



SAGE University, Bhopal


Standard Operating Procedure



Outcome Based Education

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1. Introduction

In the academic system, **Outcome** means learning outcomes. These learning outcomes student should be able to display at the end of the learning in HEI. In the early 90's, the term Outcome Based Education shifted the focus of education industry from teaching to learning. In traditional system, teachers are worried about what they teach rather than what their students learn.

In Outcome Based Education, curriculum and courses are designed according to program exit outcomes, to be displayed by student at the end of their learning. In the Outcome Based Education, main priority is what needs to be accomplished by the end of the learning, or it emphasizes on what is expected from the student to finally achieve after the degree. The Outcome Based Education system is now found to be successful for the teachers and students to measure the learning outcomes. Components of OBE -

a) Vision and Mission

Vision - The fundamental objective behind establishment

Mission - Mission statements are the action plan to achieve the vision.

b) Program educational objectives (PEOs)

The PEOs of any program are graduate attributes which could be achieved after three to five years of the graduation.

c) Program Outcomes (POs/PSOs)

It is the main component of Outcome Based Education, these are the Graduate attributes. These should be displayed by the students at the end of their degree.

d) Course Outcomes (Cos)

It is the outcome of any course, these COs are produced based on the requirement of the program outcomes. Each CO will be mapped to POs/ PSOs, and the PO/ PSO will also be mapped to the PEOs.



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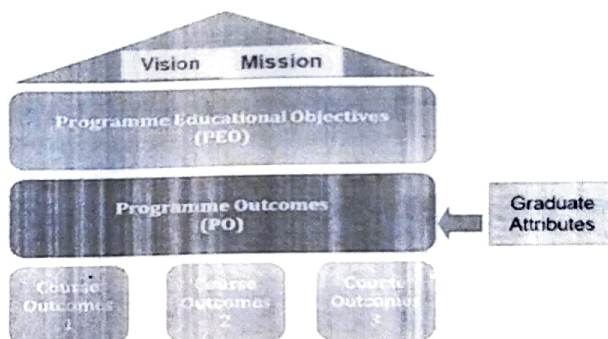


Fig 1(a) - Components of Outcome Based Education

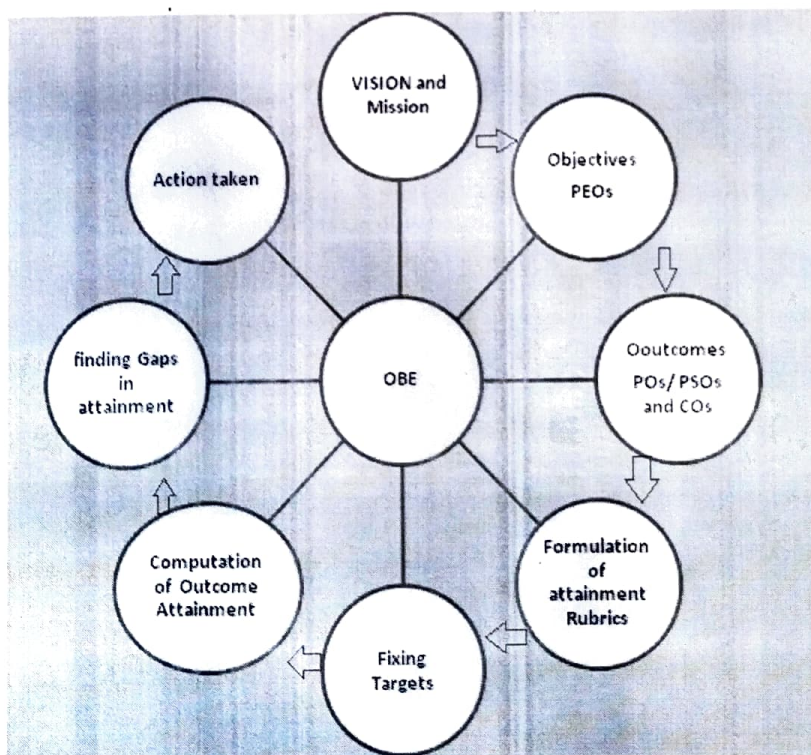


Fig 1(b) - Procedural flow of Outcome Based Education



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2. Vision and Mission

Vision and mission are the strategic statement about the purpose and priorities of the University. These statements are as a contract between the organization and various stakeholders. A well-written statement can guide decision-making, resource allocation, policy decisions, and the way of operations.

2.1 Formulation of University Vision and Mission

In order to formulate University Vision and Mission, the following steps are to be followed –

1. Feedback of stakeholders (Students, Parents, Faculty, Industry) through Dean/ HOS/ HOD.
2. Feedback by senior authorities such as VC, Pro VC, Registrar, CRC, CSA.
3. Feedback from promoting body such as chancellor, Pro chancellor, Executive Director etc.
4. All the suggestions to be compiled by the registrar office.
5. A team of following officers will formulate the mission of the University.
 - Pro Vice Chancellor (Chairman)
 - Director IQAC (Member)
 - Coordinator Students Affairs (Member)
 - Registrar (Member Secretary)
6. The prepared Vision is would be placed to the stating committee for the approval.
7. The approved Vision would be circulated to all the Deans/ HOSs/ HODs and displayed on the website for wide circulation.



