for the Project. All costs are justified, relevant and essential.	Budget is comprehensive, clearly explained, and reasonable. Vast majority of costs are justified, relevant and essential to this project.	Budget is comprehensive and reasonable but not clearly explained. Most costs are justified, relevant and essential to this project.	
Environment and Society (PO6, PO7)	Awareness towards Environment and Society (CO7)	Project meets every relevant expectation of environmental and societal issues.	Project meets most of the relevant expectation of environmental and societal issues.	Project meets some of the relevant expectation of environmental and societal issues.	
Feasibility/ Viability (PO4, PO6, PO8)	Feasibility of Project (CO4)	Processes and procedures are well-stated, manageable, appropriate, and comprehensive.	There is a logical and thoughtful plan for manageable execution of the project.	Processes and procedures for executing the project appear manageable, but there is some uncertainty	

PSO Components	Skills and Abilities	Relevance with Skills and Abilities			Level
		Substantial (3)	Moderate (2)	Slight (1)	
Essentials in of Civil Engineering Structures	Planning, Analysis, Design & Maintenance	Proficient in	Displays fair Knowledge	Displays slight Knowledge	
Proficient in identifying and solving complex infrastructural problems, applying management and engineering techniques	Problem Identification, analyzing and Management	Proficient in	Displays fair Knowledge	Displays slight Knowledge	
sustainable solutions to environmental and water resources challenges	Solutions to environmental and water resources problems	Proficient in	Displays fair Knowledge	Displays slight Knowledge	

**JSPM's Rajarshi Shahu College of Engineering**  
**Department of Civil Engineering**

**Employer Survey**

Name of Organization: \_\_\_\_\_

Address: \_\_\_\_\_

PO Components	Skills and Abilities	Relevance with Skills and Abilities			Level
		Substantial (3)	Moderate (2)	Slight (1)	
Core competency	Specific job-related knowledge	Confidently demonstrates conceptual knowledge related to the work	Moderately demonstrates conceptual knowledge related to the work	Fairly demonstrates conceptual knowledge related to the work	
	Specific job-related skills	Extensively uses specific technical skills related to the work being done	Reasonably uses specific technical skills related to the work being done	Occasionally uses specific technical skills related to the work being done	
	Comprehension	Clearly demonstrates understanding by restating information, ideas, concepts in different ways	Partially demonstrates understanding by restating information, ideas, concepts in different ways	Fairly demonstrates understanding by restating information, ideas, concepts in different ways	
	Critical thinking	Highly exhibits problem solving and decision making abilities	Moderately exhibits problem solving and decision making abilities	Rarely exhibits problem solving and decision making abilities	
Research	Research and analysis	Effectively collects, analyzes, and organizes relevant necessary	Adequately collects, analyzes, and organizes relevant	Reasonably collects, analyzes, and organizes relevant	

PO Components	Skills and Abilities	Relevance with Skills and Abilities			Level
		Substantial (3)	Moderate (2)	Slight (1)	
		information	necessary information	necessary information	
	Creative and Innovative	Successfully creates innovative strategies and/or products that meet identified needs	Sufficiently creates innovative strategies and/or products that meet identified needs	Partially creates innovative strategies and/or products that meet identified needs	
	Quality of work	Efficiently performs tasks and pays attention to detail	Satisfactorily performs tasks and pays attention to detail	Marginally performs tasks and pays attention to detail	
Modern Tools	Computer skills/new tools and technology	Extensively uses computers and other technological tools necessary to perform required tasks	Effectively uses computers and other technological tools necessary to perform required tasks	Satisfactorily uses computers and other technological tools necessary to perform required tasks	
Teamwork/ Leadership	Teamwork	Actively interacts with others in ways that contribute to effective working relationships and achievement of goals	Reasonably interacts with others in ways that contribute to effective working relationships and achievement of goals	Adequately interacts with others in ways that contribute to effective working relationships and achievement of goals	
	Organization and planning	Proficiently determines tasks and resources to complete project objectives	Moderately determines tasks and resources to complete project objectives	Fairly determines tasks and resources to complete project objectives	

