A SAMPLE CALCULATION OF ATTAINMENTS
FOR A COURSE IN AY 2020-21

COURSE OUTCOME STATEMENT

Course Outcomes (COs): Statements indicating what a student can do after the successful completion of a course. Every Course leads to some Course Outcomes. The CO statements are defined by considering the course content covered in each module of a course. For every course there may be 5 or 6 COs. The keywords used to define COs are based on Bloom's Taxonomy.

SAMPLE CO STATEMENTS:

Course: Digital Signal Processing and Application

Course Code: PC 242 EE

On successful completion of this course, students should be able to

Sample CO statements

CO No.	Course Outcome	Taxonomy Level
1	**Classify** discrete-time signals and discrete-time systems and **determine** the response of discrete-time system to a given input.	**Understand**
2	**Solve** the frequency response of the discrete-time system by **applying** z-transform to the systems	**Apply**
3	**Determine** the Discrete-Time Fourier Transform and Discrete Fourier Series coefficients of discrete-time systems	**Evaluate**
4	**Modify** the method of evaluating the Discrete Fourier Transform of discrete-time signals by using Fast Fourier Transform, thereby reducing the computational efforts	**Create**
5	**Analyze** the characteristics of digital Finite Impulse Response (FIR) filters and digital Finite Impulse Response (FIR) filters.	**Analyze**
6	**Design** digital Finite Impulse Response (FIR) filters and digital Infinite Impulse Response (IIR) filters and Describe the configuration of DSP processor and also explain its applications	**Create**

CO – PO AND CO – PSO MAPPING OF COURSES

All the courses together must cover all the POs (and PSOs). For a course we map the COs to POs through the CO-PO matrix and to PSOs through the CO-PSO matrix as shown below. The various correlation levels are:

"1" – Slight (Low) Correlation

"2" – Moderate (Medium) Correlation

"3" – Substantial (High) Correlation

"-" indicates there is no correlation.

Process involved in CO-PO Mapping

The role of CO-PO mapping will be assigned to the faculty as per hierarchy followed in figure below. After the course (subject) allotment from the department, the course in-charge of the course has to write appropriate COs for their corresponding course. It should be narrower and measurable statements. By using the action verbs of learning levels, CO's will be designed. CO statements should describe what the students are expected to know and able to do at the end of each course, which are related to the skills, knowledge and behavior that students will acquire through the course.

After writing the CO statements, CO will be mapped with PO of the department. If the department is having more than one section in a year or the same course is available for more than one program of the same institute in a semester, the subject expert will be nominated as course coordinator of the corresponding course. The role of the course coordinator is to review the CO statements and the CO-PO mapping which has been done by course in-charge. The year wise coordinator has to consolidate the CO's of the respective year and maintain the documentation of the CO attainment level of the respective year courses.

SAMPLE CO-PO AND CO-PSO MAPPING:

Course: Digital Signal Processing and Applications
 Course Code: PC 242 EE

MAPPING OF COs WITH POs & PSOs (Curriculum):

Correlation Level: High – 3; Medium – 2; Low – 1

PO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS0 1	PS O2	PS O3
1	3	1	-	-	-	-	-	2	2	2	-	-	2	1	2
2	3	2	-	-	-	-	-	2	2	2	-	-	2	1	2
3	3	3	-	-	-	-	-	2	2	2	-	-	2	1	2
4	3	3	-	-	-	-	-	2	2	2	-	-	2	1	2
5	3	3	3	-	-	-	-	2	2	2	-	-	2	1	2
6	3	3	2	2	3	-	-	2	2	2	-	-	3	1	3
Avg	3	2.5	2.5	2	3	-	-	2	2	2	-	-	2.16	1	2.16

ASSESSMENT PROCESS

Assessment Process for CO Attainment:

Bachelor of Engineering program consists of a range of courses which are categorized as Theory courses, Lab courses, Projects, Seminar.

Each of the course is assessed both using Direct Assessment Method and Indirect Assessment Method.

