SCHOOL OF COMPUTING

SRM INSTITUTE OF SCIENCE & TECHNOLOGY
Deemed to be University u/s 3 of UGC Act, 1956

CO-PO ATTAINMENT HANDBOOK

School of Computing
College of Engineering and Technology
SRM Institute of Science and Technology
May 2023

SRM INSTITUTE OF SCIENCE AND TECHNOLOGY, KATTANKULTHUR
SCHOOL OF COMPUTING

CO-PO ATTAINMENT HANDBOOK

CONTENT

1. VISION AND MISSION STATEMENTS

UNIVERSITY VISION

To emerge as a world-class University in creating and disseminating knowledge and providing students a unique learning experience in science, technology, medicine, management and other areas of scholarship that will best serve the world and betterment of mankind.

UNIVERSITY MISSION

TO MOVE UP through international alliances and collaborative initiatives to achieve global excellence.

TO ACCOMPLISH A PROCESS to advance knowledge in a rigorous academic and research environment.

TO ATTRACT AND BUILD PEOPLE in a rewarding and inspiring environment by fostering freedom, empowerment, creativity and innovation.

SCHOOL OF COMPUTING VISION

To become a world class School in importing high quality education and in providing students a unique learning and research experience in the field of Computer Science and Engineering and its related fields.

SCHOOL OF COMPUTING MISSION

- To impart knowledge in cutting edge technologies on par with industrial standards
- To collaborate with renowned academic institutions in research and development
- To instil societal and ethical responsibilities in all professional activities

2. PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

- Graduates will be able to perform in technical/managerial roles ranging from design, development, problem solving to production support in software industries and R&D sectors.
- Graduates will be able to successfully pursue higher education in reputed institutions.
- Graduates will have the ability to adapt, contribute and innovate new technologies and systems in the key domains of Computer Science and Engineering.
- Graduates will be ethically and socially responsible solution providers and entrepreneurs in Computer Science and other engineering disciplines.

3. PROGRAMME OUTCOMES (PO)

PO 1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialisation for the solution of complex engineering problems.

PO 2: Problem analysis: Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 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 public health and safety, and cultural, societal, and environmental considerations.

PO 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.

PO 5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO 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.

PO 7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable development.

PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10: Communication: Communicate effectively on complex engineering activities with the engineering community and with the 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

PO 11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12: Life-long learning: Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

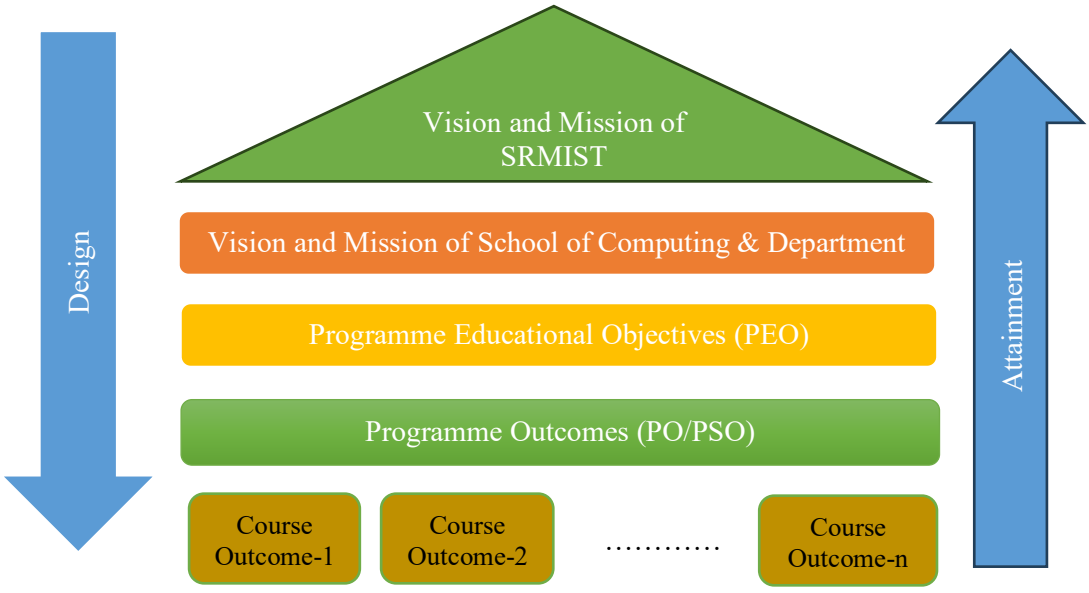
4. PROGRAMME SPECIFIC OUTCOMES (PSO) for CSE Core

PSO1 : Ability to understand client requirements and suggest solutions

PSO2 : Ability to create Software for automation and function

PSO3 : Ability to demonstrate logical, Reasoning and problem solving Skills

Key Constituents of Outcome Based Education (OBE)



5. TERMINOLOGY

- **Outcome-Based Education (OBE):** OBE is a system where all the parts and aspects of education are focused on the outcomes of the course. The students take up courses with a certain goal of developing skills or gaining knowledge and they have to complete the goal by end of the course.

- **Programme Educational Objectives (PEO**) : These are broad statements that describe what graduates are expected to attain within the four years of graduation.

- **Programme Outcomes (PO)**: Programme outcomes are statements that describe what the knowledge, skills and attitudes students should have at the time of graduation from an engineering program. And at present POs are 12 in number and they are identified by NBA and are applicable to all engineering programmes.

- **Programme Specific Outcomes (PSO):** PSOs are outcomes that are specific to a Domain/Specialization. PSOs characterize the specificity of the core courses of a programme. PSOs can be 2 to 4 in number.

- **Course Outcomes (CO)**: Course Outcomes are specific and measurable statements that define the knowledge, skills, and attitudes learners will demonstrate by the completion of a course

- **Course Articulation Matrix (CAM)** : This is the mapping between Course Outcomes and the Programme Outcomes of a specific Course.

- **Program Articulation Matrix (PAM)** : This is the mapping between the courses of a Programme with Programme outcomes of a specific programme.

- **Course Assessment Plan (CAP) :** A well planned layout that shows how assessment methods are aligned to the Course Outcomes(CO)

- **Level of Thinking :** Bloom's Six Levels of Thinking. They are Remember(1), Understand(2), Apply(3), Analyse(4), Evaluate(5) and Create(6).

- **Expected Proficiency % :** The Expected percentage of scores to attain a particular CO or PO. For ex., if the Expected Proficiency is 60% for CO1 of a course, then 60% of CO1 mark is needed to attain the CO

- **Expected Attainment % :** The expected percentage of students to get the expected proficiency. For ex., if Expected Attainment is 70% for CO1 of a course, the 70% of students are expected to get the expected proficiency % in CO1.

