

Course Outcome(**CO**)- Program
Outcome(**PO**) Calculations in
Outcome Based Education (OBE)

OBE

As per Tucker, 2004

- “OBE is a process that involves the **restructuring** of curriculum, assessment and reporting practices in education to reflect the **achievement of high order learning and mastery rather than the accumulation of course credits**”
- OBE is student-centered instruction model that focuses on **measuring student performance through outcomes.**
- OBE means focusing and organizing an institutes entire **programs** and instructional efforts around the **clearly defined outcomes we want all students to demonstrate when they leave institute**
- Done by developing a **clear set of learning outcomes** around which all of the system's components can be focused.

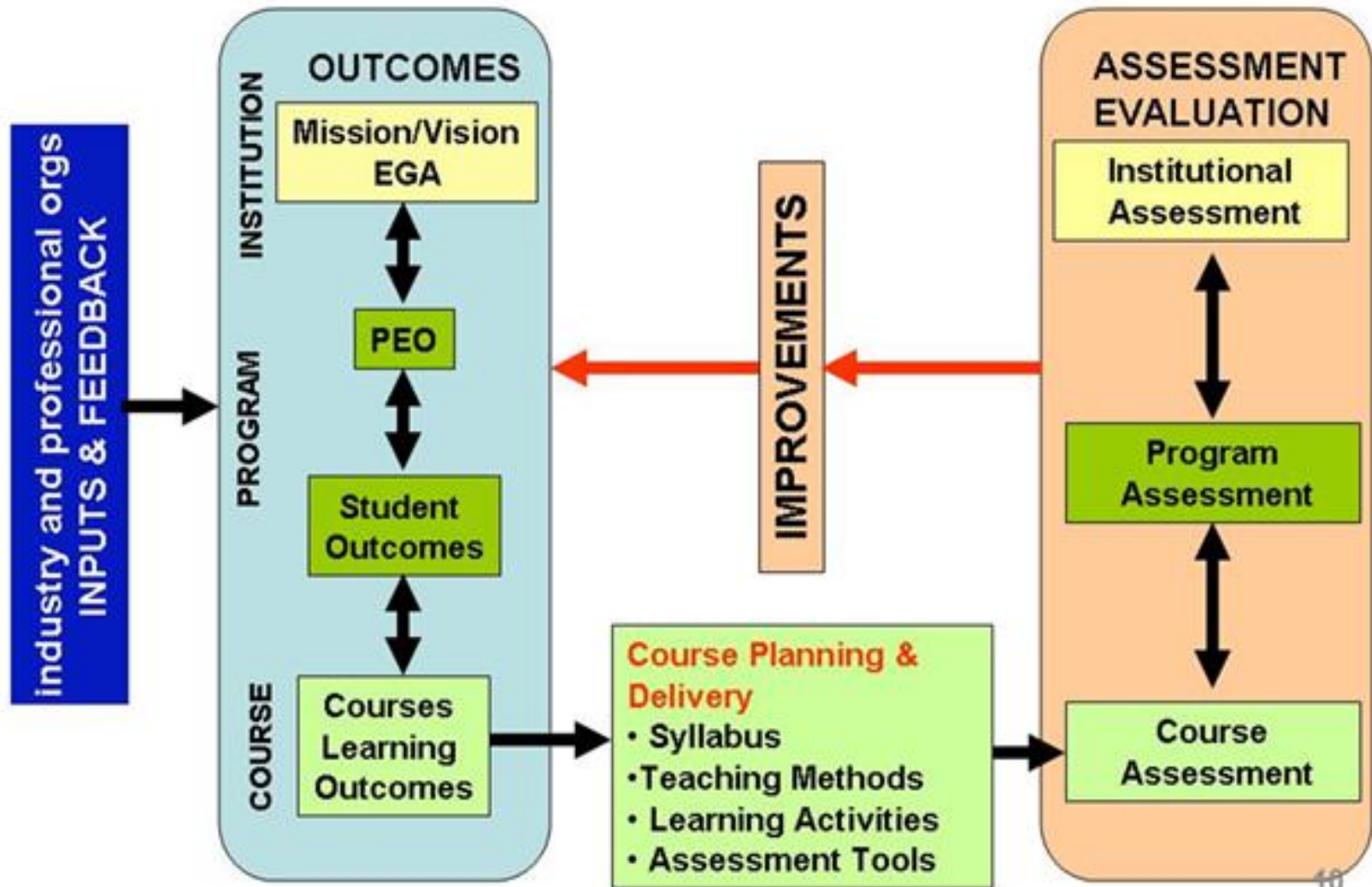
Why institutions need to follow OBE?

