

2.6.2 Attainment of CO, PO & PSO

The process of attainment of COs, POs and PSOs starts from finalizing COs for each course of the program from first year to fourth year. The course outcomes given by University of Mumbai are discussed by the concerned faculty members and COs are finalized using action verbs of learning levels as per Bloom's Taxonomy.

Then, a correlation is established between COs and POs in the scale of 1 to 3, 1 being the slight (low), 2 being moderate (medium) and 3 being substantial (high). A mapping matrix is prepared in this regard for every course in the program including the elective courses. The course outcomes and their mapping with POs are reviewed frequently by a committee of senior faculty members before they are finalized. Correlation between the course outcomes and program outcomes (POs) and Program Specific Outcomes (PSOs) is established for all courses of the program. The PSOs are in tune with the expectation of the professional bodies and the society.

For each course, attainment level of all course outcomes is arrived at rigorously based on the student performance in the internal and external examinations. Similarly, the direct and indirect feedback at the end of course helps to assess the course outcome indirectly. Thus, the CO attainment is a combined result of direct and indirect assessment.

This in turn helps in arriving at the PO assessment as each CO is mapped with certain POs and PSOs. Besides this, the exit survey is taken from students for indirect assessment of the PO's. The alumni, employer and parent's surveys are also taken for indirect assessment of the Pos and PSOs. The entire process of attainment of learning outcomes is shown in **Fig-1**. Now PO can be calculated with the help of following equation

$$WP_i = \sum_j \frac{(CO_j)}{6} \quad (i = 1 \text{ to } 12 \text{ and } j = 1 \text{ to } 6)$$

(where WP_i is the Weight factor for Programming Outcome PO_i)

CO attainment:

Direct Attainment of CO = 30% of CO attainment in internal examination + 60 % of CO attainment in the external examination +10% Course exit feedback and indirect feedback. Thus overall attainment of CO = 90% CO attainment from Direct method + 10 % of CO attainment through Indirect method.. COs are mapped with PO and PSO as shown in **Table 1**. PO and PSO

attainment: The direct attainment of PO and PSO is obtained by taking into consideration contribution of each course as shown in Program attainment matrix described in **Table 2**.

Direct Attainment of PO = Average of attainments of all CO contributing to the specific PO. Overall attainment of PO = 90% attainment through the direct method + 10 % of PO attainment through indirect method.

Overall attainment of PO = 90% PO_{dir} + 10 % PO_{indir}

Indirect attainment: Questionnaires are developed for stake holder (eg students, parents and industry persons..etc). They are circulated among them for survey via direct communication, emails or post etc. The data received from them has been analyzed and used for attainment of POs.