- **Continuous Internal Assessment (CIA) :** Continuous Internal Assessment evaluates a student's progress throughout a prescribed course. There are 4 CIAs namely CIA1, CIA2, CIA3 and CIA4 for all theory and lab courses

Ex. Course Articulation Matrix in Syllabus

Course Objectives:	*The purpose of learning this course is to:*
1	*Introduce the key role of an Operating system*
2	*Insist the Process Management functions of an Operating system*
3	*Emphasize the importance of Memory Management concepts of an Operating system*
4	*Realize the significance of Device Management part of an Operating system*
5	*Comprehend the need of File Management functions of an Operating system*
6	*Explore the services offered by the Operating system practically*

Course Outcomes (CO):	*At the end of this course, learners will be able to:*	**Learning**			**Program Outcomes (PO)**														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CO1	*Express the fundamental concepts in Operating Systems.*	*2*	*60*	*70*	*3*		*3*										*2*		
CO2	*Implement synchronization and scheduling in Operating System*	*3*	*70*	*75*	*2*	*1*	*3*											*2*	
CO3	*Apply fragmentation, paging and segmentation in memory management.*	*3*	*70*	*75*	*3*	*2*	*2*										*2*		
CO4	*Incorporate page fault handling, demand paging and page buffering techniques in Operating System.*	*4*	*60*	*70*	*3*	*2*	*2*											*2*	
CO5	*Demonstrate the storage management techniques through various File Management techniques*	*3*	*60*	*70*	*3*		*2*	*2*									*2*		

Course Outcomes

Bloom's Level of thinking

Expected Proficiency %

Expected Attainment %

CO-PO Mapping

CO-PSO Mapping

Ex. Course Assessment Plan in Syllabus

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)			
		Theory (5%)	Practice (5%)	Theory (7.5%)	Practice (7.5%)	Theory (7.5%)	Practice (7.5%)	Theory (5%)	Practice (5%)	Theory (25%)	Practice (25%)
Level 1	Remember	20%		15%		15%				15%	
Level 2	Understand	20%		25%		25%		25%		20%	
Level 3	Apply	45%	30%	40%	35%	40%	40%	20%	20%	45%	30%
Level 4	Analyze	15%	40%	20%	35%	20%	30%	20%	50%	20%	35%
Level 5	Evaluate		30%		30%		30%	25%	30%		35%
Level 6	Create										
	Total	100 %	100 %	100 %	100 %	100 %	100 %	100%	100%	100%	100%

Bloom's Level

Continuous Learning Assessment

End Semester Examination

6. LEVEL OF CORRELATION AND ATTAINMENT

Level of Correlation/Mapping Factor

It indicates to what extent a certain component mapped with the other. The correlation between CO - PO describes the level at which a particular PO is addressed through a CO.

3 - indicates **Substantial/High** mapping *(high correlation towards attainment)*
2 - indicates **Moderate** mapping *(moderate correlation towards attainment)*
1 - indicates **Low** mapping *(low correlation towards attainment)*

CO Attainment Targets

Targets are quantized into certain levels, 3 being the most common number of levels. CO Attainment targets are finalized by the course coordinator before commencing course delivery in a semester.

For Example, we can set a target as below:

Level 3: x% Students scoring >= p% of max marks allocated to CO
Level 2 : y% Students scoring >= p% of max marks allocated to CO
Level 1 : z% Students scoring >= p% of max marks allocated to CO

p% → The expected Proficiency % to attain a CO. For ex. It can be 60%
x% → The High expected Attainment %. For ex., it can be set as 85%
y% → The moderate expected attainment %. For ex., it can be set as 70%
z% → The low expected attainment %. For ex., it can be set as 60%

7. ATTAINMENT OF COs

- Attainment of COs can be measured directly and indirectly
- Direct attainment of COs can be determined from the performance of students in all relevant assessment instruments.

Direct CO attainment

- Direct attainment of COs is determined from the performances of students in Continuous Internal Assessment (CIA) and Semester End Examination (SEE).
- The proportional weightages of CIA: SEE will be as per the academic regulations in force.
- Direct attainment of a specific COs is determined from the performances of students in all the assessment items related to that particular CO.
- Hence, every assessment item needs to be tagged with the relevant CO.
- Also, we need data about performance of students assessment item – wise.
- Continuous Internal Assessment (CIA) is conducted and evaluated by the relevant department itself. Thus, institution have access to question-wise marks in all assessment instruments in Continuous Internal Assessment (CIA).
- When questions are tagged with relevant COs, the department has access to performances of students with respect to each CO.

- For the Semester End Examinations, the direct attainment is calculated from the final mark for all COs.

Indirect CO attainment

- Indirect attainment of COs can be determined from the course exit survey.
- The exit survey form should be designed to get feedback from students on all the COs.

GAP ANALYSIS

- If targets are achieved for that year, higher targets can be set (increase the target by 2% to 5%) for the following academic year as a part of continuous improvement.

- If targets are not achieved, an action plan should be performed to attain the target in the subsequent years.

8. CALCULATION OF CO ATTAINMENT

Step 1: For every course, 4-6 course outcomes (CO) are defined and mapped to Program outcomes (PO) on a scale of 0 to 3. The average of each POs are calculated. CO attainment targets are finalized by the course coordinators before commencement of the course delivery.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO205.1	3	-	3	-	-	-	-	-	-	-	-	-	2	-	-
CO205.2	2	1	3	-	-	-	-	-	-	-	-	-	-	2	-
CO205.3	3	2	2	-	-	-	-	-	-	-	-	-	2	-	-
CO205.4	3	2	2	-	-	-	-	-	-	-	-	-	-	2	-
CO205.5	3	-	2	2	-	-	-	-	-	-	-	-	2	-	-
Average	**2.80**	**1.67**	**2.40**	**2.00**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2.00**	**2.00**	**-**

Step 2: For every CIA, Enter maximum marks for each question and its corresponding CO in the relevant columns

18CSC205J - OPERATING SYSTEMS

INTERNAL ASSESSMENT-1 (CLAT3)

MAX. MARKS			1	1	1	1	1	1	1	1	1	1	4	4	4	4	4	12	12	Total
CO			CO4					CO5					CO4			CO5		CO4	CO5	
Sl. No	Roll No	Student Name	Question Numbers Mapping																	
			Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	
1	RA2111003010206	TAPESH CHANDRA DAS	1	1	1	1	0	1	1	1	1	0	4	3		4	3	12	7	41
2	RA2111003010207	RISHABH MOTIANI	1	1	0	1	0	0	1	1	1	0	2			4		8	10	32
3	RA2111003010209	ADITYA ANAND	1	1	0	0	0	1	0	1	1	0	4	4		4	4	10	10	41

Max. Marks for each Question Marks earned by student CO for each Question

Step 3: Enter mark for each student question-wise. Mark zero(0) if the student failed to answer for mandatory questions. Leave blank only for choice questions. We find the total mark of the students in last column.

Step 4: Compute the "Number of students attempted" the questions for each question.