PO Components	Skills and Abilities	Relevance with Skills and Abilities			Level
		Substantial (3)	Moderate (2)	Slight (1)	
	Time management	Precisely sets priorities and allocates time to complete several tasks within specific deadlines	Properly sets priorities and allocates time to complete several tasks within specific deadlines	Appropriately sets priorities and allocates time to complete several tasks within specific deadlines	
	Productivity	Extremely productive in completion of tasks	Reasonably productive in completion of tasks	Productive in completion of tasks	
Communication skill	Oral communication	speaks in a clear, concise and correct manner	speaks in a clear and correct manner	speaks in correct manner	
	Written communications	writes in a clear, concise and correct manner	writes in a clear and correct manner	writes in correct manner	
Professional ethics	Responsible	Always takes responsibility for her/his own actions and decisions	Often takes responsibility for her/his own actions and decisions	Sometimes takes responsibility for her/his own actions and decisions	
PSO Components	Skills and Abilities	Relevance with Skills and Abilities			Level
		Substantial (3)	Moderate (2)	Slight (1)	
Essentials in of Civil Engineering Structures	Planning, Analysis, Design & Maintenance	Proficient in	Displays fair Knowledge	Displays slight Knowledge	
Proficient in identifying and solving complex infrastructural problems, applying management and engineering techniques	Problem Identification, analyzing and Management	Proficient in	Displays fair Knowledge	Displays slight Knowledge	
sustainable solutions to environmental and water resources challenges	Solutions to environmental and water resources problems	Proficient in	Displays fair Knowledge	Displays slight Knowledge	



**Department of Civil Engineering**

**Alumni Survey**

1. Name of Alumnus: \_\_\_\_\_
2. Gender:  Male  Female
3. Year of Graduation from RSCOE: \_\_\_\_\_
4. Contact details: \_\_\_\_\_
5. e-mail: \_\_\_\_\_
6. Describe your present status  
 Employed  Entrepreneur  Pursuing Higher studies
7. Name of Organization/Institution: \_\_\_\_\_
8. Designation: \_\_\_\_\_
9. Annual income/Stipend: \_\_\_\_\_

PO Components	Skills and Abilities	Relevance with Skills and Abilities			Level
		Substantial (3)	Moderate (2)	Slight (1)	
Core competency	Specific job-related knowledge	Confidently demonstrates conceptual knowledge related to the work	Moderately demonstrates conceptual knowledge related to the work	Fairly demonstrates conceptual knowledge related to the work	
	Specific job-related skills	Extensively uses specific technical skills related to the work being done	Reasonably uses specific technical skills related to the work being done	Occasionally uses specific technical skills related to the work being done	
	Comprehension	Clearly demonstrates understanding by restating information, ideas, concepts in different ways	Partially demonstrates understanding by restating information, ideas, concepts in different ways	Fairly demonstrates understanding by restating information, ideas, concepts in different ways	
	Critical thinking	Highly exhibits problem solving and decision making abilities	Moderately exhibits problem solving and decision making abilities	Rarely exhibits problem solving and decision making abilities	
Research and Higher studies	Research and analysis	Effectively collects, analyzes, and organizes relevant necessary information	Adequately collects, analyzes, and organizes relevant necessary	Reasonably collects, analyzes, and organizes relevant	

PO Components	Skills and Abilities	Relevance with Skills and Abilities			Level
		Substantial (3)	Moderate (2)	Slight (1)	
			information	necessary information	
	Creative and Innovative	Successfully creates innovative strategies and/or products that meet identified needs	Sufficiently creates innovative strategies and/or products that meet identified needs	Partially creates innovative strategies and/or products that meet identified needs	
	Quality of work	Efficiently performs tasks and pays attention to detail	Satisfactorily performs tasks and pays attention to detail	Marginally performs tasks and pays attention to detail	
Modern Tools	Computer skills/new tools and technology	Extensively uses computers and other technological tools necessary to perform required tasks	Effectively uses computers and other technological tools necessary to perform required tasks	Satisfactorily uses computers and other technological tools necessary to perform required tasks	
Teamwork/ Leadership	Teamwork	Actively interacts with others in ways that contribute to effective working relationships and achievement of goals	Reasonably interacts with others in ways that contribute to effective working relationships and achievement of goals	Adequately interacts with others in ways that contribute to effective working relationships and achievement of goals	
	Organization and planning	Proficiently determines tasks and resources to complete project objectives	Moderately determines tasks and resources to complete project objectives	Fairly determines tasks and resources to complete project objectives	
	Time management	Precisely sets priorities and allocates time to complete several tasks within specific deadlines	Properly sets priorities and allocates time to complete several tasks within specific deadlines	Appropriately sets priorities and allocates time to complete several tasks within specific deadlines	
	Productivity	Extremely productive in completion of tasks	Reasonably productive in completion of tasks	Productive in completion of tasks	
Communication skill	Oral communication	speaks in a clear, concise and correct manner	speaks in a clear and correct manner	speaks in correct manner	

