Outcome Based Education Process Manual

SMVITM

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1. Introduction to Accreditation

Accreditation is the formal recognition by an autonomous body such as National Board of Accreditation (NBA), National Assessment and Accreditation Council (NAAC) about the quality of education after careful evaluation at various stages of teaching learning process. The NAAC accredit the whole institution where as the NBA accredit individual programs in the Institute. Beyond certification, the process involved encourages continuous look at how we teach, what is its impact, and how to achieve the set objectives better and lead to Continuous Improvement System.

Benefits of accreditation status to any engineering program:

Accreditation encourages quality improvement initiatives by institutions

- Enhance employability of graduates
- Improves student enrollment both in terms of quality and quantity
- Helps the institution in securing necessary funds
- Facilitates transitional recognition of degrees and mobility of graduates and professionals
- Motivates faculty to participate actively in academic and related activities
- Helps create sound and challenging academic environment in the institution and contributes to social and economic development of the country by producing high quality technical manpower

What happens, if there is no accreditation?

The Accreditation process has been developed as a tool for Quality Assurance in technical education. Without it, is not possible

- To sustain the present institutional growth rate.
- To correct existing imbalances in generation of quality technical manpower.
- To ensure that the institute has the necessary resources for qualitative technical education.
- To ensure the institutional products meet industry requirements.

About Washington Accord: Washington Accord is an international accreditation agreement for professional engineering academic degrees, between the bodies responsible for accreditation in its signatory countries The National Board of Accreditation (NBA) is a permanent signatory of Washington Accord. Sixteen other countries have also become the permanent signatories of this accord. To become a signatory of Washington accord, it is mandatory to adopt "outcome-based education" in the teaching-learning process.

2. Outcome Based Education

Outcome-Based Education (OBE) is an educational philosophy where the teaching and learning approach is based upon a predetermined set of expected outcomes. Outcomes are a

set of values or attributes a student should acquire upon completion of a certain level of learning.

Following are the components of Outcome Based Education, also shown in the figure 1.

1. Vision, Mission
2. Program Educational Objectives (PEOs)
3. Program Outcomes (POs)
4. Program Specific Outcomes (PSOs)
5. Course Outcomes (COs)
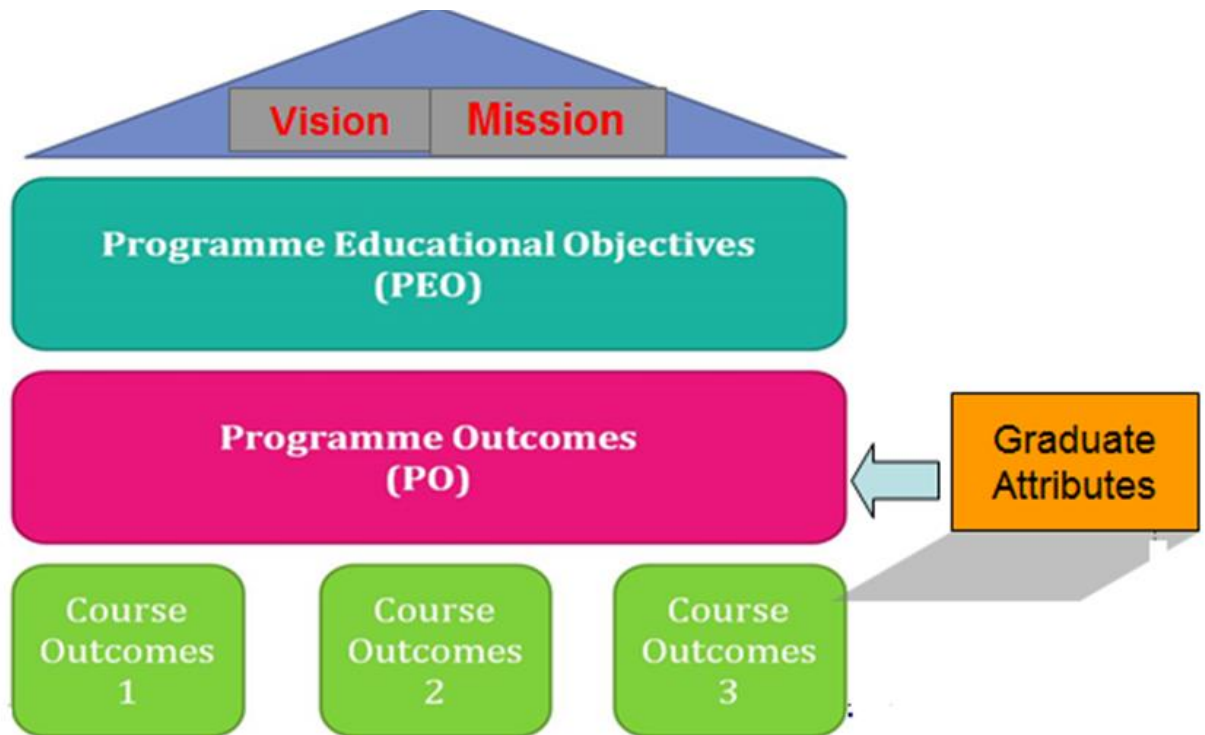
Figure1: Components of OBE