For ex. Content of cell D72 = COUNTA(D8:D71)

Here, Column D represent the marks earned by the students for Q.No.1

D72 =COUNTA(D8:D71)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
68	61	RA2111003010272	ARYAN RAI	1	1	0	0	0	1	1	1	1	0		2				9	9	26
69	62	RA2111003010273	ASMIT PRAKASH																		0
70	63	RA2111003010275	MANYA GUPTA	1	1	1	1	0	0	1	0	1	1	2	3		4	2	9		27
71																					
72	Number of Students Attempted			62	62	62	62	62	62	62	62	62	62	38	46	18	45	40	61	60	
73	Number of students who got more than 60% of marks			51	60	19	28	18	54	50	55	55	17	28	35	8	42	24	41	38	
74	Percentage of students who got more than 60% of marks			82.3	96.8	30.6	45.2	29.0	87.1	80.6	88.7	88.7	27.4	73.7	76.1	44.4	93.3	60.0	67.2	63.3	
75	AVERAGE PERCENTAGE of students who got more than 60% of marks			56.77					74.52					64.74			76.67		67.2	63.3	
76	CO ATTAINMENT LEVEL			1.0										1.0							
77	CO			CO4										CO5							

Step 5: Compute the "Number of students who score >= p% marks" for each question.

For ex. Content of cell D73 = COUNTIF(D8:D71,">="&0.6*D4)

Here, We compute the numbers of students who scores >=60% for Q.No.1

Step 6: Find the Percentage of students who scores >=p% for each question

$$\text{Percentage of students who got more than p\% of marks} = \frac{\text{No. of students who got more than p\% of marks}}{\text{No. of students attempted the Question}}$$

Step 7: Compute the average percentage of students who got more than p% of marks for each CO.

D76 =IF(D75>=85,3,IF(D75>=70,2,IF(D75>=60,1,0)))

	A	B	C	D	E	F	G	H	I	J	K
65	58	RA2111003010269	PANIKAR VRUTIKA	10.0	10.0				10.0	3.0	33
66	59	RA2111003010270	SURAJ HONDAPPANAVAR	10.0	10.0	10.0			10.0	10.0	50
67	60	RA2111003010271	ISHITA SINGH	10.0	7.0				10.0		27
68	61	RA2111003010272	ARYAN RAI		5.0			10.0			15
69	62	RA2111003010273	ASMIT PRAKASH	2.0				5.0		5.0	12
70	63	RA2111003010275	MANYA GUPTA	6.0		2.0	8.0	10.0		10.0	36
71											
72	Number of Students Attempted			50	49	49	38	33	15	45	
73	Number of students who got more than 60% of marks			31	32	23	24	26	6	31	
74	Percentage of students who got more than 60% of marks			62.0	65.3	46.9	63.2	78.8	40.0	68.9	
75	AVERAGE PERCENTAGE of students who got more than 60% of marks			59.35				62.56			
76	CO ATTAINMENT LEVEL			0.00				1.00			
77	CO				CO2			CO3			

CO Attainment for CO2 CO Attainment for CO3

Step 8: Compute the CO attainment for each CIA using the following formula.

CO Attainment Level = 3, if (the avg. % of students who got >=p% for each CO) >=x
= 2, if (the avg. % of students who got >=p% for each CO) >=y
= 1, if (the avg. % of students who got >=p% for each CO) >=z

Step 9: Repeat steps 2 to 8 for each CIA components. Use separate sheet for each CIA

Step 10: Enter the Grades earned by the students in Semester End Examinations. Calculate its corresponding numeric grades in the next column. For example, Grade "O" will be converted as 10 in numeric. Also compute the percentage of students who got more than 60% of marks in Semester End Examinations.

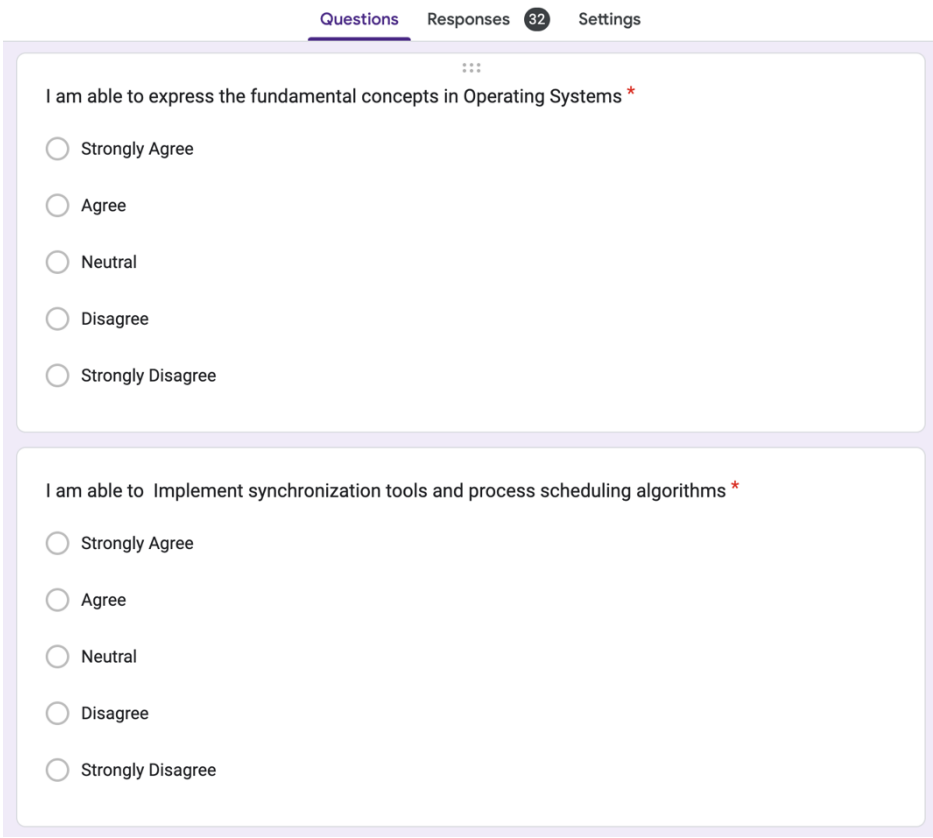
	A	B	C	D	E
1	Subject code	18CSC205J			
2	Subject Name	OPERATING SYSTEMS			
3	Year & Sem	II Year & IV Semester			
4	Academic Year	2022-23 Even Semester			
5	Name of the Faculty	Dr.M.Eliazer			
6					
7 8	Sl. No	Register Number	Student Name	University results	
9	Column1	Column2	Column3	Column4	Column5
10	1	RA2111003010206	TAPESH CHANDRA DAS	O	10
11	2	RA2111003010207	RISHABH MOTIANI	A	8
12	3	RA2111003010209	ADITYA ANAND	B	6

Grades earned by students Numeric Value for Grades

Grade	O	A+	A	B+	B	C	Other
Numeric Value	10	9	8	7	6	5	0

Step 11: Course Exit Survey will be conducted among students for Indirect CO attainment. The exit survey feedback must include questionnaire for all COs.

Sample Exit survey Questions



Step 12: Convert the exit survey responses into its numerical equivalent and compute the percentage of each CO values.