- India is a permanent signatory in the **Washington Accord** in 2014.
- It means that an **Engineering graduate from India can be employed in any one of the other countries** who have signed the accord.
- For Indian Engineering Institutions ,according to the pacts of the accord, it is compulsory that engineering institutions **follow the Outcome Based Education (OBE) model.**
- Outcome Based Education (OBE) as an essential **prerequisite for accreditation.**

Outcome based education emphasizes on

- Stating what you want your **students to be able to do at the end of the program,**
- **Assessing the students** whether they are able to do what they are expected to do.
- **Orienting teaching** and other academic processes to facilitate students to do what they are expected to do.

The OBE Framework



COURSE/PROGRAM

- **Course** is defined as a **theory, practical or theory cum practical subject studied in a semester**. For example: Engineering Mathematics
- **Program** is defined as the **specialization or discipline of a Degree**. It is the interconnected arrangement of courses, co-curricular and extracurricular activities to accomplish predetermined objectives leading to the awarding of a degree. For example: B.Tech., Civil Engineering

Writing And Assessing Course-Outcomes

- An expected Course outcome is a **formal statement** of what students are expected to learn in a course.
- Simply stated, expected learning outcome statements describe:
 1. What faculty members want **students to know** at the end of the course AND
 2. What faculty members want **students to be able to do** at the end of the course.
- It is focused on what the learner will know or be able to do by the end of a defined period of time and indicate how that knowledge or skill will be demonstrated.

Course Outcome..

Course outcomes have **three major characteristics**

- 1. They **specify an action** by the students/learners that is **observable**
- 2. They **specify an action** by the students/learners that is **measurable**
- 3. They **specify an action that is done by the students/learners** (rather than the faculty members)

Eg: Expected Learning Outcomes for this session

1. Construct/develop expected learning outcomes for a course
2. Create an assessment plan that outlines the specific methods that will be used to assess the expected student learning outcomes for a course

Do not write vaguely : Understand writing Course Outcome (How do you observe someone “understanding” a theory , How easy will it be to measure “understanding”)