PO Components	Skills and Abilities	Relevance with Skills and Abilities			Level
		Substantial (3)	Moderate (2)	Slight (1)	
	Written communications	writes in a clear, concise and correct manner	writes in a clear and correct manner	writes in correct manner	
Professional ethics	Responsible	Always takes responsibility for her/his own actions and decisions	Often takes responsibility for her/his own actions and decisions	Sometimes takes responsibility for her/his own actions and decisions	
Employability	Placement potential	All of the academic contents meet professional needs, contributing to the transfer of knowledge and skills for placement.	Most of the academic contents meet professional needs, contributing to the transfer of knowledge and skills for placement.	Some of the academic contents meet professional needs, contributing to the transfer of knowledge and skills for placement.	
Lifelong Learning	Learnability	Always engage in continuous education and keep current within the field	Mostly engage in continuous education and keep current within the field	Rarely engage in continuous education and keep current within the field	
Environmental/ Society	Empathy	Highly accountable for the impact of engineering solutions in global, economic, environmental, and societal context	Moderately accountable for the impact of engineering solutions in global, economic, environmental, and societal context	Fairly accountable for the impact of engineering solutions in global, economic, environmental, and societal context	
PSO Components	Skills and Abilities	Relevance with Skills and Abilities			Level
		Substantial (3)	Moderate (2)	Slight (1)	
Essentials of Civil Engineering Structures	Planning, Analysis, Design & Maintenance	Proficient in	Displays fair Knowledge	Displays slight Knowledge	
Proficient in identifying and solving complex infrastructural problems, applying management and engineering	Problem Identification, analyzing and Management	Proficient in	Displays fair Knowledge	Displays slight Knowledge	

PO Components	Skills and Abilities	Relevance with Skills and Abilities			Level
		Substantial (3)	Moderate (2)	Slight (1)	
techniques					
sustainable solutions to environmental and water resources challenges	Solutions to environmental and water resources problems	Proficient in	Displays fair Knowledge	Displays slight Knowledge	

**JSPM's Rajarshi Shahu College of Engineering**  
**Department of Civil Engineering**

**Exit Survey (Graduate)**

1. Name of Student: \_\_\_\_\_
2. Gender:  Male  Female
3. Academic year: \_\_\_\_\_
4. Contact details: \_\_\_\_\_
5. e-mail: \_\_\_\_\_

(Please tick ✓ in appropriate cell for your valuable feedback)

PO Components	Skills and Abilities	Relevance with Skills and Abilities		
		Excellent (3)	Good (2)	Fair (1)
Core competency	Ability to apply knowledge of Maths, Science, Humanities and professional discipline for Problem formulation and solving. (PO1)			
	Collecting and analyzing appropriate data (PO4)			
	Ability to link theory to practice. (PO3)			
	Ability to design a system component or process (PO3)			
Research and Higher studies	Ability to pursue higher studies and research (PO12)			
Interpersonal Skills	Ability to work in teams. (PO9)			
	Ability to work in arduous /Challenging situation (PO2)			
	Independent thinking (PO2)			
	Appreciation of ethical Values (PO8)			
	IT knowledge (PO5)			
Management /leadership Skills	Resource and Time management skills (PO11)			
	Judgment (PO12)			
	Discipline (PO12)			
Communication skill	Oral communication (PO10)			
	Report writing (PO10)			
	Presentation skills (PO10)			
Environmental/ Society	Awareness of the impact of engineering solutions in global, economic, environmental, and societal context (PO6,PO7)			

PSO Components	Skills and Abilities	Relevance with Skills and Abilities			Level
		Proficient in <b>(3)</b>	Displays fair Knowledge <b>(2)</b>	Displays slight Knowledge <b>(1)</b>	
Essentials of Civil Engineering Structures	Planning, Analysis, Design & Maintenance				
Proficient in identifying and solving complex infrastructural problems, applying management and engineering techniques	Problem Identification, analyzing and Management				
sustainable solutions to environmental and water resources challenges	Solutions to environmental and water resources problems				

**Department of Civil Engineering**

**Parents Feedback**

1. Name of Parent: \_\_\_\_\_
2. Name of ward: \_\_\_\_\_
3. Gender:  Male  Female
4. Class: SE / TE / BE    Division: \_\_\_\_\_    Academic Year: \_\_\_\_\_
4. Parent contact details: \_\_\_\_\_
5. Parent e-mail: \_\_\_\_\_