Survey Responses	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
Numerical Equivalent	5	4	3	2	1

	A	B	C	D	E	F	G	H	I	J	K	L
1	Timestamp	Email Address	I am able to express the funda	I am able to Implement sync	I am able to apply fragmentati	I am able to Incorporate pa	I am able to demonstrate t	CO1	CO2	CO3	CO4	CO5
33	5/24/2023 22:41:45	ss7885@srmist.edu.in	Neutral	Neutral	Neutral	Neutral	Neutral	3	3	3	3	3
34	5/24/2023 22:47:00	pv8821@srmist.edu.in	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Neutral	5	5	5	5	3
35	5/24/2023 23:48:55	iu6264@srmist.edu.in	Neutral	Neutral	Neutral	Neutral	Neutral	3	3	3	3	3
36	5/25/2023 0:44:44	yy2737@srmist.edu.in	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	5	5	5	5	5
37	5/25/2023 0:45:42	rm5576@srmist.edu.in	Agree	Agree	Agree	Agree	Agree	4	4	4	4	4
38	5/25/2023 11:47:05	kk2115@srmist.edu.in	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	5	5	5	5	5
39	5/26/2023 1:13:59	mt7682@srmist.edu.in	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	5	5	5	5	5
40	5/27/2023 12:09:17	jj3370@srmist.edu.in	Agree	Agree	Agree	Agree	Agree	4	4	4	4	4
41	5/27/2023 8:35:31	hr2067@srmist.edu.in	Agree	Agree	Agree	Agree	Agree	4	4	4	4	4
42												
43								179	177	177	177	173
44												
45												
46								CO1	CO2	CO3	CO4	CO5
47								89.50	88.50	88.50	88.50	86.50

Sum of survey responses (CO Wise)

% of Survey responses (CO Wise)

Step 13: Calculate Consolidated Continuous Internal Assessment (CIA) for each CO as f

$$CIA = \frac{\text{Avg. \% of students who got >= p\% of marks in all CIA components for theory assessment}}{2} + \frac{\text{Avg. \% of students who got >= p\% of marks in all CIA components for theory assessment}}{2}$$

Step 14: Calculate CO Attainment Level for CIA as follows :

Attainment Level for Continuous Internal Assessment (CIA) = 3 if CIA >= x%
= 2 if y% <= CIA < x%
= 1 if z% <= CIA < y%

A	B	C	D	E	F	G	H	I	J	K	L	M
CO	IA	Attainment Level (IA)	UA	Attainment Level (UA)	Direct	Direct Attainment Level	Indirect	Indirect Attainment Level	Final Attainment	CO	Final Attainment Level	Target
CO205.1	74.2	2.0	87.3	3.0	80.8	2.5	89.5	3.0	83.4	CO205.1	2.65	2.5
CO205.2	85.7	3.0	87.3	3.0	86.5	3.0	88.5	3.0	87.1	CO205.2	3	2.5
CO205.3	86.5	3.0	87.3	3.0	86.9	3.0	88.5	3.0	87.4	CO205.3	3	2.5
CO205.4	83.6	2.0	87.3	3.0	85.4	2.5	88.5	3.0	86.4	CO205.4	2.65	2.5
CO205.5	82.2	2.0	87.3	3.0	84.8	2.5	86.5	3.0	85.3	CO205.5	2.65	2.5

Step 15: "Percentage of students who got more than 6% of marks in Semester End Examination" will be considered as SEE(Semester End Examination) for all COs.

Now Calculate CO Attainment Level for SEE as in step 14.

Step 16: Direct CO Attainment score is calculated as follows:

Direct Attainment Score = 50% of CIA + 50% of SEE

Direct Attainment Level is calculated from Direct Attainment Score as follows:

Direct attainment level = 3, if direct Attainment Score >= x%
= 2 if y% <= direct Attainment Score < x%
= 1 if z% <= direct Attainment Score < y%

Step 17: Indirect Attainment Score is the "% of Exit survey responses" that we have calculated in step 12.

Now calculate the indirect attainment level from indirect attainment score as same as in step no. 16

Step 18: Final Attainment score is calculated as follows:

Final Attainment Score = 70% of Direct Attainment Score+ 30% of Indirect Attainment Score

Final Attainment Level is calculated from final attainment score as follows:

Final attainment level = 3, if final Attainment Score >= x%
= 2 if y% <= final Attainment Score < x%
= 1 if z% <= final Attainment Score < y%

9. CALCULATION OF PO/PSO ATTAINMENT

Step 1 : To calculate PO attainment we refer the following values.

(i) Final Attainment Level of COs [Refer Step 18 in the previous section]

(ii) CO-PO mapping correlations. [Refer Step 1 in the previous section]

(iii) Maximum Correlation Value. ie; 3

Final Attainment	CO	Final Attainment Level	Target
83.4	CO205.1	2.65	2.5
87.1	CO205.2	3	2.5
87.4	CO205.3	3	2.5
86.4	CO205.4	2.65	2.5
85.3	CO205.5	2.65	2.5

CO Wise Final Attainment Level

CO	PO1	PO2	PO3	PO4	PO5	PO
CO205.1	3	-	3	-	-	
CO205.2	2	1	3	-	-	
CO205.3	3	2	2	-	-	
CO205.4	3	2	2	-	-	
CO205.5	3	-	2	2	-	
AVERAGE	2.80	1.67	2.40	2.00	-	

CO PO Mapping Correlation Value

Step 2 : The PO attainment for each CO is calculated as follows:

$$\text{PO/PSO Attainment} = \left[\frac{\text{Final CO Attainment Level}}{\text{Max. Correlation Value}}\right] * \text{CO-PO Mapping Correlation value}$$

i.e, Final Attainment for CO1 is 2.65, CO1-PO1 mapping is 3, So the PO1 attainment w.r.to CO1 is = [2.65 / 3] * 3 = 2.65

PO & PSO Direct Attainment

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO205.1	2.65	-	2.65	-	-	-
CO205.2	2.00	1.00	3.00	-	-	-
CO205.3	3.00	2.00	2.00	-	-	-
CO205.4	2.65	1.77	1.77	-	-	-
CO205.5	2.65	-	1.77	1.77	-	-
AVERAGE	**2.59**	**1.59**	**2.24**	**1.77**	**-**	**-**

