Steps for preparation of CO-PO attainment

Step 1: Details of the course (course name, course code, total student no., semester etc.).

COURSE OBJECTIVES (CSE207- Data Structures and Algorithms Lab) [2nd year, 3 Sem]

Course Prerequisite: Knowledge of basic programming
Course Objective: To impart the basic concepts of data structures and algorithms

Step 2: Outline the Course Outcomes (COs) as shown below:

Course Outcomes:

- **CO1:** Understand the role and applications of data structure in real life
- **CO2:** Develop abstract data types for solving the complex problems
- **CO3:** Understand the concepts of non-linear data structures and applications
- **CO4:** Analyze the efficiency of algorithms

Step 3: Outline the Program Outcomes (PO) and Program Specific Outcomes (PSO). Perform the CO mapping with PO and PSO, as illustratively shown in the table.

Program Specific Outcomes (PSO)	Program Outcomes (PO)
❖PSO1: Insight into various fields of Information Technology	PO1: Engineering Knowledge
	PO2: Problem Analysis
	PO3: Development of Solutions
	PO4: Investigation of Complex Problems
	PO5: Modern Tool Usage
	PO6: The Engineer and Society.
❖PSO2: Understand and resolve Engineering Problems	PO7: Environment and Sustainability
	PO8: Ethics
	PO9: Individual and Team work
	PO10: Communication.
❖PSO3:Ready for Industry, Academics and Research	PO11: Project Management and Finance
	PO12: Life-long learning

Step 4: Perform the CO mapping with PO and PSO, as illustratively shown in the table.

CO Mapping with PO and PSO

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	-	-	-	-	-	-	-	2	2	3	2	2
CO2	2	2	2	2	1	-	1	-	-	-	2	2	3	3	2
CO3	2	2	2	2	2	-	-	-	-	-	2	2	3	2	3
CO4	3	3	3	3	-	1	1	1	1	1	2	2	3	3	2
Average	2.25	2.25	2.25	1.75	0.75	0.25	0.5	0.25	0.25	0.25	2	2	3	2.5	2.25

3-High **2-Medium** **1-Low**

*Here in the table, **'3'** corresponds to a high correlation; **'2'** corresponds to a medium correlation, and **'1'** corresponds to a low correlation, between CO and PO/PSO.*

Step 5: Fill in the entries (**bold**) as suggested in the table for CO attainment calculations.

If needed, one may use more internal assessment tools (assignments/quiz, etc.).
The target (P) may be 60% (first division) or as per the requirements of the course and program. Further, the target remains same for direct and indirect assessments

CO Attainment Calculations										
	Direct attainment								Indirect Assessment	
	Internal						External			
	CIA1		CIA2				ESE		Course Exit Survey	
Number of students who have scored more than the target (P) *(Target is 60%)*		P		P				P		P
Percentage of students who have achieved the target = (P/N)*100 *(**N** is the number of students who appeared in the exam)*		**(P/N)*100**		**(P/N)*100**				**(P/N)*100**		**(P/N)*100**
Attainment Level (3 for >80%, 2 for >70%, 1 for> 60%)	a =		b =				c=		d=	
Attainment based on internal assessment (CIA) = Average of (a and b);					CIA	=				
Direct CO Attainment Level (DA) =40%CIA + 60% End-Term (c) ;					DA	=				
Indirect CO Attainment Level (IA) (based on Exit Survey (d));					IA	=				
80 % of DA						=				
20 % IA						=				
CO Attainment Level (COA) = 80 % DA+ 20 % IA;					COA	=				

Step 6: After filling in the details in the last step (P and P/N), assign the attainment level (3/2/1 according to (P/N) values) based on Direct Assessment 1, Direct Assessment 2, and Indirect Assessment.

Attainment level (3 if more than 80% of students achieved the target / 2 for >70% / 1 for>60%)

Direct assessment 1: refers to evaluation through internal assessments which majorly include Continuous Internal Assessments (CIA1/CIA2) in terms of Internal Assessment Tests, Lab Assignments, Home Assignments, Class/Assignment Tests, Presentations, quizzes, etc.

Direct assessment 2: refers to evaluation through End Semester Examination (ESE)

Indirect assessment: refers to the exit feedback survey taken by students/faculty/employers. The exit feedback survey must be taken up before the end of the semester. The exit survey may be based on a marking scheme (1-3) for each CO.