Vision is a futuristic statement that the institution/department would like to achieve over a period of time

Mission statements are essentially the means to achieve the vision

Program Educational Objectives (PEOs): Programme Educational Objectives are specific goals describing expected achievements of graduates in their career and professional life after graduation, and shall be:

- consistent with the mission and vision of the department
- responsive to the interest of various stakeholders

PEOs describe the abilities acquired by the graduates 3 to 5 years after the graduation. Every program shall have 3 to 4 PEOs written based on the Vision and Mission of the department.

Program Outcomes (POs): Program outcomes are narrow statements that describe what the students are expected to know and be able to do upon graduation. The POs basically describe knowledge, skill and behavior of the students as they progress through the program as well as

by the time of graduation. PO statements should be measurable and attainable. As per the guidelines of the NBA, the POs should align with the Graduate Attributes (GA's)

Graduate Attributes (GAs): Graduate Attributes are the expected qualities of a graduate. GAs are defined by the professional bodies like ASME, IEEE etc but in our country, the professional bodies are not so much involved in engineering education. Hence the NBA has defined the GAs for the undergraduate programs.

Program Specific Outcomes (PSOs)
Program specific outcomes are what the students should be able to do at the time of graduation. PSOs are decided by the program of study. Every program should specify 2 to 4 PSOs.

Course Outcomes (COs): Course Outcome statements describe what the students are expected to know or be able to do at the end of the course. The CO statements are very narrow and related to the course only. Every course should have 4 to 6 course outcomes. Every CO statement should be measurable and attainable.
CO statement should contain an action word (Verbs) and learning.

Following are the guidelines to write the COs.
- Student focused, not professor focused- Learning not coverage oriented
- Avoid using vague qualifiers such as Understand, Know, Learn, and Appreciate. They are difficult to measure.
- Use only one action word per outcome. For example "At the end of the course the students will understand, interpret and analyze the given drawing". Since there are many action words in the course outcome, it is difficult to measure the attainment of this CO. In such case split the CO into two or more COs and then measure the attainment.
- As far as possible maintain logical order in the contents (Simpler to complex; known to unknown)
- It would be better to map the course outcomes to the learning domain in Blooms Taxonomy.
- Alignment between course (CO), program (PO) and institutional levels (Mission)
- Are limited to manageable number (4 to 6)- being accomplished within a semester
- Specific enough to be measurable

Mapping of COs with PO/PSOs: Every course leads to some outcomes. All the courses together must cover the stated list of program outcomes. To verify this, prepare a match matrix as shown below. This process is called mapping and such mapping between course outcomes and program outcomes and program specific outcomes is very essential to prove that attainment of the objectives. Mapping also reveals the gap in the curriculum.

Table1: Course PO/PSO mapping

Course \ POs	PO1	PO2	PO3	…	…
18ME32	1			3	
18ME33		1	2	1	
…	2	2			1
…		2	2		
…	2			2	
18ME86	1		4		3

3. Assessment

Assessment is the systematic collection of data to monitor the success of a program or course in achieving intended learning outcomes for students. Assessment is used to determine:

- The way the students learnt the material (process)
- What students have learnt (outcome)
- Their approach to learning before, during, or after the program or course

In the context of accreditation, following are the different levels of assessment:

- **Classroom assessment**: Assessment of individual students at the course level typically by the class instructor.
- **Course assessment**: The assessment of a specific course by the course coordinator
- **Program assessment:** Assessment of Educational Objectives and Outcomes of the program by the program coordinator(s) in association with the assessment committee.

Why Assessment?

Assessment helps us to guide the development of individual students and also to monitor and continuously improve the quality of programs. Assessment is required for the following reasons:

a. Assessment results provide qualitative information that helps faculty determine how they might improve courses and/or programs through changes in curriculum, teaching methodologies, course materials, or other areas.
b. Assessment may provide the data that about the learning outcomes of students.
c. An effective assessment program is required by NBA for continuing accreditation as evidence of the College's efforts toward continuous improvement of effective teaching and learning

4. Attainment of Course Outcomes

The key aspects in Outcome-Based Education (OBE) are the assessment of course outcomes. To address the Program Outcome (POs) Program specific outcome (PSOs) and other requirements, the Course Outcomes (COs) for each course are defined based on syllabus before commencement of the course. These COs are further broken down into Topic Level

Outcome (TLOs). Cos are assessed by direct and indirect methods. Direct assessment is done by CIE and SEE, indirect assessment by course end survey.

