



Methodology of Measuring



Attainment of POs/PSOs and COs

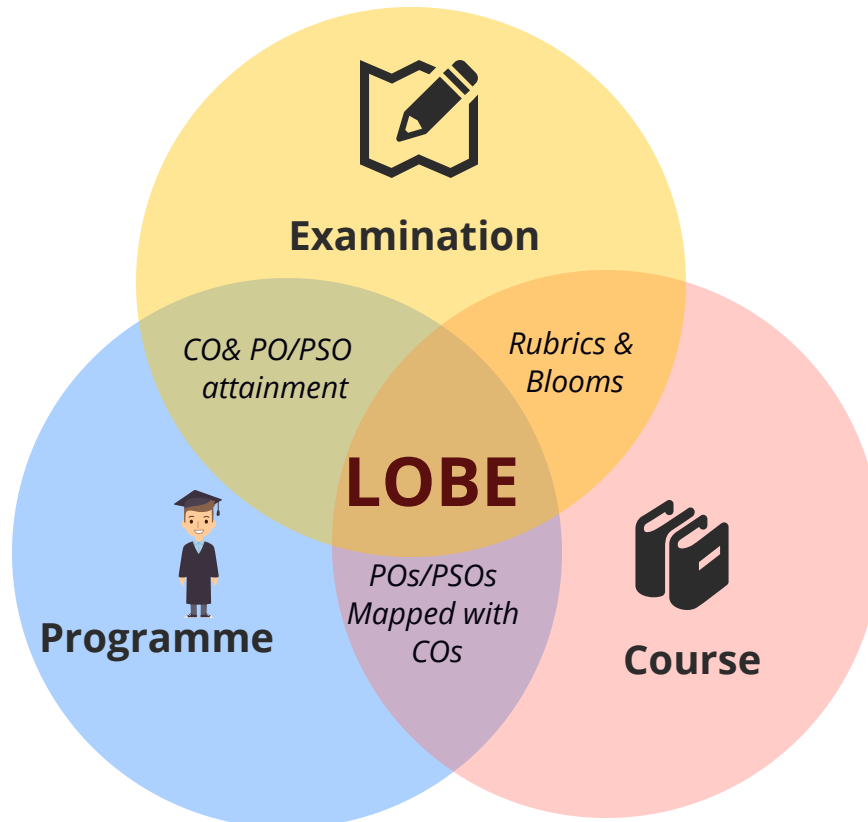
Annamalai University



COs- are the statements of knowledge/ skills/ abilities that students are expected to know, understand and perform as a result of learning experiences

POs- are the knowledge, skills, and abilities that a student should possess upon completion of a programme

Outcomes must be SMART(**S**pecific, **M**easurable, **A**chievable, **R**ealistic & **T**ime bound)



Learning Outcome-Based Education (LOBE) emphasises on the goals (Outcomes) so as to enable each student to succeed in all walks of life





Attainment of POs/PSOs and COs

Prelude

In LOBE, measurable COs are set for every course and mapped with POs and PSOs of the Programme. RUBRICS scales are adopted in different levels at different stages of assessment of attainment of POs, PSOs and COs. Rubrics are multidimensional sets of scoring guidelines that can be used to provide consistency in evaluating student work and assign particular grade on an assignment.