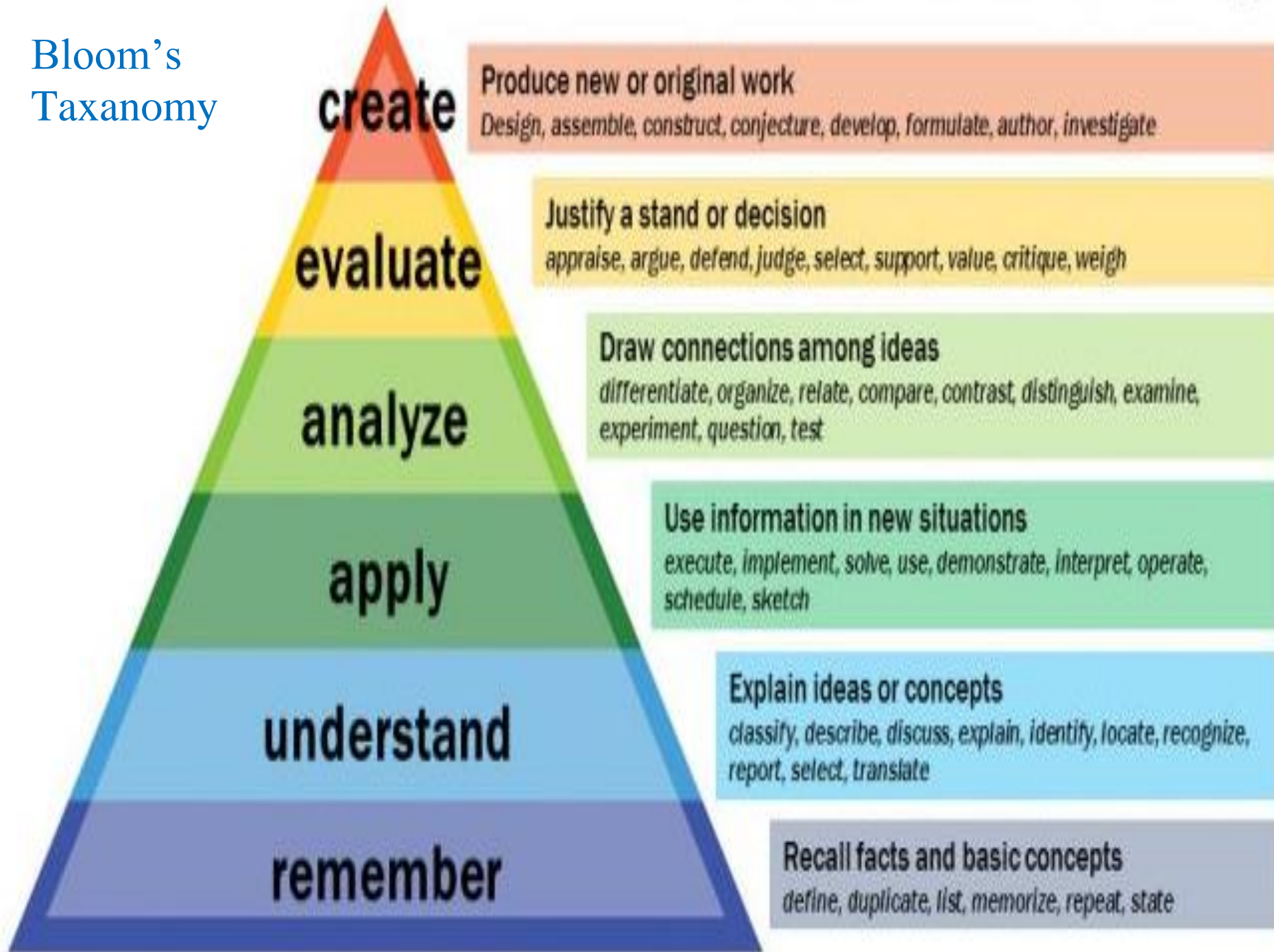
Writing Effective Course – Outcome Statements

- When stating expected outcomes, it is important to **use verbs that describe exactly what the learner(s) will be able to do** upon completion of the course. (Bloom's Taxonomy)
- Examples of good action words to include in expected learning outcome statements: **Compile, identify, create, plan, revise, analyze, design, select, utilize, apply, demonstrate, prepare, use, compute, discuss, explain, predict, assess, compare, rate, critique, outline, or evaluate**

Examples

- **predict** the appearance and motion of visible celestial objects
- **formulate** scientific questions about the motion of visible celestial objects
- **select** and integrate information from various sources
- **communicate** scientific ideas, procedures, results, and conclusions using appropriate SI units, language, and formats
- **describe, evaluate, and communicate** the impact of research and other accomplishments in space technology
- By the end of this unit, students will be able to **describe** the characteristics of the three main types of geologic faults (dip-slip, transform, and oblique) and explain the different types of motion associated with each.
- By the end of this course, students will be able to **work** cooperatively in a small group environment.