During the course delivery, these TLOs are addressed in detail. The students are then assessed to check the attainment of TLOs regularly by means of various tools.

At the end of each course, the attainment level of COs are calculated using attainment levels of TLOs, to confirm whether the COs have been attained or not. Different assessment tools used for Continuous Internal Evaluation and Semester End Examination are given in the table 2.

Table 2: CO assessment tools

Assessment Tools		Weightage	Frequency	Responsibility
Continuous Internal Evaluation	Theory Courses ● IA test ● Assignments ● Quizzes	50%	During each semester	Department level
	Laboratory Courses		During each semester	
	Technical Seminar		During 8th semester	
	Project Work		In 4th year	
Semester End Examination	Theory / laboratory	50%	End of every semester	University level
	Project Work		At the end of Graduate program	

The process of assessment of COs through Continuous Internal Evaluation is as shown in the figure 2.

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                    │     Defining COs     │
                    └─────────────────────┘
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              │  Defining TLOs and mapping them to│
              │               COs                 │
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              │  Delivering course content to     │
              │            achieve TLOs           │
              └──────────────────────────────────┘
                               │
                               ▼
              ┌──────────────────────────────────┐
              │  Assessing TLOs through           │
              │          IA                       │
              │          Assignment               │
              │          Record                   │
              │          Quiz                     │
              │          Report Presentation etc. │
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Calculating attainment levels of TLOs

Level 3: More than 70% of students scoring more than 60% of maximum marks

Level 2: 60 to 70% of students scoring more than 60% of maximum marks

Level 1: 45 to 60% of students scoring more than 60% of maximum marks

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              ┌──────────────────────────────────┐
              │  Measuring Attainment levels of   │
              │  COs through TLOs by weighted      │
              │          average method            │
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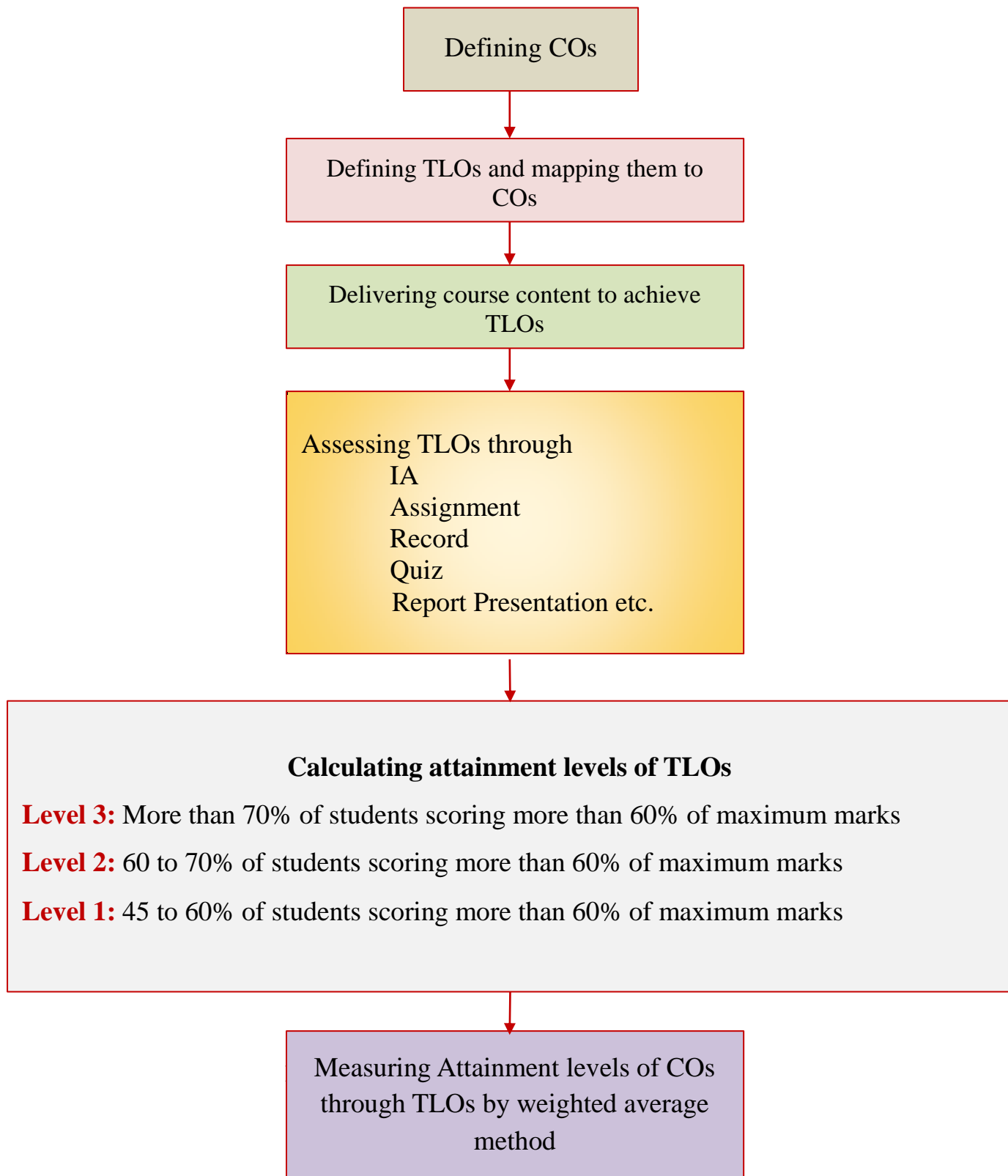
Figure 2: CO assessment by Continuous Internal Evaluation (Direct Attainment)

