

Mapping between Course Outcomes (COs) and Program Outcomes (POs) Course wise [Refresh](#) [Guidelines](#)

Curriculum: B.Tech in IT 2014-2018 Term: 3- Semester Course: Discrete Mathematics

COs to POs Mapping Current Status : Reviewed

Course Name - Course Outcomes / Program Outcomes	a	b	c	d	e	f	g	h	i	j	k
Discrete Mathematics											
CO1 - 1. Express mathematical statements using logical connectives.									H		
CO2 - 2. Analyze and perform operations associated with sets.									H	L	
CO3 - 3. Distinguish between relations and functions.									H		H
CO4 - 4. Describe the concept of Lattices and Boolean algebra.									H		H
CO5 - 5. Apply graph theory concepts to solve problems of connectivity.									H	L	H

Fig1. Snapshot of CO-PO Mapping

3. Teaching & Evaluation Scheme for DM

The Table 1 depicts Teaching and evaluation scheme for discrete Mathematics course which is governed by OBE framework. It shows the lecture hours, Tutorial hours, practical hours, credits assigned to the course, and minimum requirements for earning the credits.

Table 1: Teaching and Evaluation Scheme

Teaching Scheme				Evaluation Scheme			
L	T	P	Credits	Scheme	Theory (Marks %)		
					Max	Min for Passing	
3	1	--	4	ISE	20	40%	40%
				MSE	30		
				ESE	50	40%	

4. Assessment of the Course:

Evaluation of this course is based on: In semester evaluation (ISE), Mid semester evaluation (MSE), and End semester examination (ESE). The weightage for these components are shown in the table2 below:

Table2: Assessment of the course

ISE	MSE	ESE
20 %	30%	50%

In order to pass the course for B Tech program, students are required to obtain 40% marks in Aggregate. They need to secure minimum 40% marks in **ISE & MSE** to become eligible for ESE and minimum 40 % marks separately in ESE.

A. In- Semester Evaluation (ISE)

This evaluation scheme is designed by the course instructor as a part of course plan and intimated to the student at the beginning of the course. It needs to have minimum two components having the 10% weightage each.

The following two components were included in the ISE of Discrete Mathematics course:

- 1) **Online Quiz:** It is of 20 minutes duration conducted for 20 marks and involves GATE based questions. The marks obtained by student will be converted to 10.
- 2) **Problem Solving Test:** It is of 30 minutes duration conducted for 25 marks and tests the problem solving ability of students. The marks obtained by student will be converted to 10.

B. Mid Semester examination (MSE)

It is of 2 hours duration conducted for 50 marks and based on the 1st three units of the syllabus. The marks obtained by student will be converted to 30.

email address is compulsory for the corresponding author.

C. End Semester examination (ESE)

It is of 3 hours duration conducted for 100 marks and based on the whole syllabus. It is conducted after the end of instructions for the semester. The marks obtained by student will be converted to 50.

5. Methodology

The methods adopted to calculate the course outcome attainment gives equal importance and responsibility to students and teachers for attaining the course outcomes defined for the course. Involving students in identifying their learning index boosts the student centered teaching. It makes students responsible for their own learning. Two methods are used:

A. Direct Method

It will have 80% weightage in determining course outcome attainment. The evaluation is done by teacher. It will be calculated based on several other components.

B. Indirect Method

It will have 20% weightage in determining course outcome attainment. The evaluation is done by student.

6. Data Analysis

The Data of MSE and ESE is analysed to find the course outcome attainment.

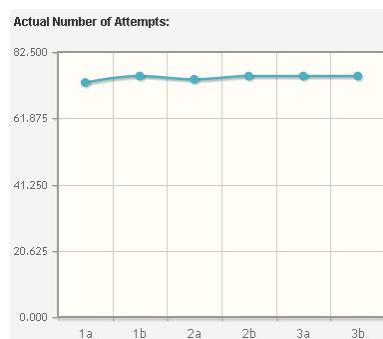
A. MSE Data Analysis

Fig 2 shows the snapshot of MSE Data Analysis Report.

Question	1a	1b	2a	2b	3a	3b
PO	4.9	4	4.9	4.9	4.9	4.9
Bloom's Level	L3	L4	L1	L2	L1	L2
CO	CO1	CO1	CO2	CO2	CO3	CO2
Marks	8	8	8	8	9	9
Average	6.18	6.09	5.04	5.19	5.01	4.63
Standard Deviation	2.92	2.43	2.64	2.34	2.53	2.02
Min in Range						
Max in Range	8	8	8	8	9	9
Number of attempts	73	75	74	75	75	75
Percentage of Attempt	97.33	100	98.67	100	100	100
Percentage of Attainment	77.23	76.17	63.01	77.33	55.7	51.41

Fig 2. MSE Data Analysis Report

Fig 3 shows the snapshot of graph of actual number of attempts for MSE.