Bloom's Taxonomy



REMEMBER	UNDERSTAND	APPLY	ANALYZE	EVALUATE	CREATE
Count	Associate	Add	Analyze	Appraise	Categorize
Define	Compute	Apply	Arrange	Assess	Combine
Describe	Convert	Calculate	Breakdown	Compare	Compile
Draw	Defend	Change	Combine	Conclude	Compose
Identify	Discuss	Classify	Design	Contrast	Create
Label	Distinguish	Complete	Detect	Criticize	Drive
List	Estimate	Compute	Develop	Critique	Design
Match	Explain	Demonstrate	Diagram	Determine	Devise
Name	Extend	Discover	Differentiate	Grade	Explain
Outline	Extrapolate	Divide	Discriminate	Interpret	Generate
Point	Generalize	Examine	Illustrate	Judge	Group
Quote	Give examples	Graph	Infer	Justify	Integrate
Read	Infer	Interpolate	Outline	Measure	Modify
Recall	Paraphrase	Manipulate	Point out	Rank	Order
Recite	Predict	Modify	Relate	Rate	Organize
Recognize	Rewrite	Operate	Select	Support	Plan
Record	Summarize	Prepare	Separate	Test	Prescribe
Repeat		Produce	Subdivide		Propose
Reproduce		Show	Utilize		Rearrange
Select		Solve			Reconstruct
State		Subtract			Related
Write		Translate			Reorganize
		Use			Revise
					Rewrite
					Summarize
					Transform
					Specify

Course Mapping

CO-PO-PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3	2	2												3	3
CO2	3													3		
CO3		2	2		2									2		
CO4		2	3		2									2		

CO-PO MAPPING JUSTIFICATION

15CS63	CO1	PO1	3	Apply the knowledge of system software to design assemblers, loaders and linkers for different architectures.
		PO2	2	Analyze the working of different passes to develop types of assembler.
		PO3	2	Design and develop the machine independent, executable code.
	CO2	PO1	3	Apply the basic knowledge of translators and its working process to develop compilers for different languages.
	CO3	PO2	2	Analyze the language constructs using different analysis techniques.
		PO3	2	Develop the parser systems to meet the particular language constructs.

