

Chaitanya Bharathi Institute of Technology
Department of Mechanical Engineering

Action Plan for the non-attainment of POs 2017-18 Batch

Date: 25 -09 -2021

POs	Target Level	Attainment Level	Observations
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PO1: Engineering Knowledge

PO1	1.78	1.72	Cos16MEC07, 16MEE01 are identified for low attainment.
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1. In 16MEC07, It was observed that students were unable to draw the part drawing due to lack of imagination on parts of machine. So, it is suggested to course instructor to show the

real components of machines while teaching which are available in the laboratory. In ME 222, It is observed by the course instructor that the student were unable to use steam tables and Mollier charts while solving problems. In this regard, more attention is required on individuals while teaching these concepts and It is suggested to conduct tutorials by getting the assistance by another faculty.

2. In ME221, Lack of full-fledged knowledge on study state and Un steady state problems. These fundamentals are to be included in Applied Thermodynamics and Heat Transfer. Planned to give complex problems on load calculations for Air conditioning system. Lack of knowledge on Thermo dynamics of human body. Adding the content in the syllabus definitely helps. Adequate content needs to be given on comfort air conditioning. Also suggested that to add more video lectures in tutorial classes.

PO2: Problem analysis:

PO2	1.69	1.60	The courses 16MEC07, 16MEE01, 16PEE05, 16MEE03, 16PEE04, 16MEE07, 16MEE01, 16PEE03, 16MEE11 are identified for low attainment.
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S. Reddy
PROFESSOR & HEAD
 Department of Mechanical Engineering,
 Chaitanya Bharathi Institute of Technology (A)
 Gandipet, Hyderabad-500 075. Telangana

S. Reddy

In 16MEC07, it was observed that students were unable to draw the part drawing due to lack of imagination on parts of machine. So, it is suggested to course instructor to show the real components of machines while teaching which are available in the laboratory.

In 16MEE01, it was observed that, Lack of full-fledged knowledge on study state and Un steady state problems. These fundamentals are to be included in Applied Thermodynamics and Heat Transfer. Planned to give complex problems on load calculations for Air conditioning system. Lack of knowledge on Thermo dynamics of human body. Adding the content in the syllabus definitely helps. Adequate content needs to be given on comfort air conditioning. Also suggested that to add more video lectures in tutorial classes.

In 16PEE05, it was suggested to give more classes to cover the fundamentals effectively. And also suggested to take students for industrial visit to show the practical applications of these concepts.

In 16MEE03, it was observed that the Teaching methods adopted were not adequate. Extra classes are to be planned to cover the fundamentals effectively. Choice in setting Question Paper needs to be changed so that all COs are covered which is implemented in R18. Suggested to frame Assignments to focus on solving complex engineering problems.


In 16PEE04, it was observed that students were not attempted the questions on the CO3. It is suggested to show more images using visual aids.

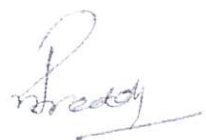
16MEE07, it was observed that students were done mistakes while solving the problems due to lack of practical knowledge. It was Observed that students required more practical knowledge on heat exchangers to design heat exchangers. It was observed that the So many input and output parameters to be considered while designing heat exchangers. It was decided to include different case studies in the syllabus from next A.Y and it is also decided that the solve more problems in class room different case studies from research papers.

In 16MEE01, it was observed that the students have done the mistakes while solving the problems using psychometric charts. It is suggested to give more assignment work on psychometric charts. It is also suggested to add tutorial classes with three faculties to teach psychometric charts to the students. It is suggested to make it mandatory for the students to bring psychometric charts to the class.

In 16PEE03, it was observed that students were unable to answer the question which were asked on CO6 because general industry application-oriented question were asked. So, it was suggested that to provide at least one industrial visit on Nondestructive testing and suggested to conduct workshop on advanced techniques of NDT.

In 16MEE11, it was observed that students were unable to understand the concepts of Energy Conservation, Management and Audit for different applications. So suggested that to give more assignments and also suggested to discuss more research papers in class rooms.


PROFESSOR & HEAD
Department of Mechanical Engineering
Chaitanya Bharathi Institute of Technology (A)
Bandipet, Hyderabad-500 075, Telangana



PO3: Design/development of solutions:

PO03	1.55	1.51	The courses 16MEE01, 16PEE05, 16MEE03,16PEE04,,16MEE01, 16PEE03, 16MEE11 are identified for low attainment.
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In 16MEE01.it was observed that, Lack of full-fledged knowledge on study state and Un steady state problems. These fundamentals are to be included in Applied Thermodynamics and Heat Transfer. Planned to give complex problems on load calculations for Air conditioning system. Lack of knowledge on Thermo dynamics of human body. Adding the content in the syllabus definitely helps. Adequate content needs to be given on comfort air conditioning. Also suggested that to add more video lectures in tutorial classes.

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PO4 : Conduct investigations of complex problems:

PO04	1.48	1.45	The courses 16MEE01, 16PEE05, 16MEE03,16PEE04,,16MEE01, 16MEE11 are identified for low attainment.
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S. Reddy
PROFESSOR & HEAD
Department of Mechanical Engineering
Chaitanya Bharathi Institute of Technology (A)
Gandipet, Hyderabad-500 075. Telangana

S. Reddy

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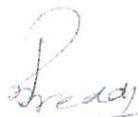
PO5 Modern tool usage:

PO05	1.55	1.51	The courses 16MEE01, 16MEE11 are identified for low attainment.
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PROFESSOR & HEAD
 Department of Mechanical Engineering
 Chaitanya Bharathi Institute of Technology (A)
 Gandipet, Hyderabad-500 075, Telangana



PO6 Modern tool usage:

PO6	1.39	1.36	The courses 16PEE05, 16MEE03, 16PEE04, 16MEE01, 16MEE11 are identified for low attainment.
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In 16PEE05, it was suggested to give more classes to cover the fundamentals effectively. And also suggested to take students for industrial visit to show the practical applications of these concepts.