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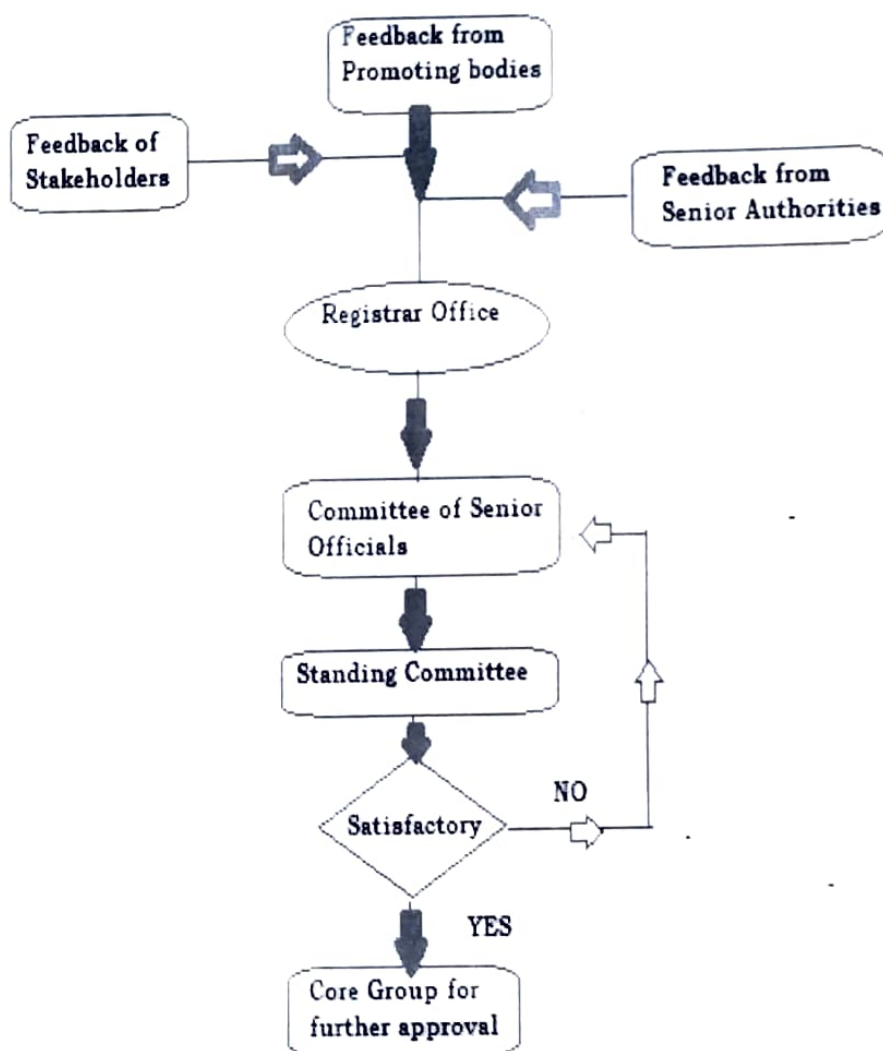


Figure 2- Process of Defining University Vision and Mission



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2.2 Formulation of School/ Department Vision and Mission

1. Vision and Mission of the University are taken as basis.
2. Dean/ HOS/ HOD organize meetings with stakeholders and collect their views.
3. Dean/ HOS/ HOD summarize the collected views and finalize the draft of Vision and Mission and forward the same to Departmental Committee.
4. Departmental Committee reviews and forwards the statements to the Academic Council for further approval.
5. The Dean/ HOS/ HOD of the School/ Department publish the Approved Vision and Mission statements.

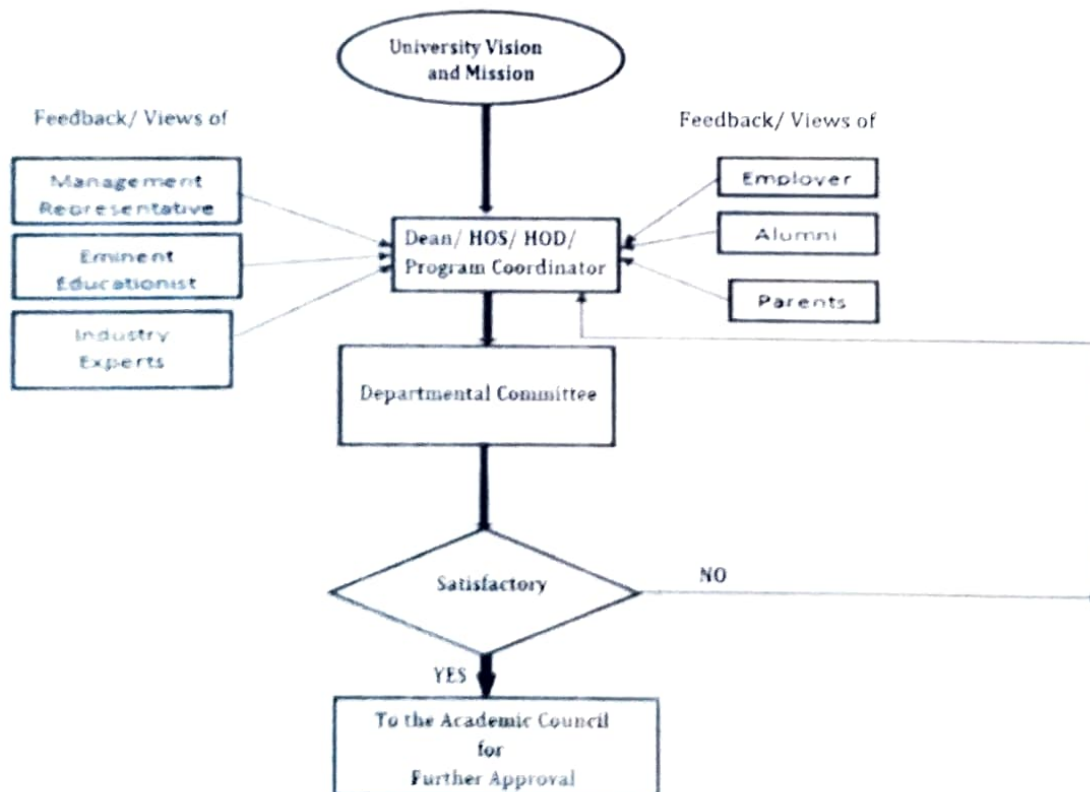


Figure 3– Process of Defining Vision and Mission of the School/ Department



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3. Defining PEOs/ POs/PSOs/COs