Methods of Measuring Attainment Levels

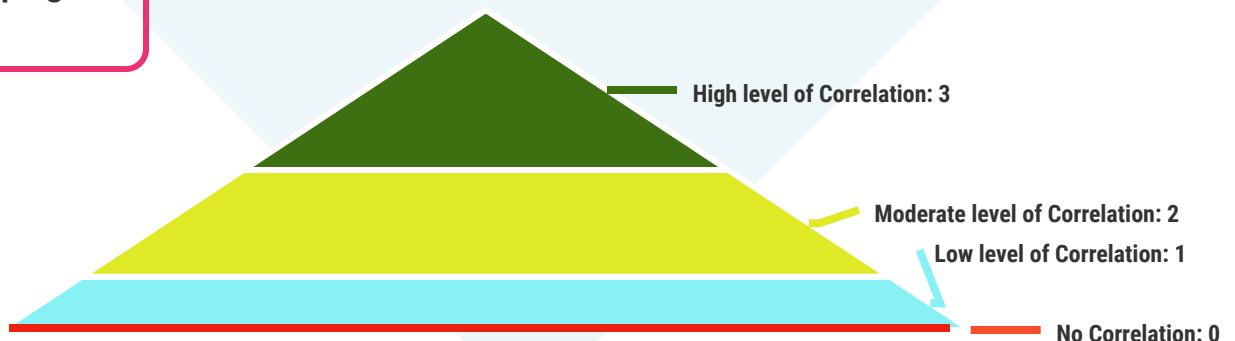
The attainment levels of POs, PSOs and COs by the students are measured for every programme offered in the University. Two different methodologies are adopted in the university. For programmes offered in the Faculty of Engineering and Technology the attainment methodology suggested by NBA with minor modification was adopted. For all other faculties direct assessment methodology developed by IQAC is adopted. This methodology is simple to adopt yet gives a robust picture about attainment levels of students considering his/her holistic performance during continuous assessment processes.

Direct Assessment Methodology by IQAC

**Level 1
Rubrics level at
Curricular Level
in CO - PO
Mapping**

The following RUBRICS scale is adopted to define the strength of correlation between the course outcomes (COs) mapped with Programme outcomes (POs) /Programme specific outcomes (PSOs).

Strength of Correlation between COs mapped with POs/PSOs





Methodology of Measuring



Attainment of POs/PSOs and COs

eg. CO - PSO Mapping for the course ENT 611 Insect Morphology and Classification in M.Sc. (Agri.) Entomology Programme

	PS01	PS02	PS03	PS04	PS05
C01	3	3	-	-	-
C02	3	3	-	-	-
C03	3	3	-	3	3
C04	3	-	-	3	3
C05	3	-	-	3	-
Total	15	9	0	9	6

Apportioning of PO attainment contribution to the individual course

The strength of correlation contributed by COs of all impact courses to a specific PO/PSO is pooled to define varying degree of CO contribution to attain a PO/PSO. This variation in degree of CO contribution to attain PO/PSO by a single course is apportioned in terms of percentage to every course based on its CO-PO/PSO strength of correlation (CO – PO/PSO Mapping score). The following formula is adopted to define PO/PSO attainment contribution of individual course impact.

$$\text{PO/PSO attainment contribution of individual course impact (\%)} = \frac{\text{CO-PO/PSO mapping score/strength of correlation by individual course to a specific PO/PSO}}{\text{Total CO-PO PSO mapping score/strength of correlation contributed by all courses to a specific PO/PSO}} \times 100$$



Methodology of Measuring



Attainment of POs/PSOs and COs

eg. Table 1. CO - PSO Mapping scores for impact courses in M.Sc. (Agri.) Entomology Programme

Courses impact	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
ENT 611	15	9	0	9	6
ENT 612	15	0	0	11	7
ENT 613	15	9	12	9	2
STA 611	0	0	0	9	9
COM 611	0	0	0	9	9
ENT 621	15	15	10	12	2
ENT 622	15	15	13	4	1
ENT 623	3	0	18	12	0
ENT 624	0	6	9	6	0
Total	78	54	62	81	36

eg. Table 2. PSO attainment contribution apportioned in percentage for every course to specific PSO in M.Sc. (Agri.) Entomology Programme

Courses impact	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
ENT 611	19.23	16.67	0.00	11.11	16.67
ENT 612	19.23	0.00	0.00	13.58	19.44
ENT 613	19.23	16.67	19.35	11.11	5.56
STA 611	0.00	0.00	0.00	11.11	25.00
COM 611	0.00	0.00	0.00	11.11	25.00
ENT 621	19.23	27.78	16.13	14.81	5.56
ENT 622	19.23	27.78	20.97	4.94	2.78
ENT 623	3.85	0.00	29.03	14.81	0.00
ENT 624	0.00	11.11	14.52	7.41	0.00
Total	100	100	100	100	100

Note: Highlighted in yellow are courses with no COs correlated to the specific PSO that gives zero impact on PSO.