In 16MEE03, it was observed that the Teaching methods adopted were not adequate. Extra classes are to be planned to cover the fundamentals effectively. Choice in setting Question Paper needs to be changed so that all COs are covered which is implemented in R18. Suggested to frame Assignments to focus on solving complex engineering problems.

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In 16MEE11, it was observed that students were unable to understand the concepts of Energy Conservation, Management and Audit for different applications. So suggested that to give more assignments and also suggested to discuss more research papers in class rooms.

PO12: Lifelong learning

PO12	1.61	1.55	The courses 16PEE05, 16MEE03, 16PEE04, 16MEE11 are identified for low attainment.
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Reddy
PROFESSOR (ME))
Department of ME
Chaitanya Bharathi
Gandipet, Hyderabad
Engineering
Technology (A)
Bangalore

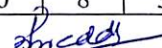
Reddy

Chaitanya Bharathi Institute of Technology

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PO and PSO Attainment of 2017-21 Batch

S. No	Code	Course Name	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
1	16MT C05	Engineering Mathematics-III	2.1 8	1.6 3	0.8 2		0.8 0						0.8 2	0.8 2	0.8 2		0.8 2
2	16ME C04	Material Science and Metallurgy	0.7 6	0.7 6	0.7 6	0.7 6	0.7 6	0.7 5	0.7 5	0.7 5	0.7 5	0.7 5	0.7 5	0.7 6	0.7 6	0.7 6	0.7 6
3	16ME C05	Mechanics of Materials	1.6 2	1.6 2	1.0 8			1.0 8				0.5 4		1.0 8	1.0 8	1.6 2	0.5 4
4	16ME C06	Fluid Dynamics	1.0 7	1.0 0	1.0 0	1.0 0		0.6 4	0.6 4	0.7 1	0.7 1			1.0 7	1.0 0	0.6 4	1.0 7
5	16ME C07	Machine Drawing	0.7 2	1.0 0	1.4 5	1.4 5	2.1 7		1.0 4	0.7 2		2.0 4	1.0 4	0.7 2	1.1 8	2.1 7	1.1 8
6	16MB C01	Engineering Economics and Accountancy	0.6 3	0.9 4	0.6 9	0.8 5	0.7 0	0.4 5	0.6 1	0.6 1	0.2 8	0.4 5	0.6 6	0.5 6	0.4 7	0.5 8	0.4 9
7	16ME C08	Material Science and Metallurgy Lab	1.0 0	1.0 0	1.0 0	1.0 0	1.0 0	1.0 0	1.0 0	1.0 0	1.0 0	1.0 0	1.0 0	1.0 0	1.0 0	2.5 0	
8	16ME C09	Mechanics of Materials Lab	3.0 0	3.0 0	2.0 0	2.0 0		2.0 0			2.0 0	1.0 0		2.0 0	1.0 0	1.0 0	1.0 0
9	16ME C10	Computer Drafting Lab	1.8 3	1.5 0	3.0 0	1.6 7	3.0 0	1.5 0	1.0 0	1.0 0	2.0 0	1.8 3	1.8 3	2.0 0	1.0 0	3.0 0	1.0 0
10	16ME C14	Kinematics of Machines	1.4 0	1.5 0	1.0 0	0.5 0	0.7 5		0.5 0					0.5 0	1.2 4		1.0 0
11	16ME C15	Thermodynamics	1.6 6	1.5 2				1.4 5	0.8 0			1.9 5		2.4 0	2.2 1	1.6 6	0.8 3
12	16ME C16	Hydraulic Machinery and Systems	2.2 6	2.0 1	2.2 6	1.6 4	1.2 6	0.7 5	0.7 5	0.7 5	0.8 8	0.9 9	0.7 5	1.5 0	1.8 8	2.1 3	


PROFESSOR & HEAD
 Department of Mechanical Engineering
 Chaitanya Bharathi Institute of Technology (A)
 Gandipet, Hyderabad-500 075, Telangana