3.1 Program Educational Objectives (PEOs)

- The PEOs of any program are that its graduates could achieve three to five years after the graduation. It is set for the entire Program being offered by any school or department.
- Broad statements of the objectives for which any specific program is run.
- Should help in achieving the vision of the department.
- Aligned to the Mission
- Established through a consultation process and brainstorming sessions involving the stakeholders such as Management, Students, Faculty, Alumni, Employer/ Industry representatives and Parents / Guardians of students.
- Achievable
- Future technological trends are predominantly considered.
- Process of Defining PEOs

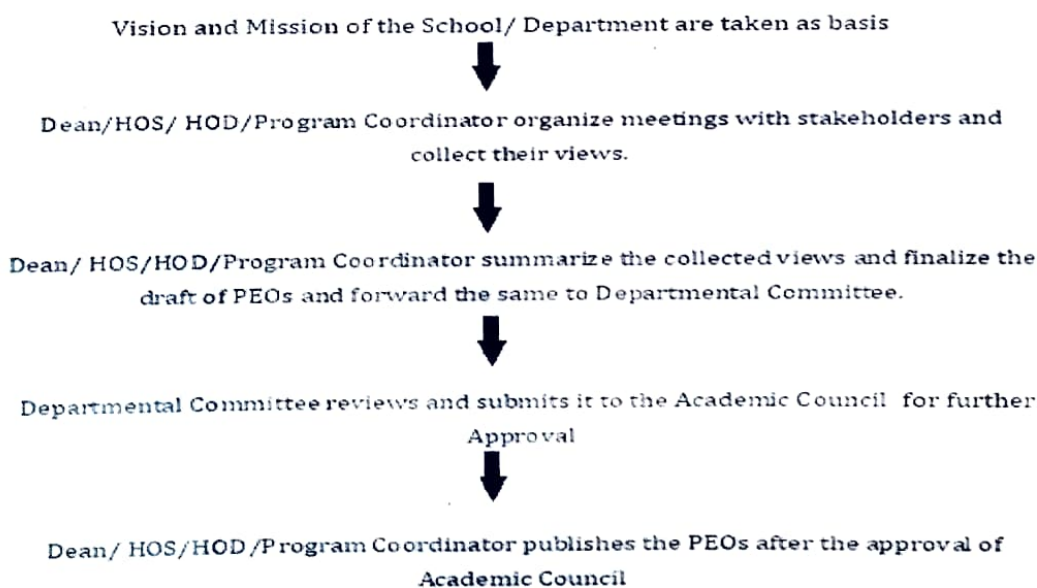


Figure 4 – Process of Defining PEOs



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- While defining the PEOs the vision and mission of the School, the strengths of the Program, and previous experiences are considered
- For a particular program, if PEO are being crafted for the first time, then a Need Survey should also be conducted.
- The academic factors and administrative set up of the School and department should also be considered.
- The process of preparing the PEOs is documented and PEOs are widely publicised for creating awareness at University website, School webpages, Corridors, laboratories, library etc.
- School must ensure that the program is being implemented in order to achieve the PEOs
- School must establish a mechanism for monitoring and reviewing the progress of attaining the PEOs.
- The PEOs will be assessed after three to five years of the graduation through a tracer study and employers questionnaire surveys.
- The data obtained from the assessment will be used as basis for the improvement of the existing PEOs

3.2 Program Outcomes (POs)

- What students should know and be able to do at the end of the program
- Are to be in line with the graduate attributes defined by Washington Accord
- POs are to be specific, measurable and achievable

3.3 Program Specific Outcomes (PSOs)

- The Program Specific Outcomes (PSOs) are defined on the basis of focus area of entire curriculum by Dean/ HOS/ HOD and approved in Department Committee meeting.
- PSOs are stated considering the internal competence of the faculty members
- PSOs are stated considering the resources of the institute, requirements of the industry and for creating wider scope for employment and higher package
- PSOs are stated to satisfy the needs of the students



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3.4 Course Outcomes (COs)

- All courses under any academic program would have their own course outcomes , commonly known as COs
- It is the outcome of any course, these COs are produced based on the requirement of the program outcomes.
- Each CO will be mapped to POs/ PSOs, and then PO/PSO will be mapped to the PEOs.
- COs are the statements of what a student should know, understand and/or be able to demonstrate after the completion of a course
- State the major skills, knowledge, attitude or ability that students will acquire
- Expressed in terms of measurable and/or observable behaviors
- Should be derived from program outcomes (POs)
- should begin with an action verb from Bloom's taxonomy
- Course Outcome statement generally divided into two main components - An action word that identifies the performance to be demonstrated and a Learning statement that specifies what learning will be demonstrated in the performance.
- Course outcome must be Measurable, Observable, Realistic and Holistic for the course



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4. Bloom's Taxonomy Based Teaching – Learning

Bloom's taxonomy is a classification system used to define and distinguish different learning levels. Educators have typically used Bloom's taxonomy in the defining outcomes, development of assessments (tests and other evaluations of student learning), curriculum (units, lessons, projects, and other learning activities), and instructional methods such as questioning strategies. There are six learning levels as per the revised version of Bloom's Taxonomy. The six levels are **remembering, understanding, applying, analyzing, evaluating, and creating**. Bloom's taxonomy primarily provides instructors with a focus for developing their course learning outcomes. There are a number of reasons why a teacher would want to use Bloom's taxonomy. Initially, it can be used to increase one's understanding of the educational process.