Indirect Assessment (Course End Survey):

During the end of each semester all students are asked to respond to the questionnaire containing the course outcome statements of all courses they studied in that semester.

The responses are recorded in a 4 level Likert scale (Strongly Agree, Agree, Neutral, Disagree) with respective attainment levels as shown below:

Table 3: Attainment level mapping for survey responses

Response	Attainment Level
Strongly Agree	3
Agree	2
Neutral	1
Disagree	0

The process of calculating the attainment of COs through survey are as follows:

Course End Survey responses

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Calculating CO Attainment

Attainment = (3*A + 2*B + C) / Total Students Responded
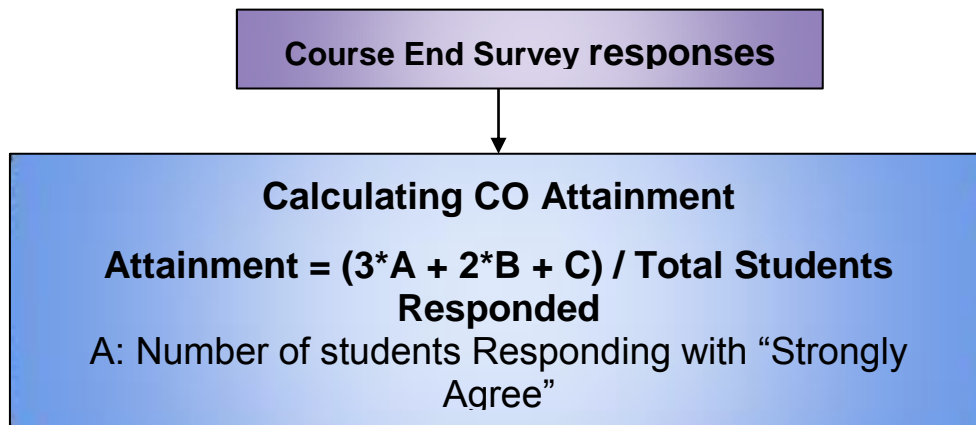A: Number of students Responding with "Strongly Agree"

Figure 3: CO assessment by indirect method

The process to calculate overall attainment of Course Outcome (CO) through CIE:

Direct Measurement — Course Attainment — 80%

Indirect Measurement — CO Attainment — 20%

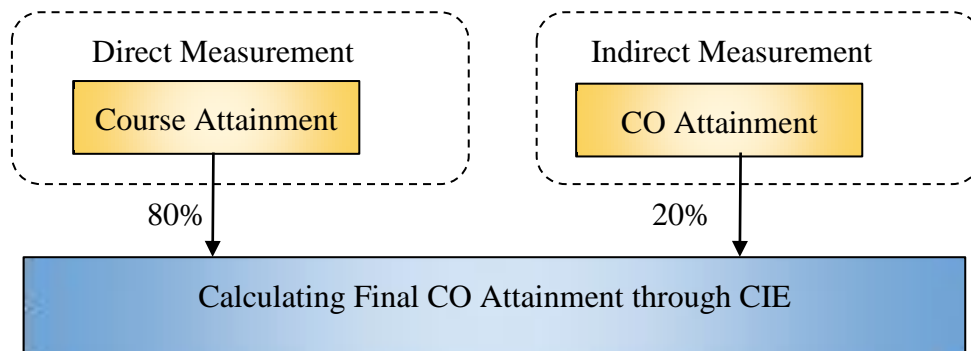Calculating Final CO Attainment through CIE

Figure 4: Process to calculate overall attainment of Course Outcome through CIE

The process of assessment of COs through Semester End Examination:

- SEE is conducted by the University for Maximum of 100 marks. Examination is more focussed on attainment of COs and POs using descriptive exam
- For each student semester-end examination results of all subjects are collected.