ASSESSMENT

Assessment is the **process of investigating**

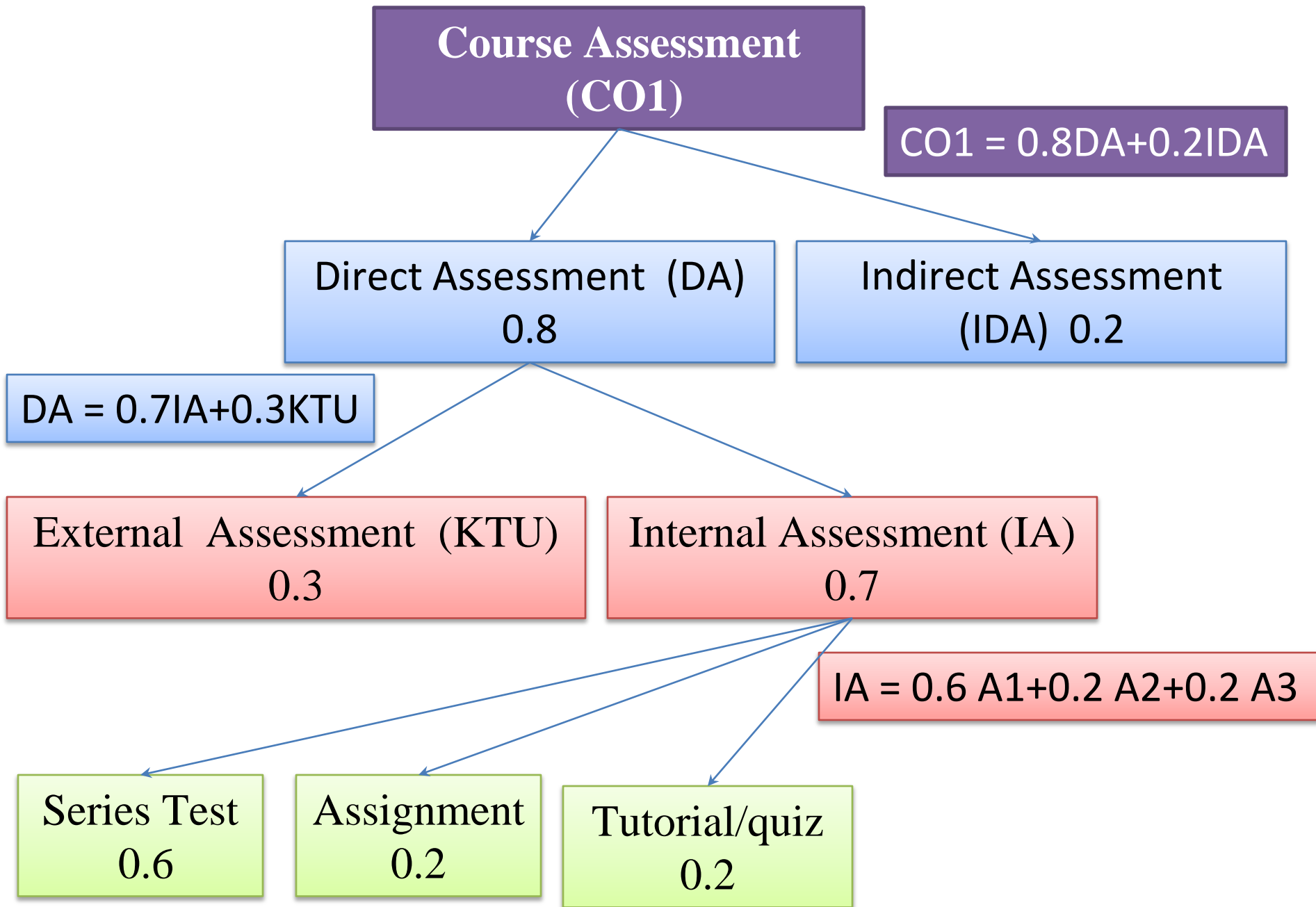
- (1) what students are learning and
- (2) how well they are learning it in relation to the stated expected learning outcomes for the course.

This process also involves **providing feedback** to the students about their learning and providing new learning opportunities/strategies to increase student learning.

Methods For Assessing Course Outcomes

Assessment tools are direct and indirect:

Direct Assessment	Indirect Assessment
Internal Exam	Course End survey
End Semester Exam	Program Exit Survey
Assignment, Tutorial	Alumni Survey
Course Project, Case Study	Employer Survey
Field Visit report	
Seminar	



TARGETS FOR CO ATTAINMENT

First time

Internal Evaluation: Average of Internal Marks for the same Course and Program in the previous 3 Academic Years

End Semester Exam: Average of End Semester Exam Marks for the same Course and Program in the previous 3 Academic Years

Subsequent Academic Years

Not less than Previous Year Target, Continuous Improvement Desirable

Fixing Attainment Levels

70% or more students Score More than Set Target	: 3
60% students Score More than Set Target	: 2
50% or more students Score More than Set Target	: 1
Less than 50% students Score More than Set Target	: 0

Sample CO Attainment Calculation

TARGET Internal: 62%, Assignment: 75%, End Sem: 58%

- A1,A2,A3, KTU, IDA = Attainment Index = 3 ,2 or 1 depending on the percentage of students who achieve target as given above
- Rules for Setting of target are also given above
- IDA done through Course Exit Survey