Level 2 & 3: Rubrics at Individual student level - Calculating PO/PSO attainment of a student impact

The direct assessment methodology is adopted to calculate PO/PSO attainment of a student for the course concerned. The instinct of adopting this technique is derived from our continuous assessment methodology which is inclusive of continuous internal assessments such as internal assessment exam, assignment, Viva-voce, seminar, presentation, mini project, assignment etc., and final practical and theory examinations. Different RUBRICS scales are adopted at every stage of continuous assessment methodology to define the performance level of the students. Further, as the Bloom's Taxonomy based question papers are holding choice for students to opt a question of their own choice, question paper based CO attainment at different stages will not reflect actual attainment of students as there exists a scope to omit a question related to a specific CO. Hence, to calculate PO/PSO attainment of a student from a concerned course, the total marks obtained by the student from all his continuous assessment tests including internal, external, practical and theory examinations are taken into account along with apportioned PO/PSO attainment contribution by the course concerned as per the formula given.



Methodology of Measuring



Attainment levels of POs/PSOs and COs

$$\text{PO/PSO attainment of a student from a course} = \frac{\text{PO/PSO attainment contribution of individual course impact (\%)} \times \text{Total marks obtained by the student in the course}}{100}$$

The PO attainment of a student from every impact course is added to derive Total PO attainment of the student for that specific PO/PSO number. The average attainment of all Pos/PSOs are calculated and termed as PO/PSO attainment Index of the student.

eg. Table 3. PSO attainment by a student in M.Sc. (Agri.) Entomology Programme considering he has scored marks as mentioned in column two of the table.

Courses	Marks scored by the student	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
ENT 611	70.00	19.23	16.67	0.00	11.11	16.67
ENT 612	95.00	19.23	0.00	0.00	13.58	19.44
ENT 613	87.00	19.23	16.67	19.35	11.11	5.56
STA 611	83.00	0.00	0.00	0.00	11.11	25.00
COM 611	93.00	0.00	0.00	0.00	11.11	25.00
ENT 621	89.00	19.23	27.78	16.13	14.81	5.56
ENT 622	84.00	19.23	27.78	20.97	4.94	2.78
ENT 623	97.00	3.85	0.00	29.03	14.81	0.00
ENT 624	86.00	0.00	11.11	14.52	7.41	0.00
Total	--	100	100	100	100	100
PO attainment Index (POAI)				86.58		

Note: Highlighted in yellow are courses with no COs correlated to the specific PO that gives Zero impact on PO



Methodology of Measuring



Attainment of POs/PSOs and COs

Level 4: Rubrics 4 at Individual student level - Threshold levels to grade students as per PO Attainment Index (POAI)

The passing minimum marks prescribed for every programme varies as per the regulatory norms followed in every subject domain or faculty. In line this, the passing minimum marks (in%) prescribed for a programme concerned is fixed as threshold levels to compare the students based on PO/PSO Attainment in a subject/PO Attainment Index in a programme and grade them in different category as described in the following example.

In M.Sc. (Agri.) Entomology Programme, passing minimum marks are 65% in a subject. Hence PO/PSO Attainment in a subject/ Attainment Index of this programme is fixed as 65 for reaching Base level of attainment. The remaining levels are fixed as given in the following table and students are categorised as reaching Achiever level/ Advanced level/ Base level /not attained as per their attainment scores.

eg. Table 4. Threshold levels of PO/PSO Attainment Index for M.Sc. (Agri.) Entomology Programme

Attainment Level	PO/PSO Attainment in a Course/PO/PSO Attainment Index (POAI) in a Programme
Achiever level	>90
Advanced level	80-89
Base level	65-79
Not attained	<65

Deriving conclusions

Scope for deriving a meaningful conclusion is the thread line that marks success of any evaluation procedure. This methodology elucidates scope to understand the following features in LOBE

1. CO - PO Mapping scores help us to understand the impact of course outcomes defined for a course and give us clue to identify the content of syllabus, modus-operandi of teaching learning practice and lacuna in learning by student.
2. Further, it helps us in identifying core courses that are vital for achieving programme outcomes.
3. PO attainment of every student from an individual course can be compared using percentile to identify top grade students for implementing advanced learning practices in that course.
4. Further, it can also be used to identify slow learners who need to concentrate much on extra learning to acquire desired knowledge/skill from that course.
5. It helps as a ready reckoner tool in quickly assorting students for selecting to competitive assignments like placement interviews, competitive exams, awarding medals/awards etc.
6. In a nutshell it helps to "identify the pit falls and fill the pot holes".