- Course attainment for each course is calculated based on Number of students scoring within predefined ranges of marks for the respective course.
- This course attainment is mapped equally to all COs of that particular course.

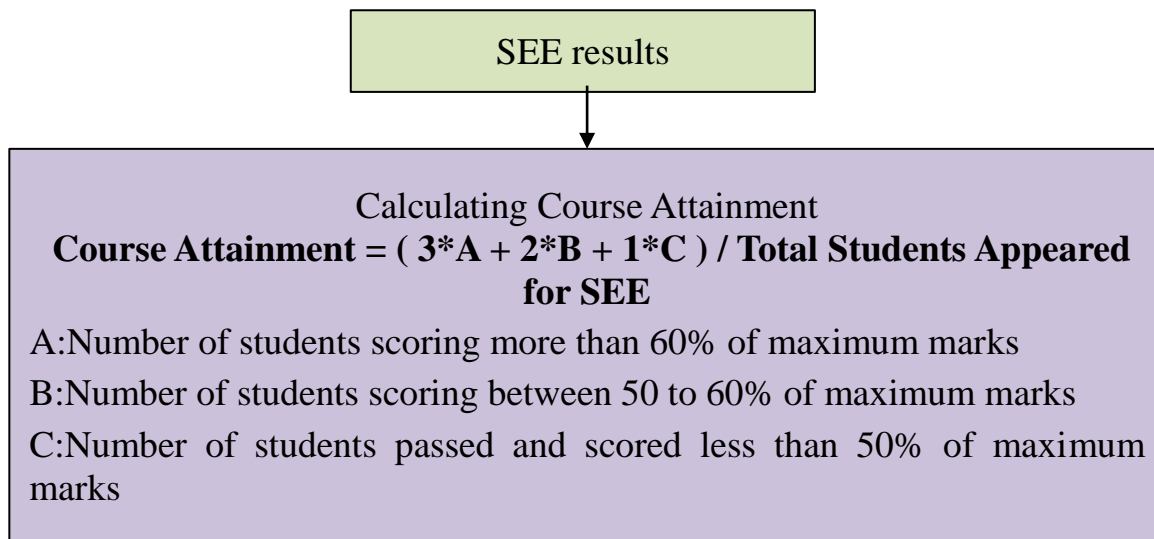The process of assessment of COs through Semester End Examination is shown in the figure 5.

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SEE results

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Calculating Course Attainment

Course Attainment = (3*A + 2*B + 1*C) / Total Students Appeared for SEE

A:Number of students scoring more than 60% of maximum marks

B:Number of students scoring between 50 to 60% of maximum marks

C:Number of students passed and scored less than 50% of maximum marks

Figure 5: CO assessment by SEE

Overall attainment of course outcomes through CIE and SEE

CO Attainment Measured from CIE   CO Attainment Measured from SEE

↓   ↓

Calculating Final CO Attainment

CO Attainment = (CO attainment from CIE + Course attainment from SEE) / 2
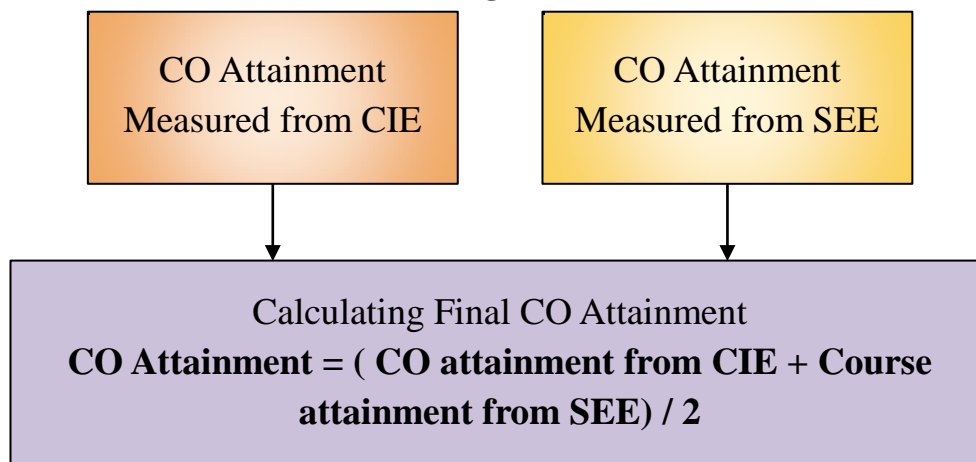
Figure 6: Overall Attainment of Course Outcome through CIE and SEE