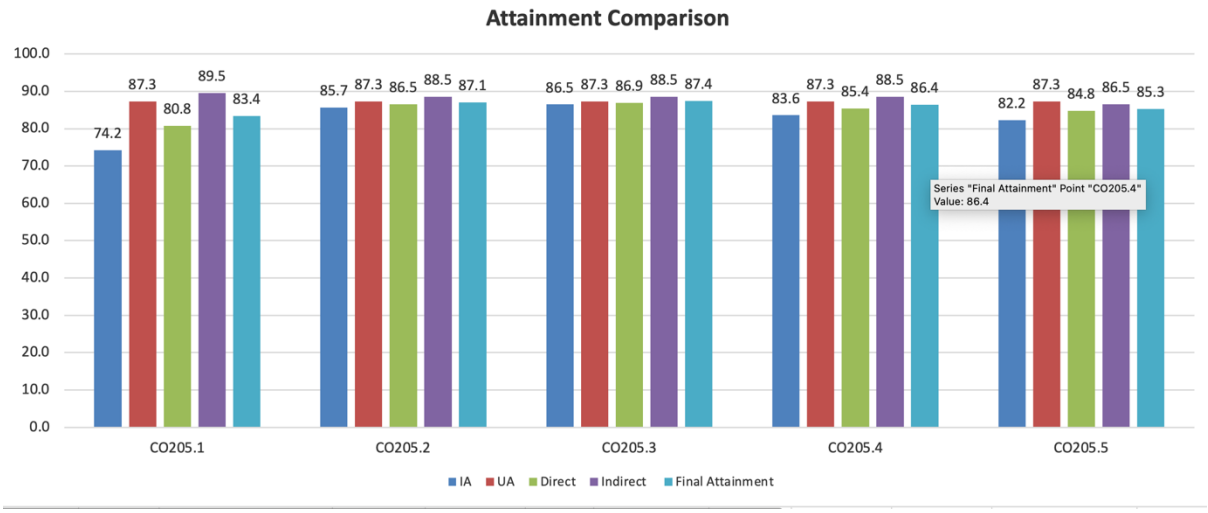
Step 3 : Repeat the calculation for all POs/PSOs

Step 4 : Compute the average PO attainment for each POs/PSOs

10. COMPARISION CHARTS

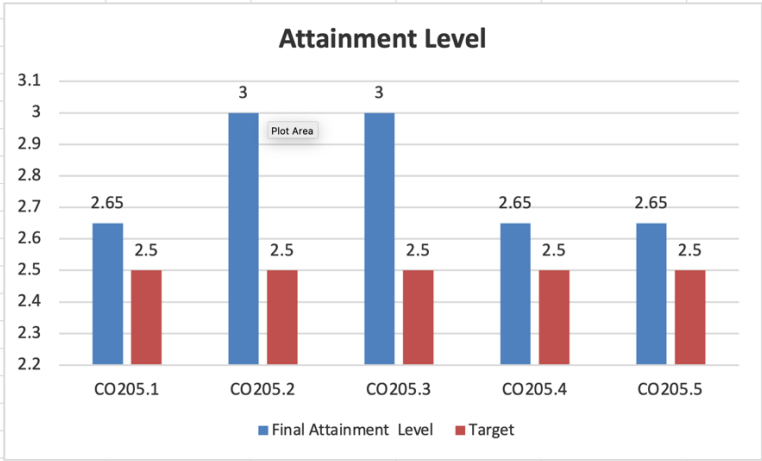
1. CO Attainment Score Comparison

The values of IA, UA, Direct attainment Score, Indirect Attainment Score and Final Attainment Scores are compared in the following chart.



2. CO Attainment Level Comparison

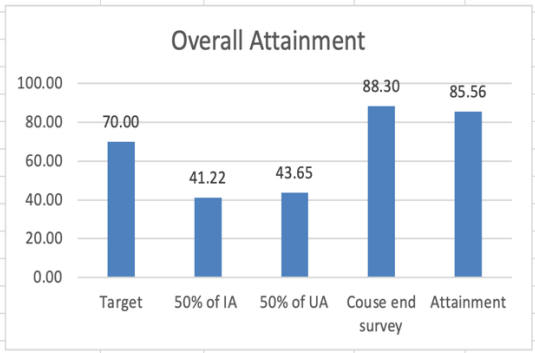
The Final attainment level is compared with target attainment level



3. Overall Attainment Comparison

The Target attainment score, 50% of IA, 50% UA, Student exit survey score and Final attainment scores are compared

IA	82.44
University	87.30
Target	70.00
50% of IA	41.22
50% of UA	43.65
Couse end survey	88.30
Attainment	85.56



11. CO ATTAINMENT FOR PROJECT & INTERNSHIP

Step 1: Define CO for project/internship

SRM INSTITUTE OF SCIENCE AND TECHNOLOGY
SCHOOL OF COMPUTING

Faculty Course Assessment Report	
Subject code	18CSP109L /18CSP111L
Subject Name	Project (Phase-II) / Semester Internship
Year & Sem	IV Year & VIII Semester
Academic Year	20xx-20xx Even Semester
Name of Faculty	Dr. xxxxx xxxx
Department	CTECH

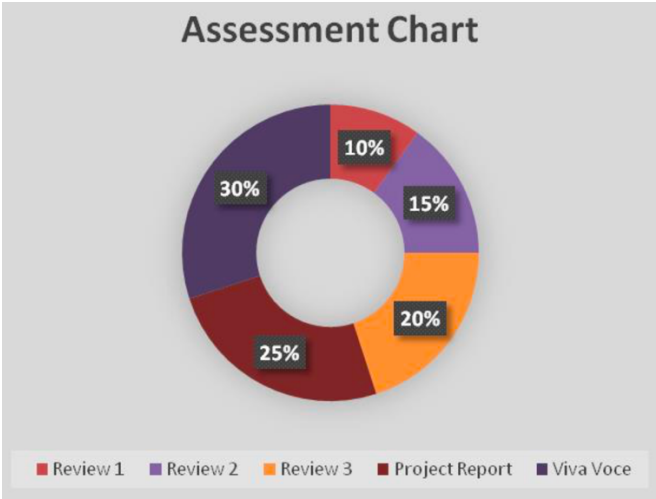
Students should be able to do the following tasks, described as "Course Outcomes"

CO Number	Description of CO	Knowledge level
CO1	Apply principles of computer science principles and engineering concepts, software engineering, including version control, code documentation, and software quality assurance to develop innovative projects.	K3
CO2	Analyze project requirements and develop effective solutions that meet the specified criteria and Design software systems or applications that address real-world problems or challenges.	K3
CO3	Apply project management techniques to plan, execute, and monitor project progress and Collaborate effectively in a team environment to complete project milestones and deliverables	K3
CO4	Identify and address potential risks, challenges, and limitations associated with the project and apply ethical and professional standards in the development and deployment of projects.	K3

Step 2: Map the CO with PO/PSO

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	3	2	2	-	-	-	3	3	3	3	3
2	3	3	3	3	3	2	-	-	-	-	3	3	3	3	3
3	3	3	3	3	3	2	-	-	3	3	3	3	3	3	3
4	3	2	-	-	3	3	3	3	-	-	2	3	3	2	2
AVERAGE	3.00	2.75	3.00	3.00	3.00	2.25	2.50	3.00	3.00	3.00	2.75	3.00	3.00	2.75	2.75

Step 3: The continuous progress is assessed through periodic review by project panel members (first, second and third review before final viva-voce) based on specific rubrics framed by the department.