PO/PSO Components	Particulars	Please tick ✓ in appropriate cell for your valuable feedback		
		Substantially (3)	Moderately (2)	Slightly (1)
Engineering Knowledge	My ward is gaining knowledge through teaching learning process at the institute.			
Problem analysis	My ward is able to analyse the Civil engineering problems			
Design/development of solutions	My ward is able to Design or development of solutions for Civil Engineering problems.			
Conduct investigations of complex problems	My ward is able to conduct investigations of complex problems			
Modern tool usage	My ward is able to use modern tools			
The engineer and society	My ward is aware of technical social issues and tries to resolve them.			
Environment and sustainability	My ward is aware of environmental, global issues and tries to resolve them.			
Ethics	My ward is aware of professional ethics.			
Individual and team work	Activities in institute helps to develop leadership and team work skills of my ward.			
Communication	Activities in institute helps to develop my wards communication			

	skills.			
Project management and finance	My ward has ability to manage activities and financial issues.			
Life-long learning	My ward will be able to pursue higher studies.			
Planning, Analysis, Design & Maintenance	My ward is aware about essentials of Civil Engineering Structures.			
Problem Identification, analyzing and Management	My ward will be proficient in identifying and solving complex infrastructural problems, applying management and engineering techniques			
Solutions to environmental and water resources problems	My ward will be able to give sustainable solutions to environmental and water resources challenges			



**Department of Civil Engineering**

**Faculty Feedback**

Note: Your valuable opinions and suggestions are solicited for further improvement of the Program. The following rubric shows the Program Educational Objectives components which reveal the skill and abilities of the students. You are requested to select appropriate level based on the skill and abilities of the students. Your responses will be kept confidential and used only for the stated purpose.

PO / PSO Components	Skills and Abilities	Relevance with Skills and Abilities			Level
		Substantial (3)	Moderate (2)	Slight (1)	
Engineering Knowledge	Fundamental Knowledge	Confidently demonstrates conceptual knowledge related to the work	Moderately demonstrates conceptual knowledge related to the work	Fairly demonstrates conceptual knowledge related to the work	
Problem analysis	Critical thinking	Highly exhibits problem solving and decision making abilities	Moderately exhibits problem solving and decision making abilities	Rarely exhibits problem solving and decision making abilities	
Design/development of solutions	Comprehension	Clearly demonstrates understanding by restating information, ideas, concepts in different ways	Partially demonstrates understanding by restating information, ideas, concepts in different ways	Fairly demonstrates understanding by restating information, ideas, concepts in different ways	
Conduct investigations of complex problems	Research and analysis	Effectively collects, analyzes, and organizes relevant necessary	Adequately collects, analyzes, and organizes relevant necessary	Reasonably collects, analyzes, and organizes relevant	

PO / PSO Components	Skills and Abilities	Relevance with Skills and Abilities			Level
		Substantial (3)	Moderate (2)	Slight (1)	
		information	information	necessary information	
Modern tool usage	Computer skills/new tools and technology	Extensively uses computers and other technological tools necessary to perform required tasks	Effectively uses computers and other technological tools necessary to perform required tasks	Satisfactorily uses computers and other technological tools necessary to perform required tasks	
The engineer and society	Technical skills	Extensively uses specific technical skills related to the work being done	Reasonably uses specific technical skills related to the work being done	Occasionally uses specific technical skills related to the work being done	
Environment and sustainability	Empathy	Highly accountable for the impact of engineering solutions in global, economic, environmental, and societal context	Moderately accountable for the impact of engineering solutions in global, economic, environmental, and societal context	Fairly accountable for the impact of engineering solutions in global, economic, environmental, and societal context	
Ethics	Responsible	Always takes responsibility for her/his own actions and decisions	Often takes responsibility for her/his own actions and decisions	Sometimes takes responsibility for her/his own actions and decisions	
Individual and team work	Teamwork	Actively interacts with others in ways that contribute to effective working relationships and achievement of goals	Reasonably interacts with others in ways that contribute to effective working relationships and achievement of goals	Adequately interacts with others in ways that contribute to effective working relationships and achievement of goals	

PO / PSO Components	Skills and Abilities	Relevance with Skills and Abilities			Level
		Substantial (3)	Moderate (2)	Slight (1)	
Communication	Oral & Written communication	speaks in a clear, concise and correct manner, writes in a clear, concise and correct manner	speaks in a clear and correct manner, writes in a clear and correct manner	speaks in correct manner, writes in correct manner	
Project management and finance	Organization and planning	Proficiently determines tasks and resources to complete project objectives	Moderately determines tasks and resources to complete project objectives	Fairly determines tasks and resources to complete project objectives	
Life-long learning	Learnability	Always engage in continuous education and keep current within the field	Mostly engage in continuous education and keep current within the field	Rarely engage in continuous education and keep current within the field	
Essentials of Civil Engineering Structures	Planning, Analysis, Design & Maintenance	Proficient in	Displays fair Knowledge	Displays slight Knowledge	
Proficient in identifying and solving complex infrastructural problems, applying management and engineering techniques	Problem Identification, analyzing and Management	Proficient in	Displays fair Knowledge	Displays slight Knowledge	
sustainable solutions to environmental and water resources challenges	Solutions to environmental and water resources problems	Proficient in	Displays fair Knowledge	Displays slight Knowledge	

## **Department of Civil Engineering**

We are pleased to inform you that our institute is undergoing the process of accreditation by National Board of Accreditation (NBA), New Delhi. The accredited institutes have distinguished status worldwide. It ensures that students are being trained to meet the global standards.