Figure 5- Different learning levels



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Northeastern University
Center for Learning, Teaching, and Assessment
Boston, U.S.A.

REVISED Bloom's Taxonomy Action Verbs

I. Remembering	II. Understanding	III. Applying	IV. Analyzing	V. Evaluating	VI. Creating
Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers.	Demonstrate understanding of facts and ideas by organizing, comparing, interpreting, giving descriptions, and stating main ideas.	Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.	Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations.	Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria.	Compile information together in a different way by combining elements in a new pattern or proposing new solutions.
define describe duplicate enumerate examine identify label list locate match memorize name observe omit quote read recall recite recognize record repeat reproduce retell select state tabulate tell visualize	ask associate cite classify compare contrast convert describe differentiate discover discuss distinguish estimate explain express extend generalize give examples group identify illustrate indicate infer interpret judge observe order paraphrase predict relate report represent research restate review rewrite select show summarize trace transform translate	act administer apply articulate calculate change chart choose collect complete compute construct determine develop discover dramatize employ establish examine experiment explain illustrate interpret judge manipulate modify operate practice predict prepare produce record relate report schedule simulate sketch solve teach transfer write	advertise analyze appraise calculate categorize classify compare conclude connect contrast correlate criticize deduce devise diagram differentiate discriminate dissect distinguish divide estimate evaluate experiment explain focus illustrate infer order organize plan prioritize select separate subdivide survey test	appraise argue assess choose compare conclude consider convince criticize critique debate decide defend discriminate distinguish editorialize estimate evaluate find errors grade judge justify measure order persuade predict rank rate recommend reframe score select summarize support test weigh	adapt anticipate assemble collaborate combine compile compose construct create design develop devise express facilitate formulate generalize hypothesize infer integrate intervene invent justify manage modify negotiate originate plan prepare produce propose rearrange reorganize report revise rewrite role-play simulate solve speculate structure test validate write

Adapted from Anderson, L. W., & Krathwohl, D. R. (2001). *A taxonomy for learning, teaching, and assessing*. Abridged Edition. Boston, MA: Allyn and Bacon.

Figure 6- Action Verbs in all the levels of Revised Bloom's Taxonomy



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5. Guidelines for Mapping of CO, PO/PSO and PEO

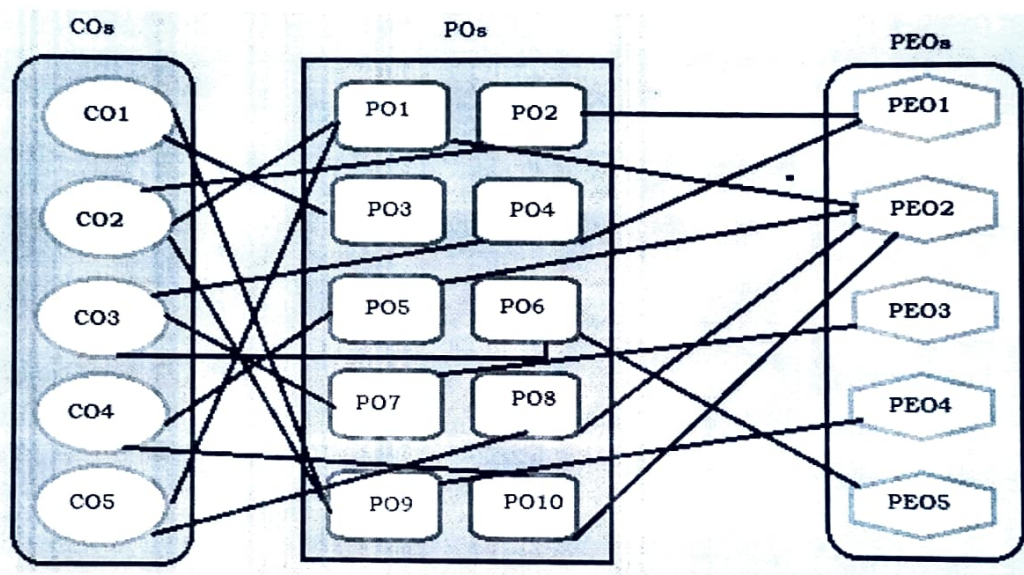


Fig 7- Relationship between CO, PO/PSO and PEO

- The school must have a systematic hierarchical process to monitor all courses of the program. Faculty handling a particular course is responsible for defining Course Outcomes (COs) for the assigned course and to do mapping of COs to POs/PSOs. COs defined by faculty members and its mapping with Pos/PSOs for that particular course is validated by HOS/HOD.
- The Program Specific Outcomes (PSOs) are defined on the basis of focus area of entire curriculum by HOS/ HOD/ Programme coordinator and approved in Departmental Committee (DC) meeting.