13	16ME C17	Manufacturing Processes	0.5 3	0.4 1	0.3 7	0.3 8	0.5 7	0.2 3	0.2 1		0.3 7	0.2 4	0.3 4	0.3 7	0.7 0	0.2 3	
14	16EE C14	Electrical Machines and Microcontroller Applications	0.9 0	0.7 2	0.5 0	0.7 1	0.7 2		0.4 3			0.4 0		0.3 6	0.6 6		0.8 3
15	16ME C18	Hydraulic Machinery and Systems Lab	0.9 8	0.9 8	1.3 7	1.6 3	0.9 8						0.9 8	0.9 8	0.9 8		1.3 7
16	16ME C19	Manufacturing Processes Lab	2.0 0	1.6 7	1.5 0	1.6 7	2.3 3	1.3 3	1.1 7	1.0 0	1.1 7	1.5 0	1.3 3	1.5 0	1.6 7	2.0 0	1.7 5
17	16EG C03	Soft Skills and Employability Enhancement Lab	0.9 0	0.9 0	0.9 0	0.9 0	0.9 0	0.9 0		2.0 3	2.3 4	1.8 0	1.8 0	1.9 8	0.9 0		0.9 0
18	16ME C20	Dynamics of Machines	1.8 5	1.8 5	1.8 5	1.8 5	1.2 3	1.2 7	0.9 8	0.6 2	0.6 2	0.9 8	0.6 2	1.2 3	1.5 2	1.7 5	0.8 0
19	16ME C21	Applied Thermodynamics and Heat Transfer	1.9 6	1.7 9	0.9 7	0.9 8	1.2 9	1.6 3	1.3 0	0.9 8	1.3 1		2.0 0	2.7 5	2.2 8	2.6 1	0.9 8
20	16ME C22	Design of Machine Elements	1.9 4	2.0 5	1.7 8	1.2 6	1.7 2	1.5 3	0.9 7				0.7 1	1.6 1	1.6 4	1.8 5	0.6 8
21	16ME E01	Refrigeration and Air Conditioning	0.9 9	0.8 7	0.4 5	0.0 8	0.3 6	0.8 2	0.4 9		0.4 5	1.4 0	1.3 6	1.2 5	1.1 6	0.9 9	0.5 0
22	16PE E01	Principles of Industrial Engineering	1.3 5	1.1 6	1.1 7	1.2 1	1.3 5	0.7 7	0.7 4	0.8 7	0.9 5	1.3 9	1.1 7	1.0 9	0.8 4	1.1 3	1.3 2
23	16PE E02	Product Design and Process Planning	2.3 2	1.7 7	2.0 8	1.6 2	2.0 9	1.4 5				1.4 5	1.3 7	1.7 7	1.6 3	1.0 0	
24	16ME E03	Fuels, Combustion and Environment	0.7 6	0.5 7	0.7 4	0.4 5	0.9 7	0.5 1	1.5 3	1.6 2	0.9 3	0.9 3	0.4 7	0.4 7	0.8 4		1.0 2
25	16PE E03	Non Destructive Testing and Evaluation	1.0 0	0.8 4	0.5 0	0.9 6	1.1 6	0.5 8	0.5 8	1.1 6	1.1 6	1.1 6	0.5 8	1.7 3	0.5 8	1.1 6	0.5 8
26	16PE E04	Plastics, Ceramics and Composite Materials	0.5 5	0.5 7	0.5 9	0.6 0	0.5 2	1.0 4	0.9 6			0.6 0	0.5 7	0.7 6	0.9 6	1.1 5	0.8 4
27	16MT E04	Probability and Numerical Methods	1.8 8	1.8 8	1.8 8	0.9 4	0.9 3						1.5 1	0.9 4	0.9 4	0.9 4	
28	16ME C23	Dynamics and Vibrations Lab	3.0 0	2.5 0	2.3 3	2.3 3	2.8 3	1.0 0	1.0 0	1.0 0	2.0 0	2.0 0	1.0 0	2.0 0	2.6 7	1.0 0	2.1 7

P. Reddy
PROFESSOR & HEAD
 Department of Mechanical Engineering
 Chaitanya Bharathi Institute of Technology (P)
 Gandipet, Hyderabad-500 075, Telangana

29	16ME C24	Applied Thermodynamics and Heat Transfer Lab	2.8 3	2.8 3	2.6 7	2.8 3	2.5 0	2.3 3	1.6 7	2.6 7	2.5 0	1.8 3	3.0 0	2.5 0	1.8 3	2.1 7	1.6 7
30	16EE C22	Electrical Machines and Microcontroller Applications Lab	3.0 0	2.2 0	1.6 0	1.0 0	1.2 0				1.0 0			1.0 0			1.0 0
31	16ME C26	CAD and CAM	2.4 9	2.4 9	1.8 3	1.6 6	2.4 9				0.8 3	1.8 3	0.8 3	2.4 9	2.4 9	2.4 9	1.6 6
32	16ME C27	Metal Cutting and Machine Tool Engineering	1.0 8	1.0 1	0.9 0	0.8 4	0.8 3	0.4 1	0.5 1	0.4 1	0.6 7	0.4 1	0.4 1	0.8 3	0.9 1	1.2 4	0.4 9
33	16ME C28	Thermal Turbo Machines	1.6 3	1.7 1	1.8 0	1.7 1	1.8 0	1.1 0	0.9 4	0.9 4	1.2 0	1.8 3	1.1 5	1.6 0	1.1 6	1.4 7	1.3 5
34	16ME C29	Machine Design	1.6 2	1.6 2	1.0 1			1.0 8			0.5 4	1.0 8		1.5 5	1.3 5	0.5 4	1.2 2
35	16ME E04	Advanced IC Engines	1.4 4	1.0 3	1.4 4	1.0 3	1.0 3	0.9 1	1.1 7	0.8 2		0.6 9	0.3 9	0.8 9	0.8 8	0.3 9	1.0 3
36	16ME E06	Computational Fluid Dynamics	1.9 7	1.9 7	1.3 7	0.6 6	1.9 7	1.3 3			0.6 6	1.3 2	0.7 4	1.8 5	1.1 3	1.1 5	1.0 2
37	16ME E06	Automobile Engineering	0.9 9	0.6 3	1.0 8	1.0 8	1.0 8	1.1 0	0.7 8				0.5 4	1.5 3	1.3 5	1.0 8	1.0 8
38	16PE E10	Digital Manufacturing	1.8 0	1.8 0	1.8 0	1.2 0	1.8 0	1.2 0	1.2 0	1.8 0	1.2 0	1.8 0	1.2 0	1.2 0	1.8 0	1.8 0	1.8 0
39	16ME E07	Heat and Mass Transfer	1.1 5	0.6 4		0.6 4	0.5 7		1.1 5					1.7 2	1.1 5	0.8 8	1.3 1
40	16ME E09	Object Oriented Programming With C++	1.6 7	1.7 0	0.9 7	1.1 1	1.3 9	1.1 1			1.4 2	1.7 0	0.5 9	1.1 2	1.0 1	1.0 1	0.9 5
41	16PE E06	Modern Machining and Forming Methods		0.8 4	0.7 7	0.8 8	0.8 0	0.8 7	0.9 2		0.9 2	0.9 2	0.8 9	0.8 4	1.3 8	1.5 2	1.5 2
42	16PEE 10	Surface Engineering	1.2 8	0.5 5					1.1 5			0.4 5		0.9 3	1.5 4	0.8 8	0.4 8
43	16ME C30	CAD and CAM Lab	2.3 3	2.1 1	2.6 7	2.0 0	2.6 7				1.7 8	2.6 7	0.8 9	2.6 7	2.3 3	2.1 1	1.7 8
44	16ME C31	Metal Cutting and Machine Tool	2.6 7	2.1 7	2.0 0	1.6 7	2.0 0	1.0 0	1.0 0	1.0 0	1.6 7	1.0 0	1.0 0	2.0 0	2.5 0	3.0 0	1.0 0