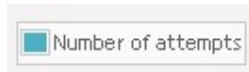


Fig 3. MSE-Actual no. Of Attempts

B. ESE Data Analysis

Fig 4 shows the snapshot of ESE Data Analysis Report.

Department*
Information Technology

Program*
B.Tech. in IT

Criculum*
B.Tech in IT 2014-2018

Term*
3 - Semester

Course*
Discrete Mathematics

Type*
EBE

Show graphs

Export

Data Analysis Report

Question	1a	2a	2b	3a	3b	4a	4b	4c	5a	5b	5c
PO	A,B,G	A	A,B,G	A,B	A,B,G	A,B	A,B	A,B	A,B,G	A,B	A,B
Bloom's Level	L1,L2,L3,L4,L5,L6	L3	L3	L4	L2	L2	L3	L1	L1	L3	L1
CO	CO1,CO2,CO3,CO4,CO5	CO1	CO2	CO3	CO2	CO5	CO4	CO1	CO5	CO3	CO4
Marks	20	10	10	16	4	7	6	7	12	8	8
Average	10.05	4.99	3.98	9.18	3.35	2.9	4.58	4.04	5.71	3.94	5.21
Standard Deviation	2.15	3.68	1.92	3.66	1.23	2.16	1.53	1.87	2.19	2.42	1.53
Min in Range	6			2		1					
Max in Range	15	10	8.5	15.5	4	7	6	6.5	10	8	8
Number of attempts	74	61	47	71	73	69	72	68	74	68	48
Percentage of Attempt	100	82.43	63.51	95.95	98.65	93.24	97.3	91.89	100	91.89	62.16
Percentage of Attainment	54.26	49.92	33.83	57.35	83.73	41.41	78.27	57.67	47.58	49.26	65.08

Fig 4. ESE Data Analysis Report

Fig 5 shows the snapshot of graph of actual number of attempts for ESE.

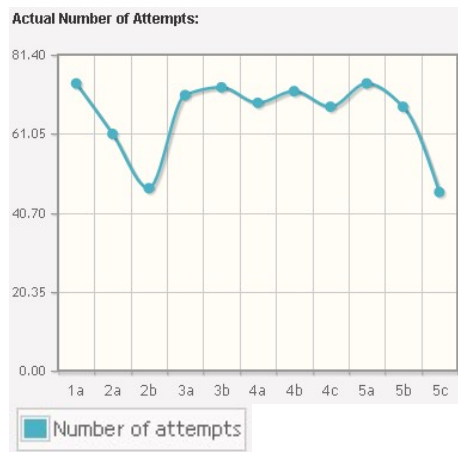


Fig 5. ESE- Actual no. Of Attempts

7. Course Outcome Attainment Analysis

The evaluation of course outcomes is performed using two approaches.

A. Direct Method

This method involves evaluation of course outcomes using various examinations which are conducted from beginning of the course till the end of the course. In this section the CO attainment is analysed for MSE and ESE examinations based on the marks secured by the students.

1) MSE Attainment

The marks secured by students in every question of Mid Semester Examination are considered to determine the attainment of corresponding CO. Fig 6 shows the snapshot of Percentage of Attainment vs. Percentage of Attempt for MSE. It has been observed that the attainment of CO

depends on two parameters attempt and complexity of the question.

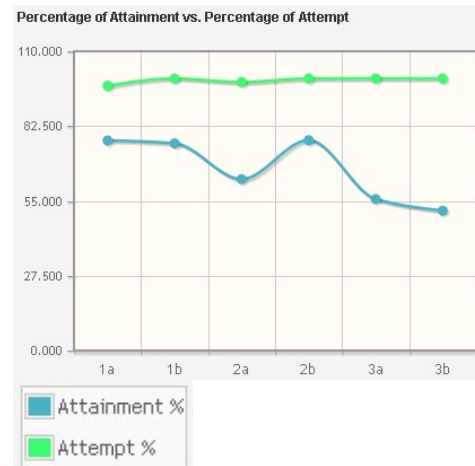
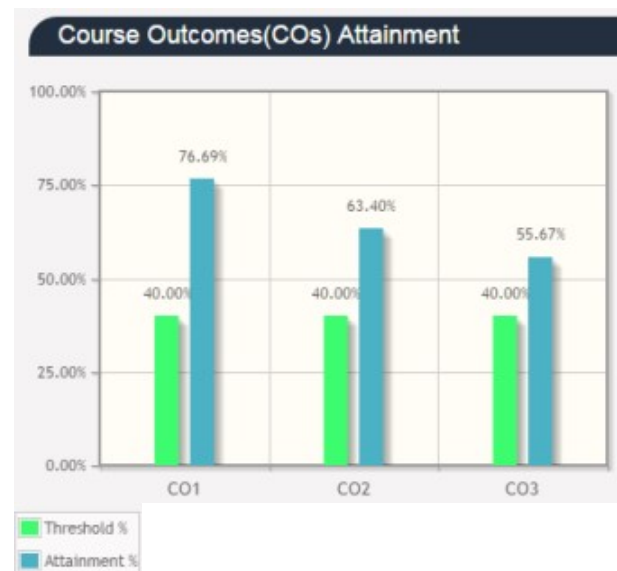