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- To define the curriculum for attaining the Program Outcomes and Program Specific Outcomes, HOS/ HOD/ Programme coordinator organizes meetings. Eminent subject experts and representatives of industry are invited in the meetings. During discussion syllabus of other leading Universities are also considered.
- The extent of correlation of each course to POs is established by mapping each course outcomes to the Program Outcomes with a level of emphasis either substantially correlated (3), moderately correlated (2), slightly correlated (1) and Not correlated (-). Similar approach is used for mapping CO to PSOs.
- A particular PO/PSO may be contributed by more than one COs of a particular course. Mapping of a course to the specific PO/PSO will be with maximum level of emphasis if course outcomes are significantly satisfying that particular PO/PSO.
- CO to PO and CO to PSO correlation for all courses are compiled in a matrix form for further analysis.
- A PO/PSO contributed by very few courses or the syllabus of a course is not adequately attaining the PO/PSOs then it is considered as weakly addressed by curriculum. From the above analysis weakly addressed POs/PSOs by curriculum are identified.



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6. Attainment of CO/ PO/ PSO/ PEO (UG Civil Engineering)

6.1 Program Educational Objectives (PEOs)

- 1) **PEO1:** Graduates will have the ability to apply knowledge across the disciplines and in emerging areas of Civil engineering to be applied in their **higher studies and research**.
- 2) **PEO2:** Graduates will demonstrate all necessary engineering and scientific competence to **work effectively** in the field of Civil engineering and allied fields considering the **social and environmental issues**.
- 3) **PEO3:** Graduates shall have **good communication skills** and will become an established professional with sound **ethical values**.
- 4) **PEO-4:** Graduates will show **good team-spirit and problem-solving skills** so they can lead organizations they join in or initiate their own ventures.
- 5) **PEO-5:** Graduates will be able to analyze the requirements, understand the technical specifications and **design the innovative solutions** by applying the principles of Civil engineering.

6.2 Program Outcomes (POs)

- 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, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.



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- 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.



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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.

6.3 Program Specific Outcomes (PSOs)

1. **PSO 1:** Graduates will be able to **apply knowledge** of Civil Engineering for **analyzing and designing projects** in the field of Structures, Transportation, Hydraulics and Irrigation engineering.
2. **PSO 2:** Graduates will design and develop Civil Engineering projects **concerning environment, ecology, energy conservation and safety**.
3. **PSO 3:** Graduates will be able to plan and execute Civil Engineering projects applying **relevant codes of practice for materials and techniques**.



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6.4 Mapping of POs with PEOs

No.	Program Outcomes	PEOs attained through PO	Program Educational Objectives
PO1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	1,2,5	PEO1: Graduates will have the ability to apply knowledge across the disciplines and in emerging areas of Civil engineering to be applied in their higher studies and research .
PO2	Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	1,2,5	PEO2: Graduates will demonstrate all necessary engineering and scientific competence to work effectively in the field of Civil engineering and allied fields considering the social and environmental issues .
PO3	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.	1,2,5	PEO3: Graduates shall have good communication skills and will become an established professional with sound ethical values .



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P04	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	1,2,5	PEO-4: Graduates will show good team-spirit and problem-solving skills so they can lead organizations they join in or initiate their own ventures.
P05	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.	1,2,5	PEO-5: Graduates will be able to analyze the requirements, understand the technical specifications and design the innovative solutions by applying the principles of Civil engineering.
P06	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.	2,3	
P07	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.	2,3	



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P08	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.	1,2,3,4,5
P09	Individual and team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings	1,2,4
P010	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.	2,3
P011	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	1,3,5
P012	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.	1,2,3,4,5

Table 1(a) - Mapping of POs with PEOs



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↓ PO \ PEO →	PEO1	PEO2	PEO3	PEO4	PEO5
P01	Y	Y			Y
P02	Y	Y			Y
P03	Y	Y			Y
P04	Y	Y			Y
P05	Y	Y			Y
P06		Y	Y		
P07		Y	Y		
P08	Y	Y	Y	Y	Y
P09	Y	Y		Y	
P010		Y	Y		
P011	Y		Y		Y
P012	Y	Y	Y	Y	Y

Table 1(b) - Mapping of POs with PEOs



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6.5 Writing the COs

Please follow following guideline while writing the COs –

1. They must state the ability that a student will acquire after studying this course.
2. They should measurable and/or observable.
3. COs should drive Program Outcomes.
4. All the courses in the department should have a uniform number of COs (between 4 and 6 usually 5).
5. Should be written by the course/subject expert
6. Course outcomes should contain an action verb from Bloom's taxonomy.

6.5.1 Example

COs of Structural Design (Course in UG Civil Engineering)

Following steps are involved in the Design of any Object/ Structure:

1. Selection of material with required quality/ grade
2. Selection of design methodology
3. Perform design
4. Apply checks (as per standards)
5. Display of final product

So, Cos of structural design according to the above steps -

COs	The students will be able to
CO1	Utilize the knowledge of various properties of concrete and structural steel
CO2	Explain the principle of working stress method and limit state methods of design
CO3	Design the beams, slab, stairs, column and footing
CO4	Apply IS code of practice for the design and checks of building components
CO5	To draw the structural components based on design



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CO-PO Mapping

COs	The students will be able to	POs attained through concerned CO	POs	Program Outcomes
C01	utilize the knowledge of various properties of concrete and structural steel	1, 2,3,4,5,12	P01	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
C02	explain the principle of working stress method and limit state methods of design	1, 2,3,4,5,12	P02	Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.



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C03	design the beams, slab, stairs, column and footing	1,2,3,5,6,7,8,9,10,12	P03	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.
C04	apply IS code of practice for the design and checks of building components	1, 2,3,4,5,6, 10,12	P04	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
C05	to draw the structural components based on design	1,2,5,9,12	P05	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.



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	P06	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.
	P07	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.
	P08	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
	P09	Individual and team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
	P010	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.
	P011	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
	P012	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.