Direct Assessment of Theory Courses:
Direct Assessment process for theory courses involves Continuous Internal Evaluation (CIE) and Semester End Evaluation (SEE).
The scheme of evaluation and grading for each course is as shown below:

S. No	Component	Duration	Maximum Marks
	Continuous Internal Evaluation (CIE)		
1.	Internal Examination – I	60 minutes	20
2.	Internal Examination - II	60 minutes	20
	Average of the two internal exams		**20**
3.	Assignments	-	**5**
4.	Quizzes	-	**5**
	CIE (Total)		**30**
5.	**Semester End Examination (SEE)** (University Examination)	3 hours	**70**
		TOTAL	**100**

Marks Range	85-100	70 to < 85	60 to < 70	55 to < 60	50 to < 55	40 to < 50	< 40	Absent
Grade	S	A	B	C	D	E	F	Ab
Grade Point	10	9	8	7	6	5	0	-

In general, for theory courses the continuous internal evaluation (CIE) process consists of two Mid-term examinations of 20 marks each, which is split into the following set of questions.

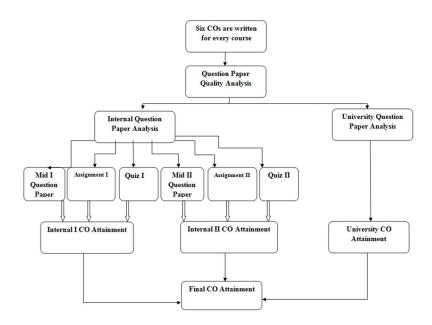| Question Type	No. of Questions	Marks per Question	Choices (Yes or No)
Short Answers	4	2	No
Long Answers	2	6	Yes (Two Choices within each question)

Attainment of Course Outcomes (CO):

- Six COs are written for each course in which, the action verbs corresponding to the Bloom's taxonomy level for cognitive learning is identified and highlighted.
- Theory courses consists of continuous internal evaluation (CIE) process which has two Mid-term examinations of 20 marks each and Assignments and Quizzes of 5 marks each.
- Internal Question paper analysis is done in which, each question is mapped with a CO. The CO percentage score (representing the maximum extent to which the CO can be attained) is computed based on **the number of students attained base marks (50%) and the number of students attempted the question**. It is made sure that the entire six COs are covered in two internal examinations.
- Assignments and quizzes also cover the entire COs. The CO percentage score is computed same as above and is assigned to each question based on assignment and quiz question paper analysis done in prior.
- CO percentage scores for Internals are computed by taking the average of scores computed for mid-term examinations, assignments and quizzes.
- Since the Semester End Examination (SEE) is conducted by the Osmania University, there is no local control the question paper. However, University Question Paper analysis is being done to check whether six COs are addressed. CO percentage scores for Semester End Examination (SEE) is also computed as above and is assigned to all the COs covered in the university question paper analysis.

Finally, the overall CO percentage score is computed by taking the average of Internal I, Internal II and Semester End Exanimations. This score is finally converted to CO attainment rubric based on the following table.

CO Percentage score	CO attainment rubric
%CO $\geq$ 70	3
70 $\leq$ %CO $<$ 60	2
%CO $<$ 60	1

The following flow chart shows the process involved in CO attainments using Direct Method:

Indirect Assessment of Theory Courses:

In indirect assessment method, CO based feedback is collected from the students at the end of the semester, wherein students rate all COs of the course in a scale of 3.

Level of CO	Student Rating
Excellent	3
Satisfactory	2
Improvements required	1

Finally, for each course, based on the feedback obtained from the students, averages are calculated for each CO and overall course attainment is computed.

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Assessment of the Attainment of Course Outcomes:

The assessments of the COs attainments is done as follows:
1) The COs attainments are evaluated by a departmental academic committee lead by the Head of the department and consisting of two senior faculty. The committee reviews the attainment levels and puts forth suggestions of measures to improve the performance of the students. This assessment is done twice a year, after the semester results are released by the University.

Methodist College of Engineering and Technology
Department of Electrical and Electronics Engineering

Course Attainment

Academic Year 2020-21

Course Name with Code	Digital Signal Processing & Applications PC 242 EE
Class	VI Semester EEE
Faculty Name	A.Archana
Type of Exam	Internal 1

Question number	Part A				Part B				Assignment	Quiz
	1	**2**	**3**	**4**	**5a**	**5b**	**6a**	**6b**		
Maximum Marks of the question	2	2	2	2	6	6	6	6	5	5
Average marks of student	1.05	0.74	0.54	0.25	2.9	3.52	5	4.7	5	5
Satisfactory mark set as base mark	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
No. of students scored Base mark& Above	31	15	11	5	7	28	2	43	70	70
No. of students attempted	44	33	32	28	10	45	2	49	70	70
% Students scored Base mark& Above	70.5	45.4	34.3	17.8	70	62	100	87.7	100	100