P. Sreedhar

PROFESSOR & HEAD
Department of Mechanical Engineering
Chaitanya Bharathi Institute of Technology (A)
Gandipet, Hyderabad-500 075, Telangana

		Engineering Lab															
45	16ME C32	Thermal Engineering Lab	1.1 2	1.4 0	0.9 3	1.2 1	1.3 1	1.4 0	0.4 7		1.2 1	1.3 1	0.4 7	1.2 1	1.2 1	0.9 3	1.2 1
46	16ME C33	Metrology & Instrumentation	1.1 9	0.7 3	0.6 9	0.6 4	0.6 6	0.6 3	0.4 4					0.5 5	1.4 8		0.5 5
47	16ME C34	Operations Research	1.1 0	0.6 7	0.5 2		0.5 3	1.0 3	0.4 4	0.5 6	0.5 3		1.0 3	0.6 7	0.5 4	0.6 3	1.3 0
48	16PE C10	Production Drawing	0.9 9	1.5 0	1.9 9	1.9 9	2.9 8		1.3 9	0.9 9		2.7 8	1.3 9	0.9 9	1.5 9	2.9 8	1.5 9
49	16PE C11	Production and Operations Management	1.7 9	1.5 9	1.7 8	1.3 2	1.6 3	1.1 3		1.2 5	2.0 0	1.1 3	1.1 1	1.3 3	0.6 6	1.0 0	1.5 4
50	16ME C35	Finite Element Analysis	1.7 7	1.7 7	1.0 7	0.9 7	1.3 5					1.4 6	1.4 6	0.4 9	0.9 7	1.7 7	1.7 7
51	16ME E10	Renewable Energy Sources	0.9 5	1.3 5	0.6 9	1.0 6	0.9 5	1.1 5	0.9 5	0.8 6	0.7 5	0.7 5	0.8 3	1.2 4	1.1 6	1.7 4	0.9 4
52	16ME E11	Energy Conservation, Management and Audit	1.1 6	1.3 1	0.8 8	1.0 2	1.1 5	1.1 5	1.0 0	0.8 9	0.9 9	0.8 5	1.0 1	1.2 9	1.2 9	1.3 1	1.3 2
53	16ME E12	Engineering Research Methodology	1.2 7	1.5 4	1.5 4	1.8 6	1.3 1	0.7 5			0.7 5	1.7 1	1.4 2	1.2 3	1.6 3	1.6 3	1.6 3
54	16ME E13	Environmental Pollution	0.6 9	1.4 5	1.9 8	2.0 6	2.0 6	2.0 6	2.0 6	1.1 4	1.9 8	2.0 6	1.7 1	1.7 9	1.1 8	1.3 7	1.3 7
55	16ME C36	Metrology & Instrumentation Lab	2.4 0	1.8 0	2.0 0	1.0 0	1.5 0	1.0 0						1.0 0	2.4 0		1.0 0
56	16ME C37	Computer Aided Engg. Lab	2.7 7	2.7 7	1.8 5	2.7 7	2.7 7	2.7 7	0.9 2		2.7 7	2.7 7	0.9 2	2.5 9	2.7 7		2.7 7
57	16ME C38	Project Seminar	2.1 6	1.2 3	1.3 0	1.9 3	1.6 3	1.3 8	1.6 3	1.4 8	1.9 7	2.7 5	1.2 2	2.1 6	1.7 7	0.9 8	1.5 8
58	16ME E15	Power Plant Engineering	1.5 2	1.5 4	1.5 1	0.9 5	0.8 2	1.6 1	1.6 1	0.9 5	1.1 5	0.8 5	0.8 5	2.2 8	0.8 2	1.1 2	1.5 3
59	16ME E16	Principles of Entrepreneurship	2.0 8	1.9 1	1.8 2	1.7 6	2.0 7	1.3 2		1.7 9	1.7 1	1.2 7	1.2 4	1.5 0	0.7 5	0.8 5	1.7 6
60	16PE E11	Supply Chain Management	1.6 0	2.2 7	2.2 7	1.9 4	1.9 4	1.6 8	2.1 0	1.6 8	2.2 7	2.2 7	2.2 7	2.2 7	2.1 1	1.5 1	0.7 6
61	16CE O02	Disaster Mitigation and Management	1.7 9	1.3 9	1.7 9	1.7 9	2.1 8	2.3 9	1.9 9	1.3 9	1.5 9	1.3 9	1.5 9	0.9 9	1.3 3		1.9 7
62	16EE	Energy Auditing	1.1	1.3	1.0	1.2	0.8	0.6	1.0		0.6	0.7		0.8	0.9	0.6	1.2

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Department of Mechanical Engineering
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Gandipet, Hyderabad-500 075, Telangana