Sample CO Attainment Calculation

TARGET Internal: 62%, Assignment: 75%, End Sem: 58%

Student	% Internal exam marks	% Assignment marks	%Tutorials	% End sem exam marks
1	75	85	80	75
2	60	80	75	68
3	55	73	50	55
4	90	68	68	80
5	80	60	90	45
6	75	90	68	82
7	78	85	75	70
8	48	60	70	56
9	61	80	85	50
10	40	80	60	78
% students above target	50%	60%	82%	60%
Attainment level	1.0	2.0	3.0	2.0

$$IA = 0.6 \times 1 + 0.2 \times 2 + 0.2 \times 3 = 1.6$$

$$DA = 0.7 \times 1.6 + 0.3 \times 2 = 1.72$$

$$CO1 = 0.8 \times 1.72 + 0.2 \times IDA$$

IDA – Got from Course Exit Survey

Department and College Name

COURSE EXIT SURVEY, Month and Year

COURSE NAME:

COURSE OUTCOMES

After successful completion of the student will be able to

CO-1:

CO-2:

CO-3:

CO-4:

CO-5:

CO-6:

COURSE EXIT SURVEY

To what extent you think you achieved these COs?

You may write 5 for "Excellent", 4 for "very good", 3 for "good",
2 for "satisfactory", 1 for "Poor" and 0 for "not achieved"

Roll No.	Name of the Student	CO 1	CO 2	CO 3	CO 4	CO 5	CO 6	SIGNATURE

Get this from whole class.

If above **70% of students rate CO1 as above 3** then IDA for CO1 is **3**

If only 50% of students rate CO6 as above 3 then IDA for CO6 is 1

Complete Calculation from C01 to CO6 using above method

PO Attainment

5.2 PO ATTAINMENT

Percentage Weightage for Direct and Indirect Components

Direct	Indirect
70	30

A sample mapping of CO-PO for one particular subject is shown below:

CO	Overall Attainment	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
EC101.1	2.08	3											
EC101.2	2.56	3	3	3									
EC101.3	2.4	2						3					
EC101.4	2.2	--									3		
EC101.5	1.9	3								3			

Direct Attainment of PO1 = $(2.08+2.56+2.4 \times 0.66+1.9)/4 = 2.031$

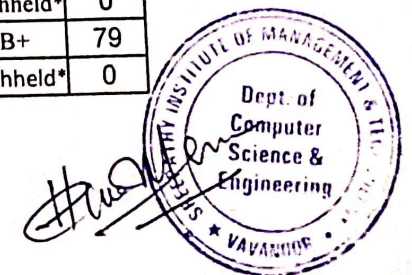
Let the Indirect attainment of PO1 be 2.7

PO1 overall attainment = $2.031 \times 0.7 + 2.7 \times 0.3 = 2.232$

Indirect Attainment of PO is through Program Exit Survey to be done at end of 8th Semester

Sreepathy Institute of Management and Technology
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO- PO Attainment
CS208 Principles of Database Design

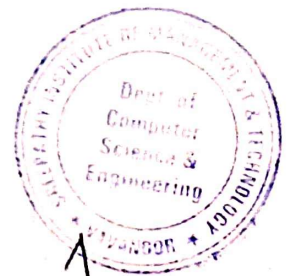
Assessing method		ST-1		ST-2		A1	A2							KTU		
Register No.	Name of Student	CO1	CO2	CO5	CO6	CO3	CO4							10	Grade	%
		10	10	10	10	5	5									
SPT18CS001	Aavani T	8	8	10	10	3	3								B+	79
SPT18CS002	Abhijith P	3	3	9	9	3	3								A	84
SPT18CS003	Abhirami A C	5	5	9	9	3	3								B+	79
SPT18CS004	Abhishek S Kumar	2	2	9	9	2	2								B	69
SPT18CS005	ABISHEK V	0	0	9	9	3	3								Withheld*	0
SPT18CS006	Adarsh M	8	8	9	9	3	3								A	84
SPT18CS007	Anagha P R	6	6	10	10	3	3								B	69
SPT18CS008	Anirudh S Rajeev	7	7	9	9	3	3								A	84
SPT18CS009	Anjali Varma N K	5	5	9	9	3	3								B+	79
SPT18CS010	Aswathy S	6	6	10	10	3	3								B+	79
SPT18CS011	Aswin V	5	5	9	9	3	3								B+	79
SPT18CS012	Athira P	2	2	9	9	3	3								Withheld*	0
SPT18CS013	Austin Ignatius	5	5	9	9	3	3								B	69
SPT18CS014	Daya K S	5	5	9	9	3	3								B	69
SPT18CS015	Dinoop K V	9	9	9	9	3	3								O	100
SPT18CS016	E Rohith	5	5	7	7	3	3								B	69
SPT18CS017	Fathima Shahana E K	9	9	9	9	3	3								A+	89
SPT18CS018	Gokul Krishnan M K	5	5	9	9	3	3								B+	79
SPT18CS019	Hareesh Mohan A V	2	2	9	9	3	3								Withheld*	0
SPT18CS020	Jeslin C John	5	5	9	9	3	3								B	69
SPT18CS021	Jithin M	2	2	3	3	2	2								Withheld*	0
SPT18CS022	Jithu M	0	0	7	7	2	2								Withheld*	0
SPT18CS023	K Gayathri	5	5	9	9	3	3								B+	79
SPT18CS024	Mohammed Dhilshad	0	0	9	9	3	3								Withheld*	0