Table 2(a) - Mapping of COs with POs



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Mapping of COs with Pos

The students will be able to	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1: utilize the knowledge of various properties of concrete and structural steel	3	2	3	3	3	-	-	-	-	-	-	3	3	-	3
CO2: explain the principle of working stress method and limit state methods of design	3	2	3	3	3	-	-	-	-	-	-	3	3	-	1
CO3: design the beams, slab, stairs, column and footing	3	2	3	3	3	1	1	1	1	1	-	3	3	1	2
CO4: apply IS code of practice for the design and checks of building components	3	2	3	3	3	1	-	-	-	1	-	3	3	-	3
CO5: to draw the structural components based on design	3	2	-	-	3	-	-	-	1	-	-	3	3	-	2
Average	3	2	3	3	3	1	1	1	1	1	-	3	3	1	3

Table 2(b) - Mapping of COs with POs



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Assessment of Course outcomes

Course Type	Assessment Tool	Assessment Criteria	Data Collection
Theory	Mid Semester Exam I & II	Based on student performance in internal Exams	Twice in a semester <i>(Questions from 2 COs in I test and 3 COs in II test)</i>
	Assignments	Based on student performance in Assignment/Tutorial	At-least one assignment per CO
	University Exams for Theory (ESE)	Based on student performance in University Exam	Once in a semester <i>(Questions from all the 5 COs)</i>
Lab	Continuous Evaluation	Based on Student performance in laboratory Classes , Submissions and internal Viva	Every turn of laboratory Class
	University Exam for Lab (ESE)	Based on student performance in University Exam	Once in a semester

Table 3- Components involved in assessment of COs



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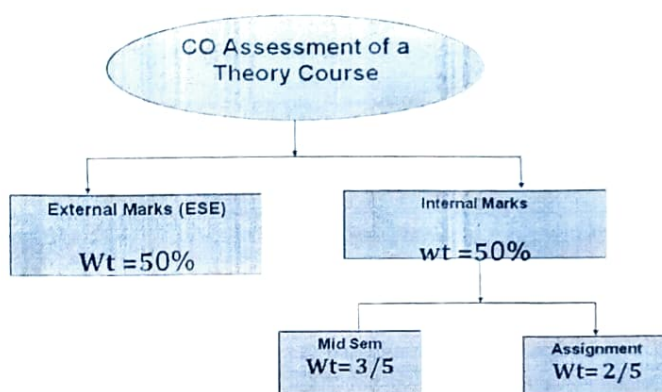
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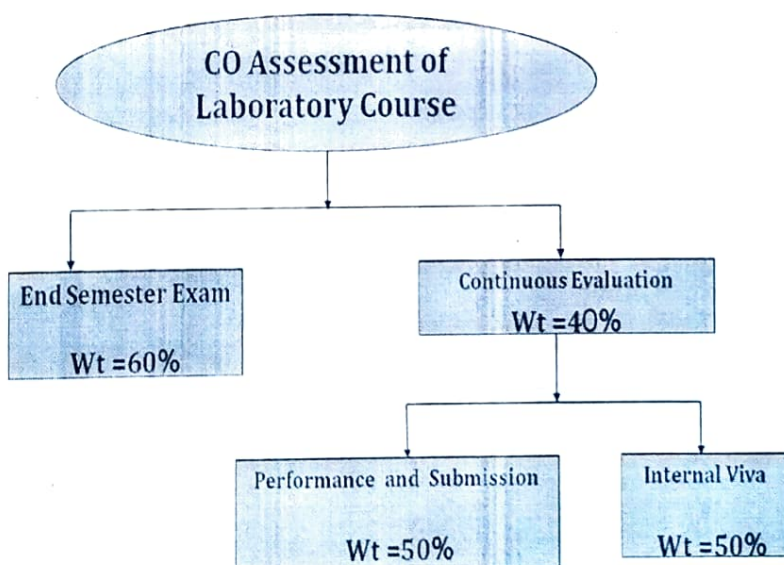
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6.5.2 Weightage of different components in Theory and Laboratory Course

Theory Course



Laboratory Course





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6.5.3 Tabulation of Data for Assessment of COs

CO Assessment of a Theory Course

Enrollment No.	Name	ESE (50)	MSE (30)	Assignment (20)	Total (100)
-------------------	------	-------------	-------------	--------------------	----------------

CO Assessment of a Practical Course

Enrollment No.	Name	ESE (60)	Performance and Submission (20)	Internal VIVA (20)	Total (100)
-------------------	------	-------------	--	--------------------------	----------------

6.5.4 Rubrics for the assessment of COs

RUBRICS for External Evaluation (Theory/Practical)		
Attainment		Rubrics
Level	3	80% Students secure more than 50% Marks
Level	2	70% Students secure more than 50% Marks
Level	1	60% Students secure more than 50% Marks



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RUBRICS for Internal Evaluation (Theory/Practical)