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	O03		2	6	3	4	3	2	3		2	8		7	3	2	4
63	16EC O07	System Automation and Control	2.4 1	2.1 7	1.4 4	1.5 6	0.8 3	1.1 0	1.4 4	0.8 7	0.8 0	0.9 3		1.6 1	2.0 4	1.4 4	1.3 3
64	16CS O09	Basics of AI	1.2 7	1.4 0	0.8 1	1.4 0	1.0 7	0.8 8							1.1 8		
65	16PY O01	History of Science and Technology	2.5 9	1.4 8	1.4 7	1.2 9	1.4 7	1.5 0	1.6 7	1.0 9	1.1 0	1.8 5	1.1 0	1.8 5	0.9 2	0.9 1	1.1 6
66	16EE O05	Waste Management	0.7 7			0.7 4	0.6 8	2.0 0	2.3 1	1.5 4	0.7 6	0.6 7	2.0 9	0.7 6	1.8 7	1.4 7	2.1 7
67	16CS O07	Basics of Cyber Security	0.7 2	0.5 9	0.7 6	0.2 5	0.7 6	1.2 0	0.8 4	1.0 4				0.6 1			
68	16ME C39	Seminar	2.1 5	1.2 3	1.3 0	1.9 3	1.6 2	1.3 7	1.6 3	1.4 8	1.9 6	2.7 5	1.2 2	2.1 5	1.7 6	0.9 8	1.5 7
69	16ME C40	Project	2.6 0	2.6 0	2.2 0	2.3 3	2.4 0	2.4 0	2.2 5	1.8 0	2.6 0	2.4 0	2.2 0	2.6 0	2.6 0	1.6 0	2.4 0
		Direct Attainment	1.6 0	1.4 7	1.3 7	1.2 9	1.4 1	1.2 0	1.0 8	1.1 4	1.2 7	1.3 8	1.1 0	1.3 9	1.3 7	1.3 9	1.2 3
		Indirect Attainment	2.2 0	2.1 1	2.0 5	2.0 9	1.9 3	1.9 9	2.0 5	2.1 9	2.2 9	2.2 2	2.1 4	2.2 1	2.1 8	2.1 6	2.1 2
		Target (2016-2020 Batch)	1.7 8	1.6 9	1.5 2	1.4 5	1.5 5	1.3 6	1.2 1	1.1 8	1.3 7	1.5 0	1.2 1	1.5 8	1.5 8	1.6 0	1.4 0
		Attained (2016-2020 Batch)	1.7 5	1.6 5	1.5 4	1.4 9	1.5 3	1.3 8	1.2 9	1.3 0	1.5 0	1.5 6	1.3 3	1.5 9	1.5 9	1.5 9	1.4 3
		Target (2017-2021 Batch)	1.7 8	1.6 9	1.5 5	1.4 8	1.5 5	1.3 9	1.2 3	1.2 0	1.4 0	1.5 3	1.2 3	1.6 1	1.6 1	1.6 0	1.4 3
		Attained (2017-2021 Batch)	1.7 2	1.6 0	1.5 1	1.4 5	1.5 1	1.3 6	1.2 7	1.3 5	1.4 7	1.5 5	1.3 1	1.5 5	1.5 3	1.5 4	1.4 1

S. Reddy

PROFESSOR & HEAD
Department of Mechanical Engineering
Chaitanya Bharathi Institute of Technology (A)
Gandipet, Hyderabad-500 075, Telangana

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PO and PSO Assessment Procedure

The assessment process includes both the direct and indirect measurement. The list of assessment tools for both direct and indirect methods is given below. The PO and PSO attainment is done for every outgoing batch.

PO-PSO Attainment	Direct Assessment	CO Attainment of Courses	80%
	Indirect Assessment	Programme Exit Survey	20%

The attainment of POs and PSOs are being calculated based on the COs attainment. The POs/PSOs attainment is calculated by multiplying the COs attainment value and the COs contribution factor, where COs contribution factor is 3, 2 and 1 for High, Medium and low contribution respectively, towards POs/PSOs. Example calculation is shown below.

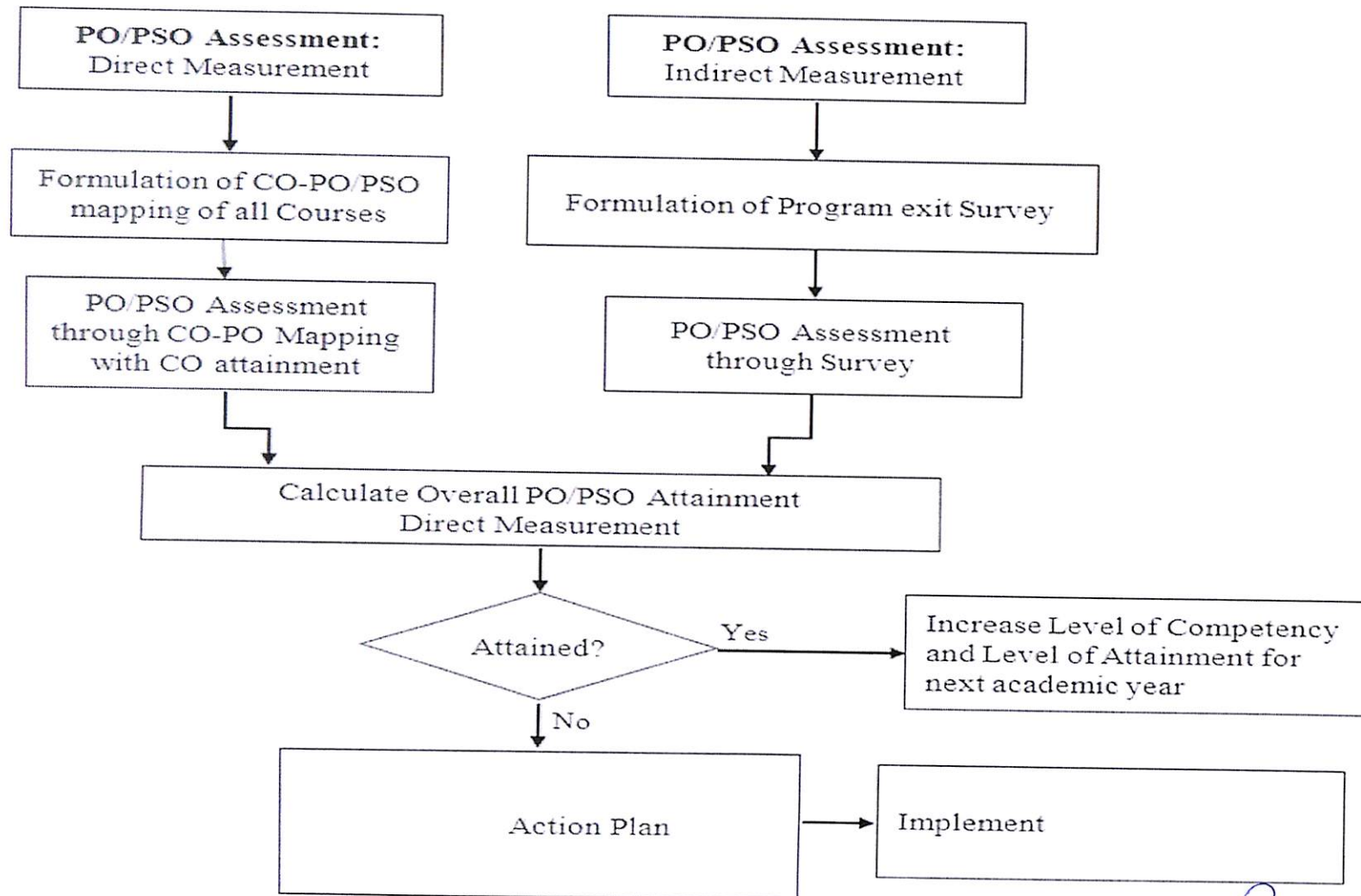
$PO_x = \text{Summation of product of CO attainment and the CO-PO articulation value} / (3 * \text{No. of COs mapped to the P.O})$