SPT18CS025	Muhammed Nishad K P	1	1	9	9	2	2							Withheld*	0
SPT18CS026	Nair Vaishnavi Ravi	8	8	9	9	3	3							B	69
SPT18CS027	Neeraja A J	7	7	9	9	3	3							A	84
SPT18CS028	Nimisha Sreenivasan	6	6	9	9	3	3							C	59
SPT18CS029	Niranjana Raj V K	5	5	9	9	3	3							B+	79
SPT18CS030	Parvathy S Menon	10	10	9	9	3	3							O	100
SPT18CS031	Pranav V K	1	1	9	9	3	3							B	69
SPT18CS032	Rithwik Krishnan K	3	3	9	9	3	3							Withheld*	0
SPT18CS033	Roshan K V	7	7	9	9	3	3							A+	89
SPT18CS034	Sabeer T K	2	2	9	9	2	2							Withheld*	0
SPT18CS035	Sanil T P	2	2	9	9	3	3							C	59
SPT18CS036	Sneha P	3	3	9	9	3	3							B	69
SPT18CS037	Sreenath K V	5	5	9	9	3	3							B+	79
SPT18CS038	Sreeram M S	5	5	9	9	3	3							Withheld*	0
SPT18CS039	Sruthy M	7	7	9	9	3	3							C	59
SPT18CS040	Sulfath P S	5	5	10	10	3	3							B+	79
SPT18CS041	Surya K	5	5	9	9	3	3							Withheld*	0
SPT18CS042	Vaisakh K P	7	7	9	9	3	3							Withheld*	0
SPT18CS043	Visakh M	3	3	9	9	3	3							B+	79
LSPT18CS044	RESHMA P.V.	6	6	9	9	3	3							Withheld*	0
LSPT18CS045	SUMIN DAS	2	2	9	9	2	2								0
CLASS AVERAGE		4.52	4.52	8.94	8.94	2.4	2.4								
THRESHOLD=50%		5	5	5	5	2.5	2.5							5	50
No of students with marks>=60%		19	19	44	44	39	39							0	24
centage of students securing marks above threst		46.34	46.34	107.32	107.32	95.12	95.12							0.00	58.54
attainmnt level based on levelindicator		0	0	3	3	3	3							0	1



Hema P. Menon
(Hema. P. Menon)