Step 4: Rubrics for Review-1, Review-2, Review-3, Project Report and Final Viva

First Review			
Performance Indicators	**Criteria**		
	Excellent	**Satisfactory**	**Needs Improvement**
Literature Survey	All objectives of the proposed work are well defined. Steps to be followed to solve the defined problem are clearly specified.	Only some objectives of the proposed work are well defined. Methodology to be followed is specified but detailing is not done	Objectives of the proposed work are either not identified or not well defined. Incomplete and improper specification
	(3)	**(2)**	**(1)**
Problem Statement	Problem statement is clear with proper feasibility towards implementation and testing	Problem statement is clear but not feasible towards implementation and testing	Problem statement is not clear
	(3)	**(2)**	**(1)**
Selection of suitable tool/method for execution	Able to provide clear justification in selecting the software tool or hardware components	Having least knowledge in the selection of software tool and hardware components	No knowledge in the selection of software tool and hardware components
	(2)	**(1)**	**(0.5)**
Project scheduling and dedication towards work	Proposed a clear work plan with proper distribution of work load among the team members	Proposed a clear work plan with improper distribution of work load among the team members	Not clear in the proposed work plan
	(2)	**(1)**	**(0.5)**
			Total Marks (10)

Rubrics for First Review

Second Review			
Performance Indicators	**Criteria**		
	Excellent	**Satisfactory**	**Needs Improvement**
Design Solution	Able to implement more than one design solutions for the problem defined with a comparative analysis	Able to implement only one design solution for the problem defined	No design is introduced and implemented
	(4)	**(3)**	**(1)**
Progress in simulation and hardware implementation	Able to complete the simulation and hardware implementation as per the project schedule provided during review 1	Able to complete minimum of 50 % of the simulation and hardware implementation mentioned as per the schedule provided during review 1.	Incomplete in the simulation and hardware implementation as per the schedule provided during review 1
	(4)	**(3)**	**(2)**
Significance of results obtained	Able to provide results which are in strong significant	Able to provide results which are in better significant	Able to provide results which are insignificant
	(3)	**(2)**	**(1)**
Incorporation of suggestion suggested by the panel members	All suggestions provided by the panel members in the previous review meetings were incorporated	Few suggestions provided by the panel members in the previous review meetings were incorporated	No suggestions provided by the panel members in the previous review meetings were incorporated
	(2)	**(1)**	**(0)**
Presentation (Slide preparation, Voice tone and quality, communication) In every review	Well designed with good flow and appropriate use of pictures and graphs. Confident delivery style with clear voice	Well designed with appropriate use of pictures and graphs, but uniformity in the slides are absent. Confidence in delivery although voice is not audible	Not so well designed. Uniformity in the slides are absent. Inappropriate use of pictures and graphs. Low confidence and voice not clear.
	(2)	**(1)**	**(0.5)**
			Total Marks (15)

Rubrics for Second Review

Group Evaluation Rubric			
Performance Indicators	**Criteria**		
	Excellent	**Satisfactory**	**Needs Improvement**
Objectives and Methodology	All objectives of the proposed work are well defined. Steps to be followed to solve the defined problem are clearly specified	Only some objectives of the proposed work are well defined. Methodology to be followed is specified but detailing is not done	Objectives of the proposed work are either not identified or not well defined. Incomplete and improper specification
	(3)	**(2)**	**(1)**
Design approach, Simulation and Analysis	Division of problem into modules, appropriate design methodology, detailed design and proper justification, complete simulation and analysis	Division of problem into modules, appropriate design methodology, detailed design and proper justification, incomplete simulation and analysis	No appropriate design methodology. No detailed design/circuit copied from some other source and incomplete simulation
	(8)	**(6)**	**(4)**
Hardware implementation, demonstration and presentation	All defined objectives are achieved, Each module working well and properly demonstrated. All modules of project are well integrated and system working is accurate	All defined objectives are achieved, modules are working well in isolation and properly demonstrated. Modules of project are not properly integrated	Defined objectives are not achieved/Some of the defined objective are achieved. Modules are not properly working/modules are working well in isolation. Modules of project are not properly integrated
	(10)	**(7)**	**(5)**
Individual Evaluation Rubric			
Contribution	The individual contributed in a valuable way to the project. The individual is also able to articulate the key aspects of the project. The individual had a level of engagement that demonstrated a strong commitment to project	The individual did not contribute as heavily as others but did meet all responsibilities. The level of analysis and understanding could have been deeper	The individual did not contribute to the project and failed to meet responsibilities. The individual level of engagement did not demonstrate commitment to the project. Conclusions simply involved restating information without reflective thought
	(3)	**(2)**	**(1)**
Basic understanding of the project	Complete understanding of the key concepts. Strong understanding about the technical requirements of the project	No clear understanding about the project but able to explain what is done	Poor understanding about the key concepts and technicalities involved in the project
	(3)	**(2)**	**(1)**
Presentation (Slide preparation, Voice tone and quality, communication)	Well designed with good flow and appropriate use of pictures and graphs. Confident delivery style with clear voice	Well designed with appropriate use of pictures and graphs, but uniformity in the slides are absent. Confidence in delivery although voice is not audible	Not so well designed. Uniformity in the slides are absent. Inappropriate use of pictures and graphs. Low confidence and voice not clear.
	(3)	**(2)**	**(1)**
			Total Marks (30)

Rubrics for End Semester VIVA VOCE Examination

Project Report			
Performance Indicators	**Criteria**		
	Excellent	**Satisfactory**	**Needs Improvement**
Adherence to the formats provided	Fully adhered to the formats as provided by the department	Partially adhered to the formats as provided by the department	Not adhered to the format as provided by the department
	(5)	**(4)**	**(3)**
Clarity in the written sentences and chapter's organization and content	Chapters organization and the written content in each of the chapters are well defined with clarity	Chapters organization and the written content in few of the chapters are well defined with clarity	Chapters organization and the written content in each of the chapters are not well defined
	(5)	**(4)**	**(2)**
Description of project details	All the details of the project are well described	Few details of the project are well described	The details of the project are not well described
	(4)	**(3)**	**(2)**
Discussions of Results and conclusion	Well discussed with good flow and appropriate use of pictures and graphs.	Well discussed with appropriate use of pictures and graphs	Not so well discussed. Inappropriate use of pictures and graphs
	(5)	**(3)**	**(2)**
Appropriate Usage of References and Citations	References and citations are used appropriately	References and citations are little inappropriate	References and citations are fully inappropriate
	(3)	**(2)**	**(1)**
Plagiarism	Plagiarism less than 10%	Plagiarism less than 15%	Plagiarism less than 20%
	(3)	**(2)**	**(1)**
			Total Marks (25)

Rubrics for Project Report

Step 5: Review Marks are recorded based on the rubrics. Each Rubric components are mapped with its corresponding COs.