- The course exit survey samples are given below for student/faculty/employer
  (Kindly note the respective course teacher may modify these templates according to the requirements of the course)

Sample1: Course Outcome exit survey for students

Course Outcome		1(Low)	2(Moderate)	3(High)
CO1	Understand the role and applications of data structure in real life			
CO2	Develop abstract data types for solving the complex problems			
CO3	Understand the concepts of non-linear data structures and applications			
CO4	Analyze the efficiency of algorithms			

Sample 2: Course Contents exit survey for students.

Questions	1(Low)	2(Moderate)	3(High)
Quality of the Course Content			
Relevance of the textbook to this course			
Were the lectures clear/well organized and presented at a reasonable pace?			
Did the lectures stimulate you intellectually?			
Are the assignment/lab experiment procedures clearly explained?			

Sample3: Faculty/Employer Survey

Questions	1(Low)	2(Moderate)	3(High)
Satisfaction with the caliber of the graduates			
Courses are relevant to the organization's vision and mission			
Satisfaction with the speed at which course content is being adapted to meet changing industrial needs			
Relevant subject or discipline knowledge			
Quality of employability skills and attributes			
The satisfaction that graduates are learning the right skills			

Further steps to follow for the calculation of Course Outcome attainment (COA) level:

Please refer to the first column in the table (in orange) for conventions used (A, B, C, D, and E) for each parameter to calculate COA.

A: Assign the attainment level (3 for>80%/2 for >70%/1 for>60%) for Direct Assessment 1, Direct Assessment 2, and Indirect Assessment.

B: Attainment based on internal assessment (CIA) = Average of [CIA1(a) and CIA2(b)]

C: Direct CO Attainment Level (DA) =40%CIA + 60% End-Term (c)

D: Indirect CO Attainment Level (IA)

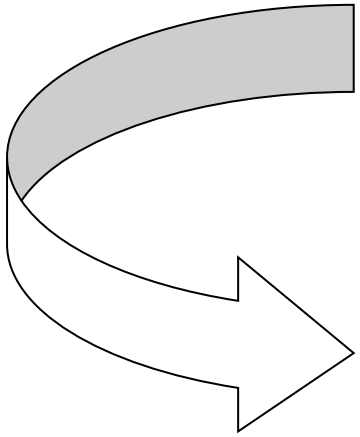
E: Finally, Course Outcome Attainment (COA) level = 80% of DA and 20% of IA

	CO Attainment Calculations									
		Direct assessment							Indirect Assessment Students/Faculty/Employer	
		Direct Assessment 1 (CIA)						Direct Assessment 2 (ESE)		
		CIA1		CIA2				ESE	Course Exit Survey	
	Number of students who have scored more than target (P)		19		15				22	22
	Percentage of students who have achieved the target = (P/N)*100		86.4		68.2				100	100
A	**Attainment Level (3 for >80%, 2 for >70%, 1 for> 60%)**	a =	3	b =	1			c =	3	d = 3
B	**Attainment based on internal assessment (CIA) = Average of (a and b);**					CIA	=	2		
C	**Direct CO Attainment Level (DA) =40%CIA + 60% End-Term (C);**					DA	=	2.6	= 0.4*2 + 0.6*3	
D	**Indirect CO Attainment Level (IA) (based on Exit Survey (d));**					IA	=	3		
					80 % of DA		=	2.08		
					20 % IA		=	0.6		
E	**CO Attainment Level (COA) = 80 % DA+ 20 % IA;**					COA	=	2.68		

Step 7: Based on the Course Objectives Attainment (COA) value as calculated at the end of step 6, perform the PO/PSO Attainment Calculations as shown below:

PO/PSO Attainment= COA x M/3 (Refer to Step 6 for COA value)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	-	-	-	-	-	-	-	2	2	3	2	2
CO2	2	2	2	2	1	-	1	-	-	-	2	2	3	3	2
CO3	2	2	2	2	2	-	-	-	-	-	2	2	3	2	3
CO4	3	3	3	3	-	1	1	1	1	1	2	2	3	3	2
Average	2.25	2.25	2.25	1.75	0.75	0.25	0.5	0.25	0.25	0.25	2	2	3	2.5	2.25



PO Attainment Calculations															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
Average Mapping **(M)**	2.25	2.25	2.25	1.75	0.75	0.25	0.5	0.25	0.25	0.25	2	2	3	2.5	2.25
PO / PSO Attainment Level*	2.01	2.01	2.01	1.56	0.67	0.22	0.45	0.22	0.22	0.22	1.79	1.79	2.68	2.2333	2.01
*** = COA x M/3 (Refer to Step 6 for COA value)**															