Methodology of Measuring



Attainment of POs/PSOs and COs

PO Attainment : A Model Worked-out

PO attainment -2018-2020: M. Sc. Ag.						
Reg No.	PO 1	PO 2	PO 3	PO 4	PO 5	PO Attainment index
1	90.08	88.47	90.49	91.79	92.24	90.61
2	89.65	89.00	91.53	92.09	92.38	90.93
3	82.27	81.35	85.66	85.60	85.97	84.17
4	84.77	84.35	88.11	87.05	85.81	86.02
5	74.54	73.47	81.79	82.26	84.24	79.26
6	71.27	71.76	84.08	79.66	80.00	77.35
7	70.69	69.12	80.34	80.45	81.95	76.51
8	75.81	78.18	71.57	77.50	82.89	77.19
9	73.96	75.29	85.94	80.68	81.05	79.39
10	75.50	77.06	86.57	81.39	81.95	80.49
11	67.81	65.29	78.26	79.39	80.86	74.32
12	69.73	67.06	78.26	80.51	82.49	75.61
13	72.04	71.76	82.83	80.49	81.46	77.72
14	76.85	75.71	82.00	83.55	86.05	80.83
15	80.58	80.18	75.98	70.53	66.89	74.83
16	63.46	66.12	66.75	59.88	53.89	62.02
17	76.35	76.41	75.53	79.43	82.62	78.07
18	80.62	79.47	78.72	79.61	82.03	80.09
19	80.96	80.18	78.81	71.23	65.43	75.32
20	65.38	66.35	75.70	70.89	70.46	69.76



Methodology of Measuring



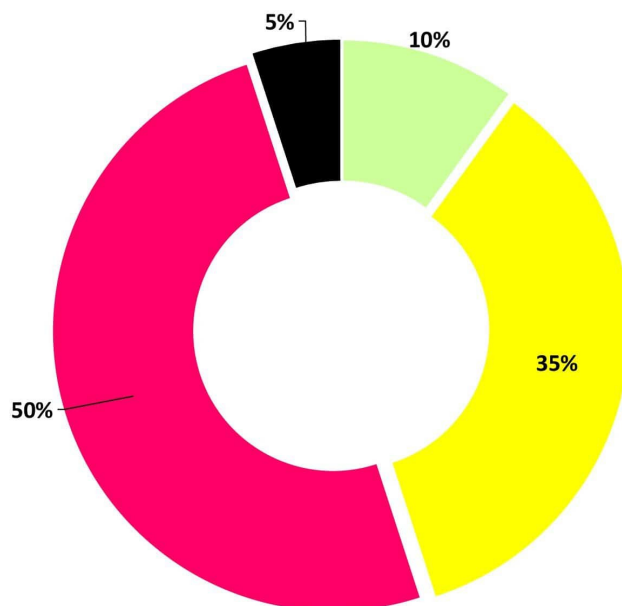
Attainment of POs/PSOs and COs

Grading students based on PSO Attainment

Attainment Level	Attainment Level	PO attainment -2018-2020: M. Sc. Ag. Entomology, Department of Entomology
Green	Achiever level	2
Yellow	Advanced level	7
Red	Base level	10
Black	Not attained	1