18CSP109L / 18CSP111L -PROJECT

INTERNAL ASSESSMENT-1 (CLAT1)

MAX. MARKS			2	3	3	2	2	2	1	
CO			1	2	2	3	3	4	4	
Sl. No	Register Number	Student Name	PI 1.6.1 (Evaluate)	PI 2.5.2 (Identify)	PI 3.6.1 (Design)	PI 10.5.2 (Define)	PI 10.4.3 (Create)	PI 9.6.1 (Present)	PI 7.5.2 (Understand)	Total
1	RA1911003010569	Yogesh	2	1.7	2	1.5	2	1	1	11.2
2	RA1911003010570	Saksham Bhandari	1.5	1.5	1.5	2	1	1.2	1	9.7
3	RA1911003010571	Mohammad Hasan Lutfy	2	1.7	3	1.6	1	1	1	11.3
4	RA1911003010572	Gurditya Khurana	2	3	2	1.5	1.5	2	1	13
5	RA1911003010573	Kasshish Raina	1	1	1	1.7	1	1	1	7.7

Step 6: Calculate CO attainment for each CO.

55	RA1911003010627	Siram Venkata Sri Vignesh	1	1	1	1	1	1	1	7
56	RA1911003010628	Tirth Kalaria	1	1	2.5	1	2	2	1	10.5
57	RA1911003010629	Mithil Hingrajiya	1.5	2	1	1	2	2	1	10.5
58	RA1911003010630	Sneha Ghosh	2	1.7	2	1.5	1	1	1	10.2
59	RA1911003010631	Pratyush Sinha	1.5	1.5	2	1.1	1	2	1	10.1
60	RA1911003010632	Vikrant Kala	1.7	2.5	2.5	1	2	2	1	12.7
Number of Students Attempted			60	60	60	60	60	60	60	
Number of students who got more than 60% of marks			43	31	39	40	37	36	59	
Percentage of students who got more than 60% of marks			71.67	51.67	65.00	66.67	61.67	60.00	98.33	
AVERAGE PERCENTAGE of students who got more than 60% of marks			71.67	58.33		64.17		60.00		
CO ATTAINMENT LEVEL			2	0		1		1		
CO			CO1	CO2		CO3		CO4		

Step 7: Repeat Step 5 & 6 for all the reviews

Step 8: Enter Semester End Examination result (Final Viva Marks) in the corresponding sheet

Step 9: Conduct Programme exit survey from the passed out students and alumni contacts. Record the responses in numeric value. Find the average for each CO and consider it as direct attainment score.

Step 10: Calculate Attainment Score for Continuous Internal assessment (CIA) from all review scores. Also record Semester End Examinations marks as SEE.

Step 11: Calculate Direct attainment score from 50% of CIA and 50% SEE.

Step 12: Calculate Direct attainment levels and Indirect attainment levels using the formula as follows:

Attainment level = 3, if Attainment Score >= x%
= 2 if y% <= Attainment Score < x%
= 1 if z% <= Attainment Score < y%

Step 13: Final Attainment score is calculated as follows:

Final Attainment Score = 70% of Direct Attainment Score+ 30% of Indirect Attainment Score

Final Attainment Level is calculated from final attainment score as per the formula in Step no. 12

12. PROGRAMME LEVEL PO/PSO ATTAINMENT

The PO attainments of all the core courses are listed and the average PO attainments are calculated. Then the average PO attainments are compared with the target PO to check whether the POs are attained at programme level or not.

			PO ATTAINMENTS											PSO ATTAINMENTS		
S.No	Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	18CSS101J	Programming for Problem Solving	2.74	2.76	2.68	2.7	-	-	-	-	-	-	-	2	-	-	2.94
2	18CSC201J	Data Structures and Algorithms	1.6	1.4	1.3	1.2									1.1		1.5
3	18CSC202J	Object Oriented Design and Programming	2.49	2.04	1.87	1.48	1.48	-	-	-	1.3	1.3	-	-	2.17	2.43	1.3
4	18CSC203J	Computer Organization and Architecture	1.4														
5	18CSS202J	Computer Communications		1.4		1.8			1.8						1.8		
6	18CSC204J	Design and Analysis of Algorithms	2.32	2.6	2.67	-	-	-	-	-	-	-	-	-	-	-	2.93
7	18CSC205J	Operating Systems	2														
8	18CSC206J	Software Engineering and Project Management	2.75	1.84	2.58	-	2.84	-	-	-	-	-	-	2.75	2.66	2.84	1.87
9	18CSC207J	Advanced Programming Practice	2.1	1.8		1.8						1.4			1.4		2.1
10	18CSC208L	Competitive Professional Skills-I	1.9					1.8									
11	18CSC301T	Formal Language and Automata	2.1				1.8									2.1	
12	18CSC302J	Computer Networks	2.95	0.97	1.64	2.83	0.99	-	-	-	-	-	-	-	-	-	1.96
13	18CSC306L	Competitive Professional Skills-II			1.8			1.9								2.1	
14	18CSP101L	Massive Open Online Course - I	1.9														
15	18CSP102L	ndustrial Training-I						1.9									2.1
16	18CSP103L	Seminar - I					1.9								2.1		
17	18CSC303J	Database Management Systems				1.9											
18	18CSC304J	Compiler Design	2.1													2.1	
19	18CSC305J	Artificial Intelligence	1.68	2.25	2.2	1.95									1.89	1.36	1.99
20	18CSC350T	Comprehension															
21	18CSC207L	Competitive Professional Skills-III				1.9		1.7	1.8		1.8			1.8			
22	18CSP104L	Massive Open Online Course - II											1.8				
23	18CSP105L	Industrial Training-II	2.1		1.7					1.8	1.8						
24	18CSP106L	Seminar - II	1.9					1.8				1.8		1.8			
25	18CSP107L	Minor Project				1.8			1.8					1.8			
26	18CSP108L	Internship (4-6 weeks)		1.8													
27	18CSP109L	Project	2.83	2.6	2.87	2.87	2.83	2.11	2.29	2.72	2.83	2.83	2.6	2.83	2.83	2.6	2.6
28	18CSP110L	Semester Internship	2.1		1.8						1.8						1.8
Average			**2.16**	**1.95**	**2.10**	**2.02**	**1.97**	**1.87**	**1.92**	**2.26**	**1.91**	**1.83**	**2.20**	**2.16**	**1.99**	**2.22**	**2.10**
		Direct	2.16	1.95	2.10	2.02	1.97	1.87	1.92	2.26	1.91	1.83	2.20	2.16	1.99	2.22	2.10
		Indirect	2.40	2.20	2.20	1.90	2.30	2.50	2.70	2.80	2.50	2.90	2.20	2.40	2.50	2.20	2.10
		Final Attainment	**2.21**	**2.00**	**2.12**	**2.00**	**2.04**	**1.99**	**2.08**	**2.37**	**2.02**	**2.05**	**2.20**	**2.21**	**2.10**	**2.21**	**2.10**

Direct Attainment

PO attainments of all the core courses are listed in the above table and its average is computed. So Direct attainment is the average PO attainment of all the courses of a programme.