### **What is Accreditation?**

Accreditation is a process of quality assurance and improvement. The accreditation by NBA is to promote and recognize excellence in technical education at both UG and PG levels. Institutions, students, employers, and the public, all benefit from the NBA accreditation process. They also benefit from the process of continuous quality improvement that is encouraged by the NBA's approach to promote excellence in technical education.

### **Benefits of Accreditation**

#### **1. Benefits to Students**

Students studying in NBA accredited Institutions can be assured that they will receive education which is a balance between high academic quality and professional relevance and that the needs of the corporate world are well integrated into programmes, activities and processes. It signifies that he has entered the portals of an Institution, which has the essential and desirable features of quality professional education.

#### **2. Benefits to Employers**

Accreditation assures prospective employers that students come from a programme where the content and quality have been evaluated, satisfying established standards. It also signifies that the students passing out have acquired competence based on well-established technical inputs.

#### **3. Benefits to Parents**

It signifies that their ward goes through a teaching-learning environment as per accepted good practices.

#### **4. Benefits to Alumni**

It reassures alumni that alumni are products of an institute with a higher standing in terms of learning.

#### **5. Benefits to Institutions**

Accreditation process quantifies the strengths, weaknesses in the processes adopted by the Institution and provides directions and opportunities for future growth. NBA provides a quality seal or label that differentiates the Institutions from its peers at the national level. This leads to a widespread recognition and greater appreciation of the brand name of Institutions and motivates the Institutions to strive for more.

The process of accreditation is Outcome Based Education (OBE) in which it is ensured that every individual satisfies Graduate Attributes (GA). We have framed the Vision, Mission and Program

Educational Objectives (PEOs) of the Program to inculcate the Graduate Attributes amongst the students.

**Vision of Department:** To provide an excellent academic environment for students to become a competent Civil engineer

**Mission of Department:**

1. To reinforce the students with fundamentals in Civil Engineering by providing scholarly and vibrant environment for successful careers.
2. To explore and develop innovations that contributes to higher education, research and entrepreneurship development in applied domains of Civil Engineering.
3. To serve society through knowledge and expertise in Civil Engineering domain.

**Programme Educational Objectives:**

- 1: Graduate shall have successful career in Civil Engineering, exhibit leadership and teamwork ability.
- 2: Graduate shall possess an ability to work in diversified professional environment with functional and disciplinary skills in social context.
- 3: Graduate shall have an ability and skill to address research, professional challenges and be a lifelong learner.

The survey/rubrics form attached gives us valuable feedback on the attainment of PEOs.

*It is requested to spare your valuable time to complete the survey/rubrics.*

**Department of Civil Engineering**

**Course End Survey**

**Course: Structural Analysis I (201008)**

**SE Civil (Sem IV)**

1. Name of Student: \_\_\_\_\_

2. Gender:  Male  Female

3. Academic year: \_\_\_\_\_

4. Contact details: \_\_\_\_\_

5. e-mail: \_\_\_\_\_

(Please tick ✓ in appropriate cell for your valuable feedback)

Course Outcome	Skills and Abilities	Relevance with Skills and Abilities developed			Average
		Substantial (3)	Moderate (2)	Slight (1)	
CO1: Able to explain the basics of configuration, classification and fundamental concepts of structural analysis.	Ability to classify the structure and explain the types of structural systems.				
	Ability to determine static and kinematic indeterminacy of given structure.				
CO2: Able to determine slope and deflection of beams, frames and trusses by applying appropriate method.	Ability to determine slope and deflection of given structure by selecting proper method.				
CO3: Able to analyze indeterminate structure using	Ability to analyze indeterminate beams, frames and truss by energy methods.				

energy methods, compatibility method.	Ability to analyze continuous beams by compatibility method.				
CO4: Able to draw Influence line diagram for determinate beams, trusses and applications of ILD.	Ability to describe the concept of Influence line diagram and apply Muller Braslua's principle to draw ILD of determinate beams and trusses.				
	Ability to determine axial, shear and moments by applying Muller Braslua's principle.				
CO5: Able to analyse arches for external and internal forces.	Ability to analyze arches to determine thrust, shear and moments.				
CO6: Able to identify plastic behavior of material and perform plastic analysis of indeterminate beams and frames.	Ability to characterize the plastic behavior of material, collapse mechanisms and theorems of plastic analysis.				
	Ability to determine shape factor of given section.				
	Ability to perform plastic analysis of beams and frames.				