PSO attainment -2018-2020: M. Sc. Ag. students

■ Achiever level ■ Advanced level ■ Base level ■ Not attained





Methodology of Measuring

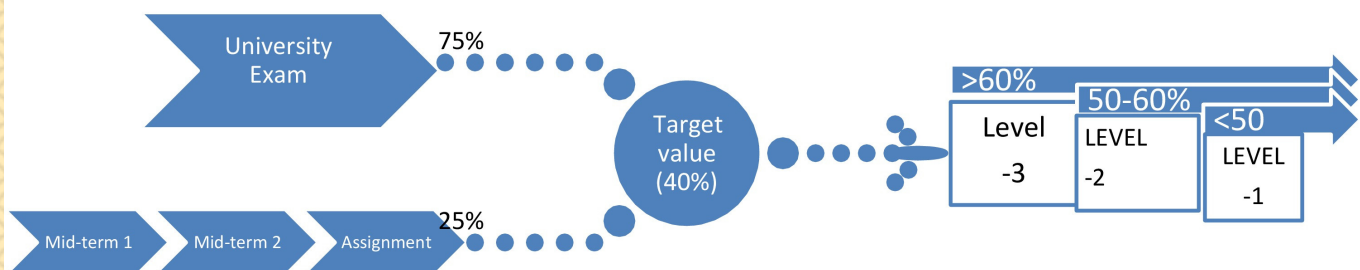


Attainment of POs/PSOs and COs

Faculty of Engineering and Technology

CO attainment Process

Semester End Examinations(SEE)



Cumulative Internal examinations (CIE)

1. The question papers for both CIE and SEE are set inline with the course outcome (CO) recommended for each courses.
2. The marks are recorded CO wise for each students of every courses.
- 3 From recorded data, the performance of students is assessed.
4. A target value of 40% is set for each CO and the percentage of students attaining the target are computed.
5. Various levels of attainment of individual CO's (set by the course teacher/assessor) are calculated as follows:
 - Level-3 More than 60% of students achieving the target for a particular course
 - Level-2 Between 50% -60 of students achieving the target for a particular course
 - Level -1 Less than 50% of students achieving the target for a particular course
6. A weighted sum of attainment of CO's ($0.25 * CIE + 0.75 * SEE$) from CIE and SEE is computed for overall CO attainment.
7. The average of all the CO attainment levels provides attainment for a particular course.



Methodology of Measuring



Attainment of POs/PSOs and COs

Faculty of Engineering and Technology

Model Attainment procedure for B.E. Programme

Year **2018-2019** Sem **VI** Course Code **01PE604**
 Course **GROUNDWATER ENGINEERING** Class Teacher **Dr. XXXXXXXX**

CO calculation			CIE (Cumulative Internal examinations)					SEE (Semester End Examinations)				
			mid-term-1		mid-term-2		Assignme nt	University exam				
Sl. No.	Register .No	Name of Student	CO-1	CO-2	CO-3	CO-4	CO-5	CO-1	CO-2	CO-3	CO-4	CO-5
			PO-1, 2, 3	PO-1, 2, 3	PO-1, 2, 3, 6, 8	PO-1,2,3,4	1, 2, 3, 6, 7	PO-1, 2, 3	PO-1, 2, 3	PO-1, 2, 3, 6, 8	PO-1,2,3,4	1, 2, 3, 6
			Qn nos	Qn nos	Qn nos	Qn nos	A1	UQ1	UQ2	UQ3	UQ4	UQ5
Max marks allotted			5	5	5	5	5	75	75	75	75	75
TARGET VALUE (40%)			2	2	2	2	2	30	30	30	30	30
1	161010001	ABDIFATH AHMED GA'AL	5.00	2.50	5.00	4.50	5.00	51	51	51	51	51
2	161010002	ABDINOUR MOHAMED ALI	5.00	5.00	5.00	5.00	5.00	47	47	47	47	47
3	161010003	Abirami. M.	4.00	3.00	3.50	3.50	5.00	57	57	57	57	57
4	161010004	AJEETH. J.	2.00	2.00	2.75	2.25	4.00	16	16	16	16	16
5	161010005	ANBUKARTHI. A.	2.50	2.00	2.50	2.00	4.00	9	9	9	9	9
6	161010006	Anul Mozhi.V. P.	5.00	4.50	3.50	4.00	5.00	54	54	54	54	54
7	161010007	BAVIN. B.	3.00	2.00	2.50	1.50	4.00	10	10	10	10	10
8	161010008	Dharanikeswari. S.	5.00	2.75	3.50	2.75	5.00	43	43	43	43	43
9	161010009	DURAIMURUGAN. S.	4.00	3.25	4.50	3.25	5.00	30	30	30	30	30
10	161010010	Ezhilarasi. T.	2.50	2.00	2.50	2.00	5.00	5	5	5	5	5
11	161010011	Jamuna. V.	3.00	3.00	4.00	5.00	5.00	30	30	30	30	30
12	161010012	KARTHIKEYAN. M.	4.25	4.00	5.00	3.75	5.00	30	30	30	30	30
13	161010013	Kavipriya. P.	3.50	3.50	5.00	3.00	5.00	41	41	41	41	41
14	162010477	MANAVALAN. R.	3.00	3.00	4.50	2.50	4.00	13	13	13	13	13
15	161010015	MAWA JAMES	5.00	5.00	5.00	5.00	5.00	70	70	70	70	70
16	161010016	MOHAMED RAFAE. A.	3.25	2.75	4.50	2.50	4.00	33	33	33	33	33
17	161010017	MUKHTAR AHMED. M. A.	3.50	3.00	4.00	2.50	4.00	7	7	7	7	7
18	161010018	Navitha. N.	5.00	5.00	5.00	5.00	5.00	51	51	51	51	51
19	161010019	NIVAS. S.	3.00	2.00	3.25	2.75	4.00	7	7	7	7	7
20	151010088	NIVDIT RAHUL. S.	2.50	2.00	2.25	2.25	4.00	2	2	2	2	2
21	161010020	PARTHSARATHI. K.	3.00	4.00	2.50	1.50	4.00	4	4	4	4	4