CO Attainment											Overall
CO 1	70.5	45.4				62		87.7	100	100	77.6%
CO 2			34.3		70				100	100	76%
CO 3				17.8			100		100	100	72.6%
CO 4											
CO 5											
CO 6											

Course Attainment

Academic Year 2020-21

Course Name with Code	Digital Signal Processing & Applications PC 242 EE
Class	VI Semester EEE
Faculty Name	A.Archana
Type of Exam	Internal 2

Question number	Part A				Part B				Assignment	Quiz
	1	2	3	4	5a	5b	6a	6b		
Maximum Marks of the question	2	2	2	2	6	6	6	6	5	5
Average marks of student	1.81	1.72	1.82	1.79	4.17	4.36	3.94	3.75	5	5
Satisfactory mark set as base mark	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
No. of students scored Base mark& Above	35	39	45	36	19	26	34	3	70	70
No. of students attempted	38	41	45	37	23	33	45	4	70	70
% Students scored Base mark& Above	92	95	100	97	82.6	78.7	76	75	100	100

CO Attainment											Overall
CO 1											
CO 2											
CO 3											
CO 4			100		82.6				100	100	95.6%
CO 5	92							75	100	100	91.7%
CO 6		95		97		78.7	76		100	100	91.1%

Methodist College of Engineering and Technology
Department of Electrical and Electronics Engineering

Course Attainment using Indirect Method

Academic Year 2020-21

Course Name with Code	Digital Signal Processing & Applications PC 242 EE
Class	VI Semester EEE
Faculty Name	A.Archana

CO No.	Course Outcomes	Average CO Attainment
1	**Classify** discrete-time signals and discrete-time systems and **determine** the response of discrete-time system to a given input.	2.2
2	**Solve** the frequency response of the discrete-time system by **applying** z-transform to the systems	2.22
3	**Determine** the Discrete-Time Fourier Transform and Discrete Fourier Series coefficients of discrete-time systems	1.95
4	**Modify** the method of evaluating the Discrete Fourier Transform of discrete-time signals by using Fast Fourier Transform, thereby reducing the computational efforts	2.07
5	**Analyze** the characteristics of digital Finite Impulse Response (FIR) filters and digital Finite Impulse Response (FIR) filters.	2.3
6	**Design** digital Finite Impulse Response (FIR) filters and digital Infinite Impulse Response (IIR) filters and Describe the configuration of DSP processor and also explain its applications	2.15
	Overall Course Attainment(Indirect)	**2.15**

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Department of Electrical and Electronics Engineering

Course Attainment

Academic Year 2020-21

Course Name with Code	Digital Signal Processing & Applications PC 242 EE
Class	VI Semester EEE
Faculty Name	A.Archana
Type of Exam	University Examination

	University Examination
Maximum external marks	70
Satisfactory Grade set as base Grade	C
No. of students scored Base Grade&above	41
No. of students attempted	54
% Students scored Base Grade&above	57.4%

CO Attainment	
CO 1	57.4%
CO 2	57.4%
CO 3	57.4%
CO 4	57.4%
CO 5	57.4%
CO 6	57.4%

Methodist College of Engineering and Technology
Department of Electrical and Electronics Engineering

Course Attainment

Academic Year 2020-21

Course Name with Code	Digital Signal Processing & Applications PC 242 EE
Class	VI Semester EEE
Faculty Name	A.Archana

CO Number	Internal I	Internal II	University Examination	%CO Attainment Direct	CO Direct (Rubric)	CO Indirect (Rubric)	Overall CO Attainment
CO 1	77.6%		57.4%	67.5%	2	2.2	2.045
CO 2	76%		57.4%	66.7%	2	2.22	2.045
CO 3	72.6%		57.4%	65%	2	1.95	2
CO 4		95.6%	57.4%	76.5%	3	2.07	2.815
CO 5		91.7%	57.4%	74.55%	3	2.3	2.86
CO 6		91.1%	57.4%	74.25%	3	2.1	2.83
Overall Course Attainment							**2.43**
Set Target for the course							**2.21**
Course Attainment Status(Yes/No)							**Yes**

CO Percentage score	CO attainment rubric
%CO ≥ 70	3
60 <=%CO <70	2
%CO< 60	1

Best Performing CO:	CO5, CO6
Least Performing CO	CO3

Attainment of the Program Outcomes (POs) & the Program Specific Outcomes (PSOs)

PO and PSO Assessment Process

Firstly, Program Outcomes (PO) and Program Specific Outcomes (PSOs) are defined for the Bachelor of Engineering Program by the Head of the Department.