Indirect Attainment

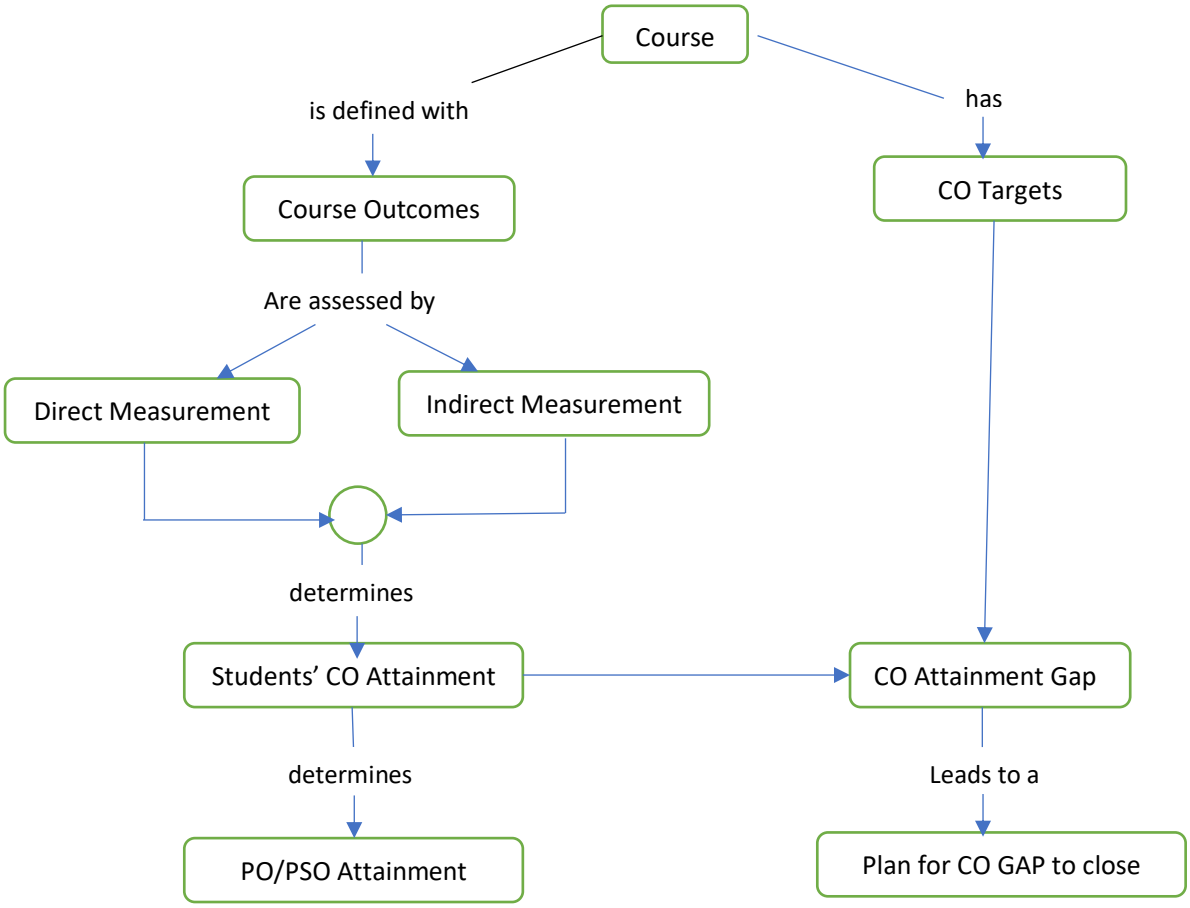
Programme exit survey and alumni survey will be conducted similar to course exit survey. These survey questionnaires will verify the attainment of all POs of a programme.

Final Attainment

80% of direct attainment and 20% of indirect attainments are added to find the final PO attainment of a programme.

13. CO ATTAINMENT AND GAP ANALYSIS

The CO attainment for each course will be compared with CO attainment target and the CO gaps can be closed by either enhancing the CO target or by enhancing the Teaching Learning process.



- Every course of a programme is defined with respect to course outcomes and each course coordinator will define a CO attainment target at the beginning of a course delivery (i.e, at the beginning of a semester).

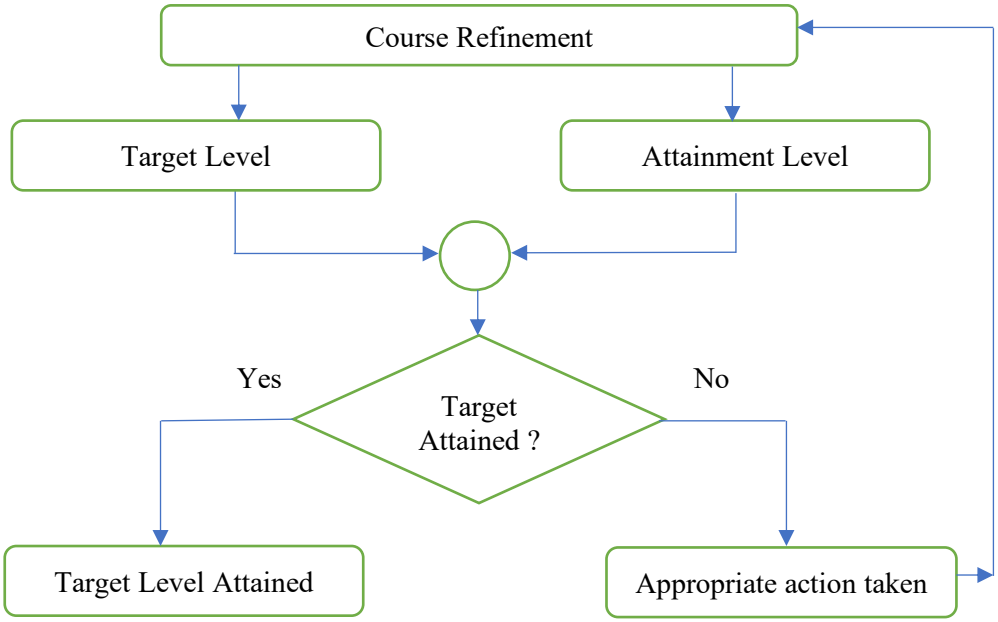
- Course outcomes are measured by direct methods like Continuous Internal Assessments (CIAs) and the CO will be measured indirectly through course exit survey at the end of the semester.

- CO attainment of individual sections will be added and the average CO attainment of a course will be calculated by the course coordinators.

- This CO attainment level is compared with CO target to check whether the students attained the target or not. If any CO is not attained, the course coordinator may suggest his plan to attain the CO in future. CO target may be redefined if needed.

14. CONTINUOUS IMPROVEMENT IN PO/PSO ATTAINMENT

Based on the PO/PSO Attainment for a course, we take appropriate action to refine the course if target is not achieved. Also we can suggest to refine the PO/PSO attainment target in future.



Every Faculty needs to compute two main attainment values as mentioned below. Based on that if target is not attained then appropriate actions should be taken.

- CO attainment
- PO attainment w.r.to CO

Course audit professor will analysis the PO/PSO attainment section-wise and recommends for further actions.