program that aims to attain the abovementioned POs should ensure that its curriculum encompasses all the attributes of the Knowledge Profile (K1 – K8) as presented in Table 4.1 and as included in the PO statements. The ranges of Complex Problem Solving (P1 – P7) and Complex Engineering Activities (A1 – A5) that should be addressed in the program are given in Tables 4.2 and 4.3, respectively.

Table 4.1: Knowledge Profile

	Attribute
K1	A systematic, theory-based understanding of the natural sciences applicable to the discipline
K2	Conceptually based mathematics, numerical analysis, statistics and the formal aspects of computer and information science to support analysis and modeling applicable to the discipline
K3	A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline
K4	Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline
K5	Knowledge that supports engineering design in a practice area
K6	Knowledge of engineering practice (technology) in the practice areas in the engineering discipline
K7	Comprehension of the role of engineering in society and identified issues in engineering practice in the discipline: ethics and the engineer's professional responsibility to public safety; the impacts of engineering activity; economic, social, cultural, environmental and sustainability
K8	Engagement with selected knowledge in the research literature of the discipline

Table 4.2: Range of Complex Engineering Problem Solving

Attribute	**Complex Engineering Problems** have characteristic P1 and some or all of P2 to P7:
Depth of knowledge required	P1: Cannot be resolved without in-depth engineering knowledge at the level of one or more of K3, K4, K5, K6 or K8 which allows a fundamentals-based, first principles analytical approach
Range of conflicting requirements	P2: Involve wide-ranging or conflicting technical, engineering and other issues
Depth of analysis required	P3: Have no obvious solution and require abstract thinking, originality in analysis to formulate suitable models
Familiarity of issues	P4: Involve infrequently encountered issues
Extent of applicable codes	P5: Are outside problems encompassed by standards and codes of practice for professional engineering
Extent of stakeholder	P6: Involve diverse groups of stakeholders with widely varying

involvement and conflicting requirements	needs
Interdependence	P7: Are high level problems including many component parts or sub-problems

Table 4.3: Range of Complex Engineering Activities

Attribute	**Complex activities** means (engineering) activities or projects that have some or all of the following characteristics:
Range of resources	A1: Involve the use of diverse resources (and for this purpose resources include people, money, equipment, materials, information and technologies)
Level of interaction	A2: Require resolution of significant problems arising from interactions between wide-ranging or conflicting technical, engineering or other issues
Innovation	A3: Involve creative use of engineering principles and research-based knowledge in novel ways
Consequences for society and the environment	A4: Have significant consequences in a range of contexts, characterized by difficulty of prediction and mitigation
Familiarity	A5: Can extend beyond previous experiences by applying principles-based approaches

The program should describe the process involved in defining and refining the POs. The correlation between the course outcomes (COs) and POs should be demonstrated through the mapping of COs onto POs.

The way in which each attribute of the Knowledge Profile (K1 – K8) is addressed in the curriculum should be demonstrated through mapping. The program should also demonstrate how each attribute of the Range of Complex Engineering Problems (P1 – P7) and Complex Engineering Activities (A1 – A5) is incorporated in the teaching, learning and assessment.

For each course, a course file must be maintained. The course file should include the assessment of outcomes, curriculum, examination questions and answer scripts, the results of other assessments, and a summary of performance and attainment of course outcomes with suggestions or feedback for future development.
POs should be assessed using direct methods. Direct methods of assessment are accomplished through the direct examination or observation of students' knowledge or skills against measurable performance indicators or rubrics. In addition, indirect methods may also be used for PO assessment. Indirect methods of assessment are based on opinions or self-reports from different stakeholders. The way in which various assessment tools, including examinations and rubrics, contribute to the evaluation of