5. Attainment of Program Outcomes and Program Specific Outcomes

Evaluation of attainment of POs and PSOs is based on direct and indirect assessment tools. Direct assessment of POs and PSOs is based on students' performance in CIE and SEE. Indirect assessment is based on graduate survey of the particular outgoing batch students. Figure 7 shows the process to record the attainment of POs and PSOs.
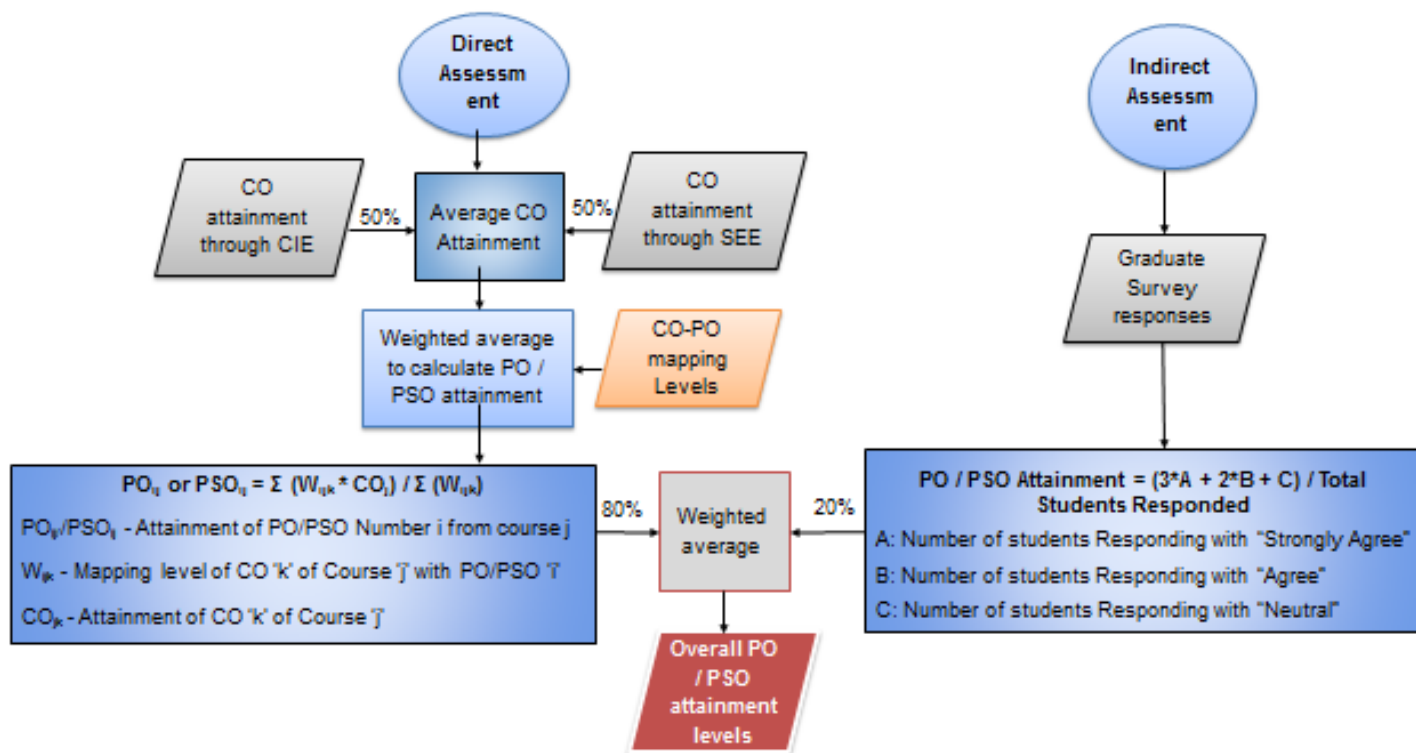
Figure 7: Process to record the attainment of POs and PSOs

6. Implementation of Outcome Based Education

Following coordinators are monitoring the Outcome Based Education (OBE) in the department(s) / programme(s).

1. **Course Coordinator** – Faculty responsible for the course, identified by the programme coordinator. He is responsible for the course he/she is teaching. The course coordinator is also responsible for the defining the course outcome in the beginning of every semester and attainment/assessment of the course.

2. **Program Coordinator** – The HOD of the programme shall identify the senior faculty as the programme coordinator. Programme coordinator is responsible for the assessment/attainment of the Programme Outcomes (POs) and Programme Specific Outcomes of the programme.

7. Program Assessment Committee (PAC) takes care the quality of teaching-learning process in the departments(s)/ Programme.

Program Assessment Committee is formed with the objective of interacting and maintaining the liaison with the key stake holders such as students, faculty, alumni and parents. There shall be one PAC for every program and the PAC shall monitor and reviews the activities of the program. The Program Coordinator (PC) shall be the chairman of the PAC. The Program coordinator is appointed by the HOD of the respective program. Generally the senior faculty member in the program and having the motivation to work for the betterment of the program is identified as the program coordinator.