Fig 6. MSE- Percentage of Attainment vs. Percentage of Attempt



Course Outcomes	Max Marks	Average of Secured Marks	Threshold %	Attainment %
CO1	16.00	12.27	40.00%	76.69%
CO2	25.00	15.85	40.00%	63.40%
CO3	9.00	5.01	40.00%	55.67%

Fig 7. MSE- CO Attainment

The above fig 7. depicts the individual COs planned marks distribution and average of secured marks distribution as in the MSE question paper. The respective CO attainment is calculated using the following formula:

$$\text{Individual CO Attainment \%} = \left(\frac{\text{Average of Secured Marks}}{\text{Max Marks}} \right) * 100$$

2) ESE Attainment

The marks secured by students in every question of End Semester Examination are considered to determine the attainment of corresponding CO in ESE. Fig 8 shows the snapshot of Percentage of Attainment vs. Percentage of Attempt for ESE. It has been observed that as the attainment of CO depends on two parameters attempt and complexity of the question.

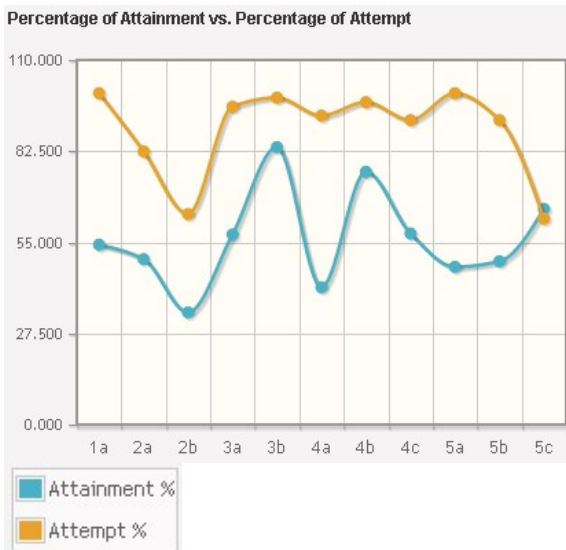


Fig 8. ESE- Percentage of Attainment vs. Percentage of Attempt

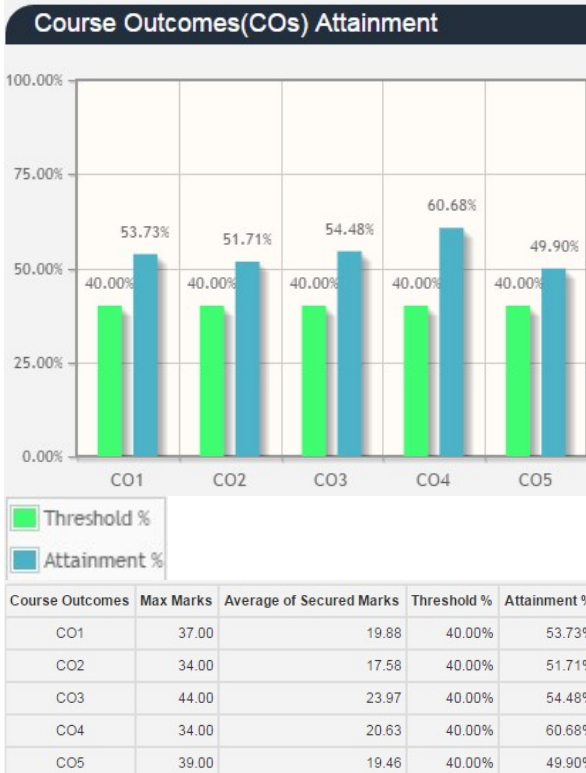


Fig 9. ESE- CO Attainment

The above fig 9. depicts the individual COs planned marks distribution and average of secured marks distribution as

in the ESE question paper. The respective CO attainment is calculated using the following formula:

$$\text{Individual CO Attainment \%} = \left(\frac{\text{Average of Secured Marks}}{\text{Max Marks}} \right) * 100$$

B. Indirect Method

This method involves evaluation of course outcomes using Course Exit Survey.