Attainment		Rubrics
Level	3	80% Students secure more than 80% Marks
Level	2	70% Students secure more than 80% Marks
Level	1	60% Students secure more than 80% Marks

$$\text{Attainment of CO}_{xx} = 0.5 \times \text{EE} + 0.5 \times \text{IE}$$



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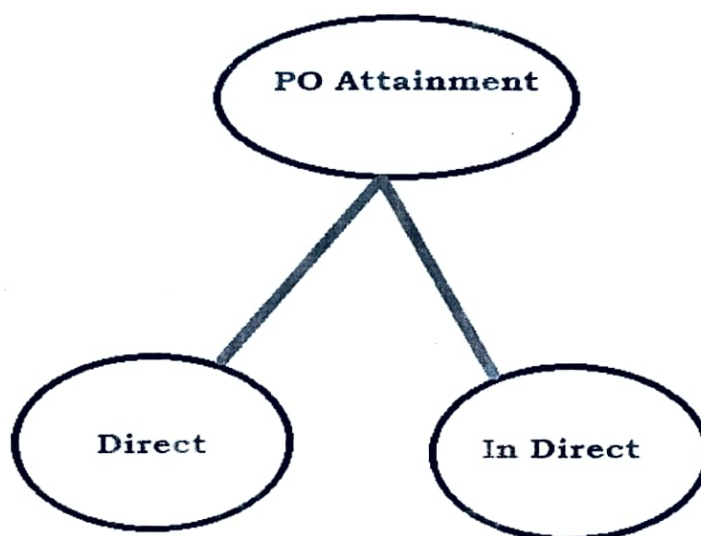
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6.6 Attainment of Program Outcomes and Program Specific Outcomes



Direct Assessment Method - Performance in the ESE, MSE, Assignments, Tutorials/ QUIZ

Indirect Assessment Method – Program End Survey (50%), Employer Survey (20%) Alumni Survey (15%), Parents Survey (15%)

PO/PSO attainment = 0.8 x Direct PO/PSO attainment

+

0.2 x indirect PO/PSO attainment



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6.6.1 Direct Assessment Method

Direct methods show the students' knowledge and skills from their performance in the internal evaluation such as internal tests/mid semester tests, assignments, presentations and university examination. These methods provide a sampling of what students know, thus providing strong evidence of student learning against measureable course outcomes. The knowledge and skills described by the course outcomes are mapped to specific problems on internal exams/assignment/group task. Throughout the semester the faculty records the performance of each student on each course outcome. At the end of the semester direct assessment of PO is computed combining the student performance on internal as well as university examination giving them 50:50 weightage. Students finally get grades from university.

6.6.2 Indirect Assessment Method

Direct assessment methods do not fully assess student's performance like leadership quality, lifelong learning, social responsibility and their performance in professional career. Therefore indirect methods are employed for the assessment such attributes of learning.

Indirect methods use surveys and feedback from students and rest of the stakeholders such as parents, their employer, alumni to assess students learning. Indirect assessment strategies are implemented by embedding them in the Parent's Survey, Employer's survey, Programme end survey and Alumni Survey.

Finally, program outcomes are assessed combining attainments through direct and indirect methods in the proportion of 80:20.



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6. MATRICES required for calculating the attainments

(May vary as per Scheme of respective program)

CO Attainment _____ (Course Name) Theory					
CO	External Attainment (EA)	Internal Attainment (IA)	Final $= (0.5 \times EA + 0.5 \times IA)$	Target	GAP
C01					
C02					
C03					
C04					
C05					

Matrix 1 - CO Assessment of a Theory course

CO Attainment _____ (Course Name) Laboratory					
CO	External Attainment (EA)	Internal Attainment (IA)	Final $= (0.6 \times EA + 0.4 \times IA)$	Target	GAP
C01					
C02					
C03					
C04					
C05					

Matrix 7.2 - CO Assessment of a Laboratory Course



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7.1 Attainment of PO/PSO

PO/PSO attainment= 0.8x Direct PO/PSO attainment + 0.2x indirect PO/PSO attainment

Direct PO Attainment: Attainment of Program Outcome through Course Outcomes.

- Direct PO attainment is calculated using CO attainment with the help of the mapping table for CO-PO.
- For each course, the no. of COs mapped to each PO are identified.
- PO attainment due to one course is calculated by average sum of product of weightage and CO attainment

$$\text{Direct PO Attainment} = \frac{\sum (\text{CO-PO Mapping} \times \text{CO Attainment})}{\sum \text{CO-PO Mapping}}$$

Example

For a course "(_____)"

CO	EA	IA	Final =(0.5*EA+0.5*IA)
C01	2	3	2.5
C02	3	2	2.5
C03	1	1	1
C04	1	0	0.5
C05	2	3	2.5



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Theory Course CO-PO mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	3	2	3	-	-	-	-	-	1	-	-	-
C02	3	2	3	-	-	-	-	-	1	-	-	-
C03	3	2	3	-	-	-	-	-	1	-	-	-
C04	3	2	3	-	-	-	-	-	1	-	-	-
C05	3	2	3	-	-	-	-	-	1	-	-	-
Po Attainment	3									-	-	-

7.1.1 Total Direct PO attainment of any course is calculated as

$$\text{Total PO attainment} = (\text{PO attainment of TH}) * 2/3 + (\text{PO attainment of LAB}) * 1/3$$

Total Direct PO Attainment	Attainment of Theory (T)	Attainment of Lab (L)	Total
Theory +Lab	2/3	1/3	$T * 2/3 + L * 1/3$
Theory	1	0	T
Lab	0	1	L



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PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PO Attainment Theory (T)												
PO Lab (L)												
Total Direct PO Attainment= 2/3(T) + 1/3(Lb)												

Indirect PO attainment

Tools Used (Percent Wait age)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Exit Survey (50%)	3	2	3	2	2	3	3	2	2	2	2	2
Employer Survey (20%)	3	2	3	2	2	3	3	2	2	2	2	2
Alumni Survey (15%)	3	2	3	2	2	3	3	2	2	2	2	2
Parents Survey (15%)	3	2	3	2	2	3	3	2	2	2	2	2
Final Indirect PO	3	2	3	2	2	3	3	2	2	2	2	2