Members of the PAC: The program coordinator is required to identify the members of the PAC after discussing with the respective HOD. Members of the PAC are HoD, program coordinator, senior faculty members, students, parents and alumni.

Duties of the PAC: The PAC is formed with an objective of strengthening the teaching-learning process in the program. Following are the duties of the PAC.

- Oversees daily operations and coordinates activates of the programme, including the activities to be carried out by the faculty of other programs and ensure quality teaching learning in the programme.
- PAC monitors and reviews the activities of the programme taking the course coordinators into confidence.
- Schedules programme work plan in accordance with specifications of the program objectives and outcomes.
- Conducts and interpret various surveys (Course end survey, Graduates exit survey, Alumni survey, Employer survey etc.) required to assess course and program outcomes.
- Communicate the effectiveness of teaching learning process adopted and the outcomes attainment in writing to the HOD.
- Identify the gap in the curriculum and communicate the same along with the remedies to the HOD.

About PAC meeting: The program coordinator is responsible to discuss the issues related to teaching learning process with the course coordinators. To ensure better teaching learning process, it is necessary to get the advice from key stakeholders through various surveys conducted from time to time. The PAC should meet at least once in every semester and discuss the attainment of Course Outcomes (COs) of the program. The PAC is also responsible for the attainment and measurement of Program Outcomes (POs). The POs are assessed at the end of every academic year.

- PAC meeting to be held once in every semester. The first PAC meeting to be held (Preferably 2nd week of October) to discusses about the attainment of course outcome of the even semester courses and attainment of Program Outcomes (POs) of the previous academic year. The second PAC meeting held in the last week of January every year discusses about the attainment of course outcomes of odd semester courses.
- The discussions held during the meeting should be documented properly by the program coordinator. The program coordinator also prepares the suggestions/recommendations related to the improvement of teaching-learning process and submits the report to the Internal Quality Assurance Cell (IQAC) for further discussion/implementation.

8. Annual Assessment Plan

The annual assessment plan for every academic year starting in the month of July and ending in the month of June is given in the table 4.

Table 4: Annual Assessment Plan

Month	Week	Activities	People responsible
July	I	Preparation and uploading previous year department e-newsletter	Faculty identified by the HOD
	II	IQAC meeting to plan for the academic year	IQAC coordinator
	III	Orientation on OBE and accreditation for the newly appointed faculty members	IQAC and New faculty
	III	Submission of perspective plans by all committees/cells	Committee Coordinators
	III	Preparation of Institute academic calendar for odd semester in line with VTU calendar	Vice Principal
	III	Preparation of department calendar for odd semester in line with institute calendar	HOD
	III	Preparation of class timetable and individual timetable	Timetable coordinator
	III	Research review presentation by the Faculty pursuing Research and Research scholars of SMVITM Research Center	Dean R&C, Research scholars
	III	Performance based appraisal one to one discussion with faculty	Management, Principal, HOD, All faculty
	III	Define the COs and plan the assessment plan for the theory as well as practical courses to be taught by the faculty during odd semester	All faculty
	IV	Conduct department meeting to discuss the activities to be conducted in the department	HOD
	IV	Conduct FDP on teaching learning	IQAC
August	Throughout	Adopt various assessment tools in the teaching-learning process	All faculty
	I	Collect and analyze the curriculum feedback from faculty, students, alumni and employer	Faculty identified by the HOD
	I	Conduct orientation program for first year students	Faculty identified by the Principal
	II	Collect the participation certificate (Internship & Other participation) from those students who have undergone the industrial training during even semester vacation	Faculty identified by the HOD
September	Throughout	Adopt various assessment tools in the teaching-learning process	All faculty
	III	Conduct first internal assessment test	EMS coordinator
	III	Conduct department meeting to review the progress of the department activities	HOD
	IV	Conduct class committee meeting to know the student grievances	HOD
	IV	Conduct first internal assessment review meeting	HOD
	IV	Send the first internal assessment performance report to the parents	FA/TG
	IV	Form student council	SWO
October	Throughout	Adopt various assessment tools in the teaching-learning process	All faculty
	I	Obtain the formative faculty feedback	IQAC/Faculty identified by the HOD
	II	PO measurement of previous academic year	Program Coordinator
	III	Conduct academic audit	IQAC
	III	PAC meeting to discuss PO attainment of previous year	PAC members
	III	Conduct second internal assessment test	EMS coordinator
	III	Conduct department meeting to review the progress of the department	HOD