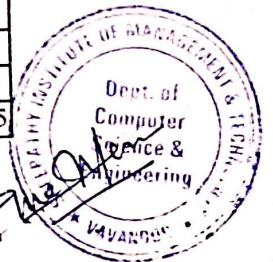
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	Direct Assessment Tools												Direct Attainment	Indirect Attainment	
	ST-1	ST-2	A-1	A-2	T1	T2	T3	T4	T5	T6	IA	KTU			
CO1	1	0	0	0	0	0	0	0	0	0	0	0.7	0.3	0.8	0.2
CO2	0.6	0	0.4	0	0	0	0	0	0	0	0	0.7	0.3	0.8	0.2
CO3	0	1	0	0	0	0	0	0	0	0	0	0.7	0.3	0.8	0.2
CO4	0	1	0	0	0	0	0	0	0	0	0	0.7	0.3	0.8	0.2
CO5	0	0	0	1	0	0	0	0	0	0	0	0.7	0.3	0.8	0.2
CO6	0	0	0	0	0	0	0	0	0	0	1	0.7	0.3	0.8	0.2

	Attainment Level												Direct Attainment	Indirect Attainment	CO Attainment
	ST-1	ST-2	A-1	A-2	T1	T2	T3	T4	T5	T6	IA	KTU			
CO1	3	0	0	0	0	0	0	0	0	0	3	1	2.4	3	2.52
CO2	0	0	3	0	0	0	0	0	0	0	1.2	1	1.14	3	1.512
CO3	0	3	0	0	0	0	0	0	0	0	3	1	2.4	3	2.52
CO4	0	2	0	0	0	0	0	0	0	0	2	1	1.7	3	1.96
CO5	0	0	0	3	0	0	0	0	0	0	3	1	2.4	3	2.52
CO6	0	0	0	0	0	0	0	0	0	3	3	1	2.4	3	2.52
														CO	2.26

Course Outcomes	Program Outcomes												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	0	1	PO12	PSO1	PSO2
CO1	1	2	0	0	2	0	0	0	0	0	0	0	1	1
CO2	2	0	2	3	0	0	0	0	0	0	0	0	2	1
CO3	2	0	0	0	2	0	0	0	0	0	0	0	1	1
CO4	1	0	0	0	2	0	0	0	0	0	0	2	0	1
CO5	2	2	2	2	0	0	0	0	0	0	0	2	2	1
CO6	2	0	0	2	0	0	0	0	0	0	0	2	2	1
Average	1.67	2.00	2.00	2.33	2.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	1.60	1.00
Attainment	1.26	1.68	1.34	1.62	1.56							1.56	1.21	0.75



	Direct Assessment Tools						Direct Attainment	Indirect Attainment
	ST-1	ST-2	A-1	A-2	IA	KTU		
CO1	0.6	0	0.4	0	0.7	0.3	0.8	0.2
CO2	0.6	0	0.4	0	0.7	0.3	0.8	0.2
CO3	0.6	0	0.4	0	0.7	0.3	0.8	0.2
CO4	0	0.6	0	0.4	0.7	0.3	0.8	0.2
CO5	0	0.6	0	0.4	0.7	0.3	0.8	0.2
CO6	0	0.6	0	0.4	0.7	0.3	0.8	0.2

	Direct Assessment Tools						Direct Attainment	Indirect Attainment	CO Attainment
	ST-1	ST-2	A-1	A-2	IA	KTU			
CO1	1	0	3	0	1.8	3	2.16	2	2.13
CO2	1	0	3	0	1.8	3	2.16	2	2.13
CO3	3	0	3	0	3	3	3	2	2.8
CO4	0	3	0	3	3	3	3	2	2.8
CO5	0	3	0	3	3	3	3	2	2.8
CO6	0	3	0	3	3	3	3	2	2.8

CO Average **2.58**

Course Outcomes	Program Outcomes												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	0	3	0	0	0	0	0	0	0	0	0	0	2
CO2	2	0	3	0	0	0	0	0	0	0	0	0	0	2
CO3	2	0	3	0	0	0	0	0	0	0	0	0	0	2
CO4	2	0	3	0	2	0	0	0	0	0	0	0	0	2
CO5	2	0	2	0	0	0	0	0	0	0	0	0	0	2
CO6	2	0	3	0	0	0	0	0	0	0	0	0	0	2
Average	2.0	0.0	2.8	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
Attainment	1.72	0.00	2.42	0.00	1.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.72

Krishnan. K.V.