Methodology of Measuring



Attainment of POs/PSOs and COs

Faculty of Engineering and Technology

Model Attainment procedure for B.E. Programme

Year 2018-2019 Sem VI Course Code 01PE604
 Course GROUNDWATER ENGINEERING Class Teacher Dr. XXXXXXXX

PO Articulation

Course Code	Name of the Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
GROUNDWATER ENGINEERING	01PE604	3	2	2			2		3		3	2	1

PO Attainment

Course Code	Name of the Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
GROUNDWATER ENGINEERING	01PE604	75	100	100			100		75		75	100	100

$$\text{PO attainment} = \frac{\text{Average COs of a course}}{\text{PO1 scale in the articulation table}} * 100\%$$



Methodology of Measuring



Attainment of POs/PSOs and COs

Faculty of Engineering and Technology

Model Attainment procedure for B.E. Programme

Year **2018-2019** Sem **VI** Course Code **01PE604**
 Course **GROUNDWATER ENGINEERING** Class Teacher **Dr. XXXXXXXXX**

01PE604 GROUNDWATER ENGINEERING

CO Articulation

Course Outcome	Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	To know the rock properties affecting groundwater and types of aquifers	3	1	2											3	
CO2	To understand the concept of permeability, its measurement, and flow equations for steady and unsteady flow in confined and unconfined aquifers	3	1	2											2	
CO3	Acquire knowledge of well construction and maintenance		3	2			2		2				1	2		
CO4	To know the various techniques of surface and sub-surface investigations of groundwater	3	2	2	1								2	3	2	
CO5	To know the methods of artificial recharge of groundwater and Understand the concept of seawater intrusion						2		2				2	2		

CO Attainment

Course Outcome	Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	To know the rock properties affecting groundwater and types of aquifers	75	100	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	75	NA
CO2	To understand the concept of permeability, its measurement, and flow equations for steady and unsteady flow in confined and unconfined aquifers	75	100	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	100	NA
CO3	Acquire knowledge of well construction and maintenance	NA	75	100	NA	NA	100	NA	100	NA	NA	NA	100	100	NA	NA
CO4	To know the various techniques of surface and sub-surface investigations of groundwater	75	100	100	100	NA	NA	NA	NA	NA	NA	NA	100	75	100	NA
CO5	To know the methods of artificial recharge of groundwater and Understand the concept of seawater intrusion	NA	NA	NA	NA	NA	100	NA	100	NA	NA	NA	100	100	NA	NA

$$\text{CO attainment} = \frac{\text{CO attainment level (weighted sum)}}{\text{CO scale in the articulation table}} * 100\%$$