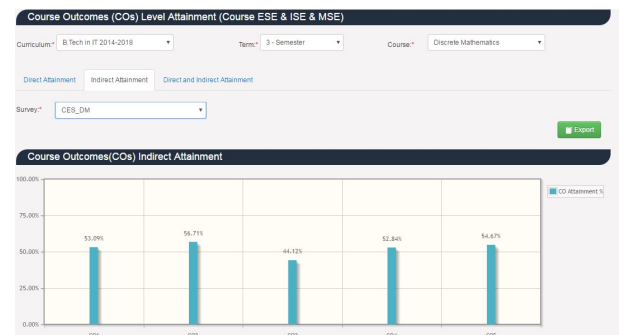


Fig. 10 In-direct CO Attainment

C. Hybrid Method

This method involves evaluation of course outcomes using the combination of direct and indirect methods.

Fig 11 shows the snapshot of Course Outcome Attainment using hybrid method. The graph says that attainment of each CO is greater than 60%.

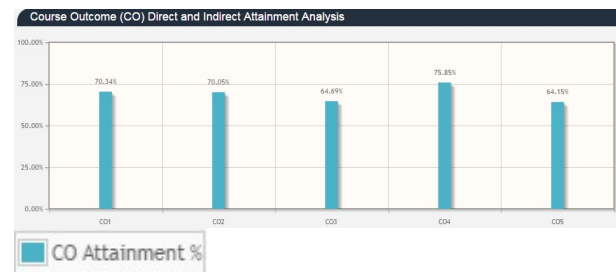


Fig. 11 Direct and indirect Attainment Analysis of Course Outcomes

Overall CO Attainment is calculated by assigning the 80% weightage to the direct method and 20% weightage to the indirect method. Fig. 12 shows the snapshot of overall CO Attainment for the Discrete Maths course

COs Code	Actual Direct Attainment %	Actual Indirect Attainment %	Direct Attainment Weightage %	Indirect Attainment Weightage %	After Weightage Direct Attainment %	After Weightage Indirect Attainment %	Overall Attainment %
CO1	74.85	53.09	80.00	20.00	59.72	10.62	70.34
CO2	73.39	56.71	80.00	20.00	58.71	11.34	70.05
CO3	69.84	44.12	80.00	20.00	55.87	8.82	64.69
CO4	81.60	52.84	80.00	20.00	65.28	10.57	75.85
CO5	66.53	54.67	80.00	20.00	53.22	10.93	64.15

Fig. 12 Overall Co Attainment Analysis

7. Conclusions

This methodology gives equal importance and responsibility to students and teachers for attaining the course outcomes defined for a particular course. It is

observed that a single method is not enough to determine the attainment of course outcomes. When both the methods are used jointly then attainment of course outcomes is high. This methodology of involving students in identifying their learning index boosts the student centered teaching. It makes students responsible for their own learning. This study will help faculties from other institutes to find the course outcome attainment for their own course and improve the teaching learning process.

References

- 1) Rajasekhar Devarapalli, Saroja Pilli, Prof. Vijayaratnam Naladi and Dr.Srinivasarao Pallekonda, "An Empirical Study To Enhance The Knowledge and Skills Through Training" International Journal of Management (IJM), Volume 4, Issue 4, 2013, pp. 758 - 770, ISSN:Print: 0976-6502, ISSN Online: 0976-6510.
- 2) Pragati Sawant, "Implementation of OBE Approach for Computer Algorithms Course and it's Outcome", 2nd International Conference on Transformations, 5th – 8th JAN 2015, published in published in Journal of Engineering Education Transformations (JEET), special issue.
<http://www.journaleet.org/index.php/jeet/article/view/59365>.
- 3) Pragati Sawant , "Towards student centered Teaching-A New Paradigm", 3rd International Conference on Transformations in Engineering Educations.
- 4) W. Spady , "Outcomes Based Education: Critical Issues and Answers ", American Association of School Administration: Arlington, Virginia, 1994.

Note: The live demonstration of this tool will be given at the time of presentation. The separate document is also attached which gives the clear view of all the snapshots added in this paper.