		activities	
	IV	Conduct class committee meeting to know the student grievances	HOD
	IV	Conduct second internal assessment review and semester end result analysis meeting of previous semester	HOD
	IV	Send the second internal assessment performance report to the parents	FA/TG
	IV	Conduct parent teacher meeting	SWO
November	Throughout	Adopt various assessment tools in the teaching-learning process	All faculty
	I	IQAC meeting for the discussion of academic review	IQAC coordinator
	II	Get the list of students opted for open elective and professional electives and finalize the electives for next semester	HOD
	II	Encourage the students to undergo mini project, industrial training and such other activities during semester vacation so as to bridge the curriculum gap	Faculty identified by the HOD
	II	Obtain the summative feedback about the faculty, courses and also the response to assess the attainment of POs and PEOs.	IQAC/Faculty identified by the HOD
	III	Conduct third internal assessment test	EMS coordinator
	III	Conduct department meeting to review the progress of the department activities	HOD
	III	Conduct the course end survey	Program/course coordinator
	IV	Conduct graduation day	Faculty identified by the Principal
December	Throughout	Conduct semester end examinations of theory courses	CS, DCS and All faculty
	III	Course allotment to the faculty members for even semester	HOD
	IV	Complete the CO assessment for the odd semester courses and submit the course file to the program coordinator	All faculty
	IV	Personal details updation in the college website (publications, FDP, NPTEL course etc.,)	Web coordinator, All Faculty
January	I-II	Conduct semester end examinations of theory courses	CS, DCS and All faculty
	II	Define the COs and plan the assessment for the theory as well as practical courses to be taught by the faculty during even semester	All faculty
	II	Submission of perspective plans by all committees/cells	Committee Coordinators
	II	PAC meeting to review the CO attainment of odd semester	Program coordinator
	III	IQAC meeting	IQAC coordinator
	III	Preparation of Institute academic calendar for even semester in line with VTU calendar	Vice Principal
	III	Preparation of department calendar for even semester in line with institute calendar	HOD
	III	Preparation of class timetable and individual timetable	Timetable coordinator
	III	Conduct department meeting to discuss the activities to be conducted in the department	HOD
	III	Research review presentation by the Faculty pursuing Research and Research scholars of SMVITM Research Center	Dean R&C, Research scholars
February	Throughout	Adopt various assessment tools in the teaching-learning process	All faculty
	II	Collect the participation certificate (Internship & Other participation) from those students who have undergone the industrial training during even semester vacation	Faculty identified by the HOD
	III	Annual Sports meet	PED
March	Throughout	Adopt various assessment tools in the teaching-learning process	All faculty
	III	Conduct first internal assessment test	EMS coordinator
	III	Conduct department meeting to review the progress of the department activities	HOD
	III	Conduct class committee meeting to know the student grievances	HOD
	IV	Conduct first internal assessment review meeting	HOD
	IV	Send the first internal assessment performance report to the parents	FA/TG
	IV	Conduct institute annual fest (Varnothsava)	Extra-curricular

			coordinator
April	Throughout	Adopt various assessment tools in the teaching-learning process	All faculty
	I	Obtain the formative faculty feedback	IQAC/Faculty identified by the HOD
	III	Conduct second internal assessment test	EMS coordinator
	III	Conduct department meeting to review the progress of the department activities	HOD
	III	Conduct class committee meeting to know the student grievances	HOD
	III	Conduct parent teacher meeting	SWO
	IV	Send the second internal assessment performance report to the parents	FA/TG
	IV	Conduct alumni meet	Alumni coordinator
	IV	Conduct International/National Conference	Faculty identified by the Principal
May	Throughout	Adopt various assessment tools in the teaching-learning process	All faculty
	II	Get the list of students opted for open elective and professional electives and finalize the electives for next semester	HOD
	II	Encourage the students to undergo mini project, industrial training and such other activities during semester vacation so as to bridge the curriculum gap	Faculty identified by the HOD
	II	Obtain the summative feedback about the faculty	IQAC/Faculty identified by the HOD
	III	Conduct third internal assessment test	EMS coordinator
	III	Conduct department meeting to review the progress of the department activities	HOD
	III	Conduct the course end survey	All faculty
	III	Conduct the graduate survey	Program coordinator
June	Throughout	Conduct semester end examinations for both theory and lab courses	CS, DCS and All faculty
	II	Course allotment to the faculty members for odd semester of next academic year	HOD
	II	Submission of filled self-appraisal form to the HOD	All faculty members
	III	Complete the CO assessment for the even semester courses and submit the course file to the program coordinator	All faculty
	IV	Submission of activity completion report by the various college level committee/cell to Principal	Coordinator of various committees
	IV	Personal details updation in the college website (publications, FDP, NPTEL course etc.,)	Web coordinator, All Faculty

Apart from the above, all department/committee/cell shall plan and conduct the activities throughout the academic year.