x indicates the PO number. PSO attainment is also calculated in the same manner

The POs and PSOs attainment is calculated and observations are recorded. The average values of CO-PO articulation matrix is computed for each course and the average of averages are computed for each P.O and PSO. The target values are chosen as percentage of the average of average values of CO-PO articulation matrix obtained. The percentage is incremented year to year. If the POs and PSOs attainment value is less than target value, the causes are identified, action plan is made and implemented. The process for POs and PSOs attainments described in the flowchart shown in Figure Indirect assessment is made based on programme exit surveys. Overall attainment of POs is calculated by taking 80% of direct attainment and 20% of indirect attainment.


PROFESSOR & HEAD
 Department of Mechanical Engineering
 Chaitanya Bharathi Institute of Technology (A)
 Gandipet, Hyderabad-500 075, Telangana

PROFESSOR & HEAD
 Department of Mechanical Engineering
 Chaitanya Bharathi Institute of Technology (A)
 Gandipet, Hyderabad-500 075, Telangana



PO PSO attainment Process

P. Prasad
 PROFESSOR & HEAD
 Department of Mechanical Engineering
 Chaitanya Bharathi Institute of Technology (A)
 Gandipet, Hyderabad-500 075, Telangana

Procedure for setting PO targets

The target values are chosen as percentage of the Program articulation matrix. The percentage increment in target level is decided in PAQIC meeting and approved by Department advisory board every year. The following are target values during previous years

- 80 % for the 2017-18 passed out batch
- For the 2018-19 passed out batch the target is decided as 82% If the target is attained and remains same as the previous target ,if not attained
- For the 2019-20 passed out batch 82 % If the target is attained and remains same as the previous target ,if not attained
- For the 2020-21 passed out 84% If the target is attained. previous target ,if not attained
- For the 2021-22 passed out 84% If the target is attained. previous target ,if not attained



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Example Calculation of PO and PSO attainment through Direct Method

Direct PO and PSO attainment of individual courses are measure of its CO attainment values and its Course Articulation, the method of calculation is shown below for a PO and CO values

Course X	Statement	CO Attainment	PO1 (Articulation)
CO1	Expand functions in the given intervals.	CO1x	A
CO2	Solve linear and nonlinear PDEs.	CO2x	B
CO3	Solve one-dimension, two-dimension, Heat steady state equations and also one-dimension wave equation	CO3x	C
CO4	Solve problems on Analytic functions, Cauchy's theorem and Cauchy's integral formula.	CO4x	A
CO5	Expand functions by using Taylor's and Laurent's series.	CO5x	B


$$PO1 \text{ Attainment} = (CO1x * A + CO2x * B + CO3x * C + CO4x * A + CO5x * B) / (3*5)$$

In similar manner POs and PSO calculations are to be done as shown below as an example calculation

S. No	Code	Course Name	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
1	C101	Mechanics of Material	1.62	1.62	1.08								1.62	1.08	1.08		0.54
2	C102	Material Science	1.62	1.62	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.62	0.54
3	C103	Kinematics of Machines	1.08	1.08	1.08			0.54				1.08		1.62	0.54	1.08	0.54
n		PO1 _n														
			*														

$$*POi \text{ Attainment} = \sum_{i=1}^n POi / \text{Total Number of Courses Contributing to POi}$$

The procedure and guidelines is presented below for both direct and indirect assessment,


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Direct Assessment

COs Attainments are calculated by both direct and indirect methods.

Direct methods display the students' knowledge and skill from their performance in the continuous internal evaluation, semester end examinations, seminars, assignments.

Course end survey conducted at the end of the semester is used as indirect assessment of COs.

80% weightage is given to direct method and 20% to the indirect method.