**Department of Civil Engineering**

**Lab Work Assessment Rubric**

Lab Course: \_\_\_\_\_ Class: SE/TE/BE Civil (Sem \_\_\_\_)

Name of Student: \_\_\_\_\_ Roll No.: \_\_\_\_\_

Gender:  Male  Female

Academic year: \_\_\_\_\_

Performance Criteria (PO)	Sub criteria	Substantial (3)	Moderate (2)	Slight (1)	Level	Average
<b>Conduct, interprets and analyse an experiment (PO4)</b>	Theoretical concepts of the experiment	Demonstrates an accurate understanding of the lab objectives and concepts. The student can correctly answer questions	Moderate understanding of lab objectives and concepts. Answers to questions are basic and superficial suggesting that concepts are not fully grasped.	Fair understanding of lab objectives and concepts. Answers to questions are basic with Some introductory information, but still missing some major points		
	Design, develop, perform/execute the experiment	Experimental design shows a clear understanding of the scientific process and thoroughly addresses the factors necessary (variables, controls, repeated trials, etc.) to gather the most accurate data.	Experimental design shows a basic understanding of the scientific process; does not address all factors necessary to gather the most accurate data.	Experimental design shows a minimal understanding of the scientific process; fails to address many factors necessary to gather the most accurate data.		
	Conclusion	Conclusion includes a summary of the experiment, whether the findings supported the hypothesis,	Conclusion includes a general overview of the experiment and what was learned from the experiment; "something is	Conclusion shows little effort and reflection; "a lot is missing"		



Performance Criteria (PO)	Sub criteria	Substantial (3)	Moderate (2)	Slight (1)	Level	Average
		possible sources of error, and what was learned from the experiment	missing”			
	Relating results with standard norms	Standard norms and result comparisons have been interpreted correctly and discussed, good understanding of result is conveyed	Standard norms and result comparisons have been interpreted correctly and discussed, moderate understanding of result is conveyed, only minor improvements are needed	Some of the results have been correctly interpreted and discussed; partial but incomplete understanding of results is still evident		
Use of equipment's and modern tools (PO5)	Knowledge of equipment's	Complete knowledge of all equipment's	Moderate knowledge of all equipment's	Fair knowledge of all equipment's		
	Handling of equipment's	Careful handling and follows all safety precautions	Careful handling and follows safety precautions most of time	Proper handling but did not follow safety precautions		
	Software application	superior use of software to obtain unique solution	use of software to obtain correct/valid results	uses software, but contains errors		
Team Work and Team Member (PO9)	Working with in a lab group	Works collaboratively with group members to complete tasks	Sometimes works collaboratively with group members to complete tasks	Rarely works collaboratively with group members to complete tasks		
	Acknowledging contributions of group members	Recognizes the views and input of group members	Recognizes some views and input of group members	Ignores the views and input of group members		
Professional and ethical attitude (PO6,PO8)	Manners, courtesy and safety	While performing the experiment, the student is tidy, respectful of others, mindful of	While performing the experiment, the student is mostly tidy, sometimes	While performing the experiment, the student is untidy, not respectful of		

Performance Criteria (PO)	Sub criteria	Substantial (3)	Moderate (2)	Slight (1)	Level	Average
		safety, and leaves the area clean.	respectful of others, sometimes mindful of safety, and leaves the area clean only after being reminded.	others, not mindful of safety, and leaves the area messy even after being reminded.		
<b>Written Communication through journal (PO10)</b>	Journal quality	Report is well organized and cohesive and contains no errors. Presentation seems polished.	Report is well organized and cohesive but contains some errors.	Report is somewhat organized with some errors		