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Final PO & PSO attainments

Sem	Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
I																
II																
.....																
.....																
....																
Direct PO-PSO Attainment(DA)																
Indirect-PO- PSO Attainment (IA)																
Final-PO & PSO Attainment (0.2 *IA + 0.8*DA)																
Target																
Gap In Attainment																

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Each School should conduct two mid semester test, first test of 20 and second of 30 marks. Guidelines for preparing MSE question papers -

1. University End semester question papers are taken as reference.
2. Exam coordinator sends question paper format to all concerned faculty members.
3. All faculty members prepare question paper according to format for their subject. For every question, its mapping to Bloom's Taxonomy level as well as to COs are taken into account.
4. HOS/HOD calls the meeting of scrutiny committee to review the level of questions and their mapping with COs and approves the question papers.
5. Answer sheets are evaluated and given to students for their analysis. Records of marks are maintained by concerned faculty members.
6. Based on the performance of the students COs attainments are assessed and poorly attained COs and corresponding units of the syllabus are identified and instructions are issued to concerned faculty for improvement.

Session: 2022-23

SAGE University, Bhopal						
School of Engineering and Technology						
Program_____						
Class:	Time: 1.00 Hr			Max. Marks: 20		
Course Name: Geo Tech Engg II (CE -8002)						
Bloom's Taxonomy Level	Remembering	Understanding	Applying	Analysis	Evaluation	Creation
Q Mapping						
NOTE : 1. Attempt any two question from each section. 2. All questions carry equal marks.						
CO Mapping	Section	Question				Marks
CO1	I	a) xx b) xx c) xx				10
CO2	II	a) xx b) xx c) xx				10

MID SEMESTER EXAMINATION- II
Session 2022-23

SAGE University, Bhopal School of Engineering and Technology Program _____						
Class:		Time: 1:30 Hr		Max. Marks: 30		
Subject Name: Geo Tech Engg II (CE -8002)						
Bloom's Taxonomy Level	Remembering	Understanding	Applying	Analysis	Evaluation	Creation
Q					I(a),I(c),II(b), II(c),III(a)	I(b),II(a),III(b), III(c)
Mapping						
NOTE: 1. Attempt any two questions from each section. 2. All questions carry equal marks.						
CO Mapping	Section	Question				Marks
C03	I	a) xxx b) xxx c) xxx				10
C04	II	a) xxx b) xxx c) xxx				10
C05	III	a) xxx b) xxx c) xxx				10



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ESE Question Paper Blue Print

Note: Examiner may give internal choices in questions

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COURSE CODE

Name of Program – Semester

Course Name

(Month – Year)

Max. Duration: 3 hrs

Max. Marks: 100

SECTION A (C01)

..... (20)

Q. No	Question	Bloom's Taxonomy Level	Marks	Note
a	XXXXXXXXXX XXXXXXXXXXXX	1/2	1	True- False/Objectives/Fill in the blanks
b	XXXXXXXXXX XXXXXXXXXXXX	1/2	1	
c	XXXXXXXXXX XXXXXXXXXXXX	2/3	3	100-150 words
d	XXXXXXXXXX XXXXXXXXXXXX	3/4	5	150-300words
e	XXXXXXXXXX XXXXXXXXXXXX	3/4/5	10	300-500 words

SECTION B (C02)

..... (20)

Q. No	Question	Bloom's Taxonomy Level	Marks	Note
a	XXXXXXXXXX XXXXXXXXXXXX	1/2	1	True- False/Objectives/Fill in the blanks
b	XXXXXXXXXX XXXXXXXXXXXX	1/2	1	
c	XXXXXXXXXX XXXXXXXXXXXX	2/3	3	100-150 words
d	XXXXXXXXXX XXXXXXXXXXXX	3/4	5	150-300words
e	XXXXXXXXXX XXXXXXXXXXXX	3/4/5	10	300-500 words

SECTION C (C03)

..... (20)

Q. No	Question	Bloom's Taxonomy Level	Marks	Note
a	XXXXXXXXXX XXXXXXXXXXXX	1/2	1	True-False/Objectives/Fill in the blanks
b	XXXXXXXXXX XXXXXXXXXXXX	1/2	1	
c	XXXXXXXXXX XXXXXXXXXXXX	2/3	3	100-150 words
d	XXXXXXXXXX XXXXXXXXXXXX	3/4	5	150-300words
e	XXXXXXXXXX XXXXXXXXXXXX	3/4/5	10	300-500 words

SECTION D (C04)

..... (20)

Q. No	Question	Bloom's Taxonomy Level	Marks	Note
a	XXXXXXXXXX XXXXXXXXXXXX	1/2	1	True-False/Objectives/Fill in the blanks
b	XXXXXXXXXX XXXXXXXXXXXX	1/2	1	
c	XXXXXXXXXX XXXXXXXXXXXX	2/3	3	100-150 words
d	XXXXXXXXXX XXXXXXXXXXXX	3/4	5	150-300words
e	XXXXXXXXXX XXXXXXXXXXXX	3/4/5	10	300-500 words

SECTION E (C02)

..... (20)

Q. No	Question	Bloom's Taxonomy Level	Marks	Note
a	XXXXXXXXXX XXXXXXXXXXXX	1/2	1	True-False/Objectives/Fill in the blanks
b	XXXXXXXXXX XXXXXXXXXXXX	1/2	1	
c	XXXXXXXXXX XXXXXXXXXXXX	2/3	3	100-150 words
d	XXXXXXXXXX XXXXXXXXXXXX	3/4	5	150-300words
e	XXXXXXXXXX XXXXXXXXXXXX	3/4/5	10	300-500 words