Direct Assessment tools

Assignment: This is a qualitative performance assessment tool designed to assess students' knowledge of engineering practices, framework, and problem solving. It is used to test the higher order Bloom's taxonomy levels of the students.

Slip tests / Quizzes This type of assessment is carried out by the individual teacher as per the Academic Calendar.

Mid Examinations for theory Courses: carried out during the examination sessions which are held twice for a course in every semester

Semester End Examinations: Conducted once for every semester by the institute

Direct Assessment Tool-Wise Weightage

S.No	Assessment Tool	Max. Marks			
		R-13	R-16	R-18	R-20
Theory courses					
1.	Assignments / Slip testes (Avg. of Best 3)	05	10	10	10
2.	Class tests (Avg. of two tests)	20	20	20	20
3	Open ended problem/project-oriented assignment / review of research papers	-	-	-	10
4	Semester End Examination (SEE)	75	70	70	60
Laboratory courses					
1	Continuous internal Evaluation	25	25	15	50
2	Semester End Examination	50	50	35	50



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Project					
1	Continuous internal Evaluation	50	50	50	50
2	Semester End Examination	100	100	100	100

Direct Assessment Tools

S.No			Frequency	Assessment Process and Purpose	Responsibility
	Tool	Mode			
1.	Assignment (Theory course)	Written	Twice/Thrice in a semester depending on the Regulation	Conducted by the faculty to test the higher order cognitive levels	Course teacher
2.	Slips tests (Theory course)	Written	Twice/Thrice in a semester depending on the Regulation	Conducted by the faculty to test the conceptual understanding	Course teacher
3.	Class tests (Theory course)	Written	Twice in a semester	Tests the students' comprehension of knowledge and concepts in the respective course. Mostly addresses level 1 to level 4 of BLT and higher cognitive levels, a little extent	Academic and Examination cell
4.	Continuous internal assessment (Lab course)	Written and Oral	Weekly	Preparatory work, Experiment, Analysis/investigation and report writing	Course teacher
5.	Semester End Examination (Theory)	Written	Once in a semester	Tests the students' comprehension of knowledge and concepts in the respective course. Mostly addresses level 1 to level 4 of BLT and higher cognitive levels, a little extent	Academic and Examination cell

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6	Semester End Examination (Lab)	Written and Oral	Once in a semester	Application of theory to practice. Conduction of experiment, results, discussion and inferences	Academic and Examination cell
7	Continuous internal assessment (Seminar)	Presentation and oral and report	Weekly (in 7th and 8th Semesters)	Problem identification, literature survey, methodology	Course teacher
8	Continuous internal assessment (Project)	Presentation and oral	Thrice (in 8th semester)	To review the project progress.	Committee constituted by HoD
9	Semester End Examination (Project)	Presentation, oral and report	Once in 8th semester	Problem identification, analysis, design, modern tool usage, communication and presentation skills , social and environmental concerns	Academic and Examination cell

CO Assessment Procedure

Step 1: Mapping of Assessment Questions with COs

Assignment/Slip tests: there are 3 assignments/slip tests depending on the regulation. For example in R-16 there are 3 assignments. the assignment papers are set by the course teacher dealing with course. During framing the questions, it is taken care that the three assignments cover all the COs and the questions are set such a way that higher order cognitive levels are tested.



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A sample assignment is provided below.

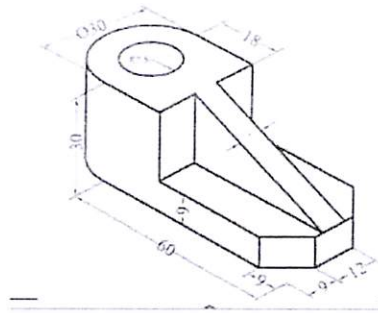
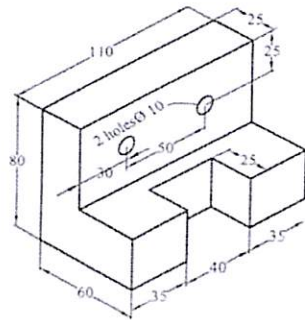
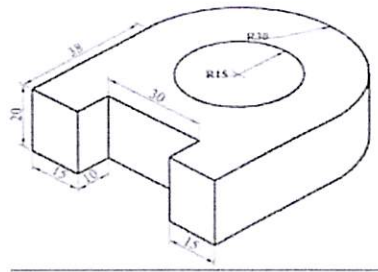
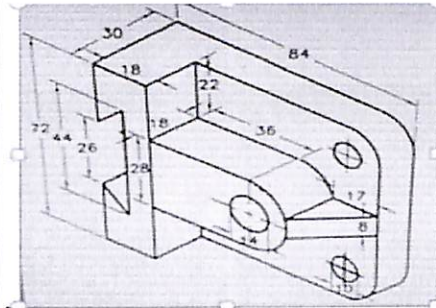
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Sub: Manufacturing Processes
Assignment-1

S. No	Question	CO	BL
1	<p>Select the suitable manufacturing Processes for manufacturing of following components along with your justification where ever possible (you may refer content in web such as google, YouTube etc)</p> <ol style="list-style-type: none"> a. Connecting rod b. Machinebed c. Jewellery d. PVCtubes e. Automobile body building f. Stainless steel glasses g. Window grilles h. N-95masks i. Rails j. Fan blades k. Almarah l. Jewellery m. Titanium implants n. Dental implants o. Washers p. Spark plug q. Exhaust manifold r. Pet bottles s. large tubes for water supply. 	CO1	BT2
2	<p>Design the pattern for the following components with different combinations of cast material and pattern materials.</p> <p>Cast metals: Al, Steel, CI</p>	CO2	BT3



PROFESSOR & HEAD
 Department of Mechanical Engineering
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 Gandipet, Hyderabad-500 075. Telangana

Pattern Materials: wood, Steel



P. Reddy
PROFESSOR & HEAD
Department of Mechanical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-500 075. Tel: 040-26111111

Class tests: The question paper is framed by the course teacher. while framing the question paper the course teacher prepares the questions to test the attainment of COs. Against each question the CO is mentioned. A sample is provided below.