**JSPM's Rajarshi Shahu College of Engineering**  
**Department of Civil Engineering**

**Seminar Assessment Rubric**

Title of Seminar: \_\_\_\_\_ Academic year: \_\_\_\_\_

Name of Student: \_\_\_\_\_ Roll No. \_\_\_\_\_

Name of Guide: \_\_\_\_\_

Key Performance Indicators/ (CO)	Relevance with Performance Criteria			Level	Average
	Substantial (3)	Moderate (2)	Slight (1)		
Identification of topic (CO1)	Clear, concise and complete Identification of seminar topic	Adequate Identification of seminar topic; Any lack of specifics does not impair theories	Improper Identification of topic		
Literature references (CO1)	A variety of supporting materials (explanations, examples, illustration's, statistic's, analogies, quotations from relevant authorities) make appropriate reference to the information or analysis that significantly supports the topic selected.	Adequate supporting materials (explanations, examples, illustration's, statistic's, analogies, quotations from relevant authorities) make appropriate reference to the information or analysis that significantly supports the topic selected.	Insufficient supporting materials (explanations, examples, illustration's, statistic's, analogies, quotations from relevant authorities) make appropriate reference to the information or analysis that significantly supports the topic selected		
Understanding, Analyzing and Evaluating (CO2)	Identifies and richly contextualizes the area of topic, discusses various perspectives and draws explicit connections among those perspectives.	Identifies the area of topic and identifies various perspectives, drawing few or no connections among those perspectives	Identifies the area of topic.		
	Explains and summarizes specific information and	Summarizes specific information with some explanation	Restates information gathered from		

Key Performance Indicators/ (CO)	Relevance with Performance Criteria			Level	Average
	Substantial (3)	Moderate (2)	Slight (1)		
	provides a solid and/or detailed analysis of the line of reasoning.	and provides a limited analysis of the line of reasoning.	sources rather than summarizing the information.		
	Analyzes various items of evidence gathered from sources and explains in detail why they are relevant and credible enough to support the argument.	Identifies various items of evidence and makes some reasonable connections between that evidence, its relevance to the argument..	Identifies various items of information but makes few or no connections between those items of information, their relevance to the argument.		
Writing Skills (CO3)	Specific central idea that is clearly stated in the abstract; appropriate, concrete details support the central idea and show originality and focus	Central idea is vague; somewhat sketchy and non-supportive to the topic; lacks focus.	Unable to find specific supporting details; more than 4 errors in information.		
	Logically organized and well-structured displaying a beginning, a body, and a conclusion. Critical thinking skills are evident.	Somewhat digresses from the central idea; ideas do not logically follow each other.	Central point and flow of topic is lost; lacks organization and continuity.		
	Written work has no errors in word selection and use, sentence structure, spelling, punctuation, and capitalization.	Written work is relatively free of errors in word selection and use, sentence structure, spelling, punctuation, and capitalization	Written work has several errors in word selection and use, sentence structure, spelling, punctuation, and capitalization		
Core Acquaintance (CO4)	The seminar topic has high degree of relevance with core knowledge, places it in a clear and relevant context. Addresses advanced theories/models, clearly articulated within the context of the source materials.	The seminar topic has moderate degree of relevance with core knowledge, places it in a clear and relevant context. Addresses advanced theories/models, fairly articulated within the context of the source materials.	The seminar topic has slight relevance with core knowledge, places it in a clear and relevant context. Not addressing advanced theories/models.		

Key Performance Indicators/ (CO)	Relevance with Performance Criteria			Level	Average
	Substantial (3)	Moderate (2)	Slight (1)		
Proof reading (CO5)	Thoroughly familiar with the text; has notations and questions in the margins; key words, phrases, and ideas are highlighted; possible contradictions identified; pronounces words correctly.	Has read the text and comes with some ideas from it but these may not be written out in advance; good understanding of the vocabulary but may mispronounce some new or foreign words.	Appears to have read or skimmed the text but has not marked the text or made meaningful notes or questions; shows difficulty with vocabulary; mispronounces important words; key concepts misunderstood; little evidence of serious reflection prior to the seminar.		
Presentation (CO6)	The presentation uses minimal (or no) notes or written script to effectively convey the material. The presentation establishes connections between the spoken and the visual..	The presentation is read at times but is delivered mostly independently of a written script.	The presentation is entirely read either from the research paper, a written script, or from the slides.		
	Effective techniques of media design enhance the oral presentation.	Techniques of media design inconsistently support the oral presentation.	Ineffective techniques of media design inhibit or distract from the oral presentation.		
	Communication strategies (e.g., eye contact, vocal variety&energy, expressive gestures, movement), coupled with an effective execution of those strategies, strongly support the communication of the argument.	Communication strategies (e.g., eye contact, vocal variety&energy, expressive gestures, movement), and/or an ineffective execution of those strategies, inconsistently support the communication of the argument.	Communication strategies used for delivery of the content (e.g., eye contact, vocal variety&energy, expressive gestures, movement) severely limit the presentation's impact.		
	Understands question before answering; cites evidence from text; expresses thoughts in	Responds to questions voluntarily; comments show an appreciation for the	Responds to questions but may have to be called upon by others; has		

Key Performance Indicators/ (CO)	Relevance with Performance Criteria			Level	Average
	Substantial (3)	Moderate (2)	Slight (1)		
	complete sentences; move conversation forward; makes connections between ideas; resolves apparent contradictory ideas; considers others' viewpoints, not only his/her own; avoids bad logic.	text but not an appreciation for the subtler points within it; comments are logical but not connected to other speakers; ideas interesting enough that others respond to them.	read the text but not put much effort into preparing questions and ideas for the seminar; comments take details into account but may not flow logically in conversation.		