Six COs are written for each course in which, the action verbs corresponding to the Bloom's taxonomy level for cognitive learning is identified and highlighted. For each course, the course outcomes are mapped with the POs and the PSOs and presented in a CO-PO mapping table. The mapping table gives the strength of the mapping of a CO with a specific PO/PSO in the scale 1-3.

Correlation Factor	Status
3	Highly Correlated
2	Moderately Correlated
1	Slightly Correlated

The college follows a unique and in-house developed scheme in determining the CO-PO mapping matrix, based on differential taxonomy levels of the COs and the POs& PSOs.

Direct Method:

In order to compute PO and PSO attainments, CO attainment for every course for a batch is computed using the results of Continuous Internal Evaluation (CIE) and Semester End Examinations (SEE). Then PO and PSO attainments are calculated for a course from the weighted average of the CO attainments of that course, where the weights are the CO-PO mapping strengths.

The formula used to calculate PO and PSO Attainment is given below:
PO Attainment= {CO Attained*(corresponding PO from CO-PO Mapping table)}/ 3
PSO Attainment= {CO Attained*(corresponding PSO from CO-PSO Mapping table)}/ 3
 The PO/PSO attainments are averaged over all the courses of a batch to get the final attainments of the POs/PSOs using direct method.

Assessment of the Attainment of Program Outcomes & Program Specific Outcomes

The assessments of the COs and POs attainments are done at two levels.
1. The COs attainments and subsequent POs attainments are evaluated by a departmental academic committee lead by the Head of the department and consisting of two senior faculty. The committee reviews the attainment levels and puts forth suggestions of measures to be the performance of the students be improved. This assessment is done twice a year, after the semester results are released by the University.
2. The analysis of the PO attainments is put forth by all the departments to the College Academic Cell. College Academic Cell reviews the assessments of the departmental academic committee, gives suggestions for any modification and gives the final approval.

Methodist College of Engineering and Technology
Department of Electrical and Electronics Engineering

Programme Attainment

Academic Year 2020-21

Course Name with Code	Digital Signal Processing & Applications PC 242 EE
Class	VI Semester EEE
Faculty Name	A.Archana

CO-PO Mapping:

PO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS0 1	PS O2	PS O3
1	3	1	-	-	-	-	-	2	2	2	-	-	2	1	2
2	3	2	-	-	-	-	-	2	2	2	-	-	2	1	2
3	3	3	-	-	-	-	-	2	2	2	-	-	2	1	2
4	3	3	-	-	-	-	-	2	2	2	-	-	2	1	2
5	3	3	3	-	-	-	-	2	2	2	-	-	2	1	2
6	3	3	2	2	3	-	-	2	2	2	-	-	3	1	3
AVG	3	2.5	2.5	2	3	-	-	2	2	2	-	-	2.16	1	2.16

PO Attainment:

PO / CO	CO Attainment	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO 9	PO 10	PO 11	PO 12	PS 01	PS O2	PS O3
1	2.045	2.045	0.68	-	-	-	-	-	1.36	1.36	1.36	-	-	1.36	0.68	1.36
2	2.045	2.045	1.36	-	-	-	-	-	1.36	1.36	1.36	-	-	1.36	0.68	1.36
3	2	2	2	-	-	-	-	-	1.33	1.33	1.33	-	-	1.33	0.66	1.33
4	2.815	2.815	2.815	-	-	-	-	-	1.87	1.87	1.87	-	-	1.87	0.93	1.87
5	2.86	2.86	2.86	2.86	-	-	-	-	1.9	1.9	1.9	-	-	1.9	0.95	1.9
6	2.83	2.83	2.83	1.88	1.88	2.83	-	-	1.88	1.88	1.88	-	-	2.83	0.94	2.83
AVG	2.43	2.43	2.09	2.37	1.88	2.83	-	-	1.61	1.61	1.61	-	-	1.77	0.80	1.77