## Group Discussion Assessment Rubric

Name of the Team: \_\_\_\_\_

Branch: Class: \_\_\_\_\_

Team Members: (Roll Nos.: \_\_\_\_\_ )

Performance Criteria	Excellent	Average	Poor	Ex Grading Poor				
				5	4	3	2	1
Completion of assigned readings.	All readings complete	Some readings complete	Absent or no readings complete					
Understanding of assigned readings.	Sophisticated understanding of readings; Noticed more than the average student; Is able to draw on readings in creative ways to interpret the passage.	Good, average understanding of readings; Significant use of readings in discussing the interpretation of the passage.	Poor understanding of readings;					
Application of readings and interpretive methods to questions	Sophisticated use of readings and interpretive methods in discussing the questions; Contributions offer exceptional insights about the questions being discussed; Creative and critical thought	Some effort made to use interpretive methods and readings in answering the questions. May be some major gaps or errors; Might at times ignore or overlook major relevant ideas in the readings.	Poor understanding and little or no proper use of assigned methods. Little use of readings in answering the questions.					
Appropriateness and clarity of contribution to group discussion.	Speaks clearly and coherently; Kind in disagreement; Makes substantial contribution; Does not dominate conversation.	Makes some contribution; May speak too much or too little; May make comments that are off-topic or confused	Little or no contribution; May be angry or hostile toward other members					

Teacher I/C: \_\_\_\_\_

Name with Signature and Date \_\_\_\_\_

## Written Assignment Rubric

Name of the Student:

Branch:

Class:

Roll No.:

Performance Criteria	Excellent	Average	Poor	Ex Grading Poor				
				5	4	3	2	1
Overall effectiveness of communication	The writer's decisions about focus, organization, style/tone, and content made reading a pleasurable experience. Writing could be used as a model of how to fulfill the assignment. The purpose and focus of the writing are clear to the reader and the organization and content achieve the purpose well. Writing follows all requirements for the assignment.	The writer has made good decisions about focus, organization, style/tone, and content to communicate clearly and effectively. The purpose and focus of the writing are clear to the reader and the organization and content achieve the purpose well. Writing follows all requirements for the assignment.	The writer's decisions about focus, organization, style/tone, and/or content interfere with communication. The purpose of the writing is not achieved. Requirements of the assignment have not been fulfilled.					
Clarity of writing	Writing flows smoothly from one idea to another. The writer has taken pains to assist the reader in following the logic of the ideas expressed. Sequencing of ideas within paragraphs and transitions between paragraphs make the writer's points easy to follow.	Sentences are structured and word are chosen to communicate ideas clearly. Sequencing of ideas within paragraphs and transitions between paragraphs make the writer's points easy to follow.	Sentence structure, word choice, lack of transitions and/or sequencing of ideas make reading and understanding difficult.					
Demonstration of knowledge	Demonstration of full knowledge of the subject with	Writer is at ease with content and able to elaborate and explain	No grasp of required subject matter. No understanding of major					



	explanations and elaboration.	to some degree.	issues. No interpretation of results.					
Flow of information	Information is presented in a logical, interesting way, which is easy to follow.	Information is presented in a logical manner, which is easily followed.	Sequence of information is difficult to follow. No apparent structure or continuity.					
Division of information	All information is located in the appropriate section.	Some information is in the wrong section.	Lack of appropriate sections or many items are in the wrong section.					
Format & aesthetics	Report format is consistent throughout including heading styles, fonts, margins, white space, etc.	Report format is generally consistent.	Work fails to follow required report format.					
Effectiveness	All figures are effectively interpreted and discussed in the report.	Most figures are properly interpreted and important features noted.	Figures are not used effectively. Little understanding of important features or issues.					
Citations	Citations consistent with format.	Minor inconsistencies referring to figures.	Citations fail to follow required format or no citation provided.					
References	Reference section complete, comprehensive and follows required format.	Minor inadequacies in references or inconsistencies in format.	No referencing system used.					

Teacher I/C:

Name with Signature and Date

## References

1. <https://www.aicte-india.org/sites/default/files/ExaminationReforms.pdf>
2. <https://www.nbaind.org/files/PEOs-Curriculum-and-CO-PO-mapping-21-may-2016.pdf>
3. <http://www.aliet.ac.in/copo/Program%20Outcomes.pdf>