CHAITYANYA BHARATHI INSTITUTE OF TECHNOLOGY, HYDERABAD - 75
B.E IV SEM (Mechanical-1 & 2)-II-Semester, February, 2018
I-Mid Sessional

Subject: 16ME C17: MANUFACTURING PROCESSES

Date : 06-02-2018 (Tuesday) Duration : 1hr
Time : 02:00 -03:00 pm Marks : 20


PART -A (Answer all the questions: 6 M)

1	What is the purpose of core and core prints? (CO2)	2
2	What is meant by gating ratio? Differentiate between pressurized and un-pressurized gating systems? (CO1)	2
3	State the causes and remedies for shrinkage cavity and blow hole defects in castings. (CO2)	2

PART - B (Answer any two of the following)

4	(a) What are the functions of riser & gating system? (CO1)	2
	(b) State and explain various pattern allowances. (CO2)	5
5	(a) Explain the CO ₂ moulding process. (CO2)	2
	(b) Describe the construction & working of cupola furnace (CO2)	5
6	(a) Design the riser for a casting section of 250mm x 100mm x 50mm. Assume height of the riser is equal to diameter of the riser. (Use Modulus Method). (CO1)	2
	(b) Explain shell moulding along with its merits and demerits. (CO2)	5

Paper set by: Dr. P.V.R.Ravindra Reddy, Prof., & Dr.BVS. Rao, Asst. Prof., MED


PROFESSOR
Department of Mechanical Engineering
Chaitanya Bharathi Institute of Technology
Hyderabad-500 075. Tel

Semester End Examination: The paper setter is instructed to frame the questions to address the COs. A sample of SEE paper is shown below.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (Autonomous)

B.E. (Branch) IV Sem (Backlog) Examination June 2021

Manufacturing Processes

Time: 3 Hours

Max Marks: 70

Note: Answer all questions from **Part-A** at one place in the same order Answer any **five** questions from **Part-B**

Part - A (20 Marks)

S.No	Question	*M	*CO	*BT
1	What are the advantages the casting processes	(2)	CO1	BT1
2	Find the solidification time of a sphere having radius 200mm, if a sphere of radius 100 mm of same material solidifies in 5 min under same conditions.	(2)	CO2	BT3
3	State the causes and remedies of the defect blow hole.	(2)	CO3	BT4
4	What is binder used in CO2 Moulding process? Explain the procedure of CO2 moulding	(2)	CO3	BT2
5	What are the difference between TIG and MIG welding processes	(2)	CO4	BT2
6	What is the purpose of flux in arc welding?	(2)	CO4	BT1
7	Define Brazing.	(2)	CO4	BT1
8	A cylinder is compressed to half of its length. What is true strain experienced by the member?	(2)	CO5	BT3
9	What is the difference between blanking and piercing operations?	(2)	CO5	BT2

P. S. R. Reddy
PROFESSOR & HEAD
 Department of Mechanical Engineering
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10	A billet of 100 mm diameter is extruded to 10 mm diameter. If the extrusion constant is 300 MPa, calculate the load required assuming ideal deformation.	(2)	CO6	BT3
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Part - B (50 Marks)

S.No	Question	*M	*CO	*BT
11	(a) What are various pattern allowances? Explain any two of them	5	CO1	BT1
	(b) Explain the procedure for Caine's method of riser design?	5	CO2	BT2
12	(a) What are the various inspection methods used to find out subsurface defects of the casting? Explain about them in brief.	5	CO3	BT5
	(b) Explain briefly about investment casting with its merits and demerits.	5	CO1	BT1
13	(a) What are constant voltage and constant current characteristics in arc welding? Where do you use them?	5	CO4	BT2
	(b) Explain Electron beam welding processe- with the equipment diagram.	5	CO4	BT1
14	(a) What is the difference between cold working and hot working? State their merits and demerits.	5	CO5	BT2
	(b) Derive the expression for true strain in terms of engineering strain	5	CO5	
15	(a) State the difference between forward and back ward extrusion with neat sketches	5	CO1	BT2
	An 18 mm thick sheet is rolled to 16mm in a pass with the rollers of diameter 500 mm rotating at 100 rpm . Find a) Bite angle b) contact			

	(b)	length d) velocity of the sheet at neutral point d) friction coefficient assuming that maximum reduction possible is 5mm.	5	CO6	BT3
16	(a)	What is choke? What is gating ratio? Explain pressurized and unpressurized gating systems with their merits and demerits.	5	CO2	BT2
	(b)	Explain about cold chamber die casting process.	5	CO1	BT1
17	(a)	Explain about Thermit Welding process.	3	CO4	BT1
	(b)	State and explain about von-Mise's criteria.	3	CO5	BT2
	(c)	Find the blank diameter of a cylindrical cup of 30 mm diameter and 50 mm height. What is force required for drawing operation of the above cup, if the thickness of the cup is 1mm and yield strength of the material is 150 MPa	4	CO6	BT3



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 Department of Mechanical Engineering
 Chaitanya Bharathi Institute of Technology (A)
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Step 2: Recording of Marks and Mapping with COs

During evaluation, the examiner records marks obtained against each question for all direct assessment tools and then CO wise marks are computed. A sample record of marks of class test and SEE are presented here under

Class test Marks

This table is NOT EDITABLE							Enter the Marks, COs in the Table Below.												
Max Marks	6	19	2	0	0	0	CO-Mapping →	CO1	CO2	CO3	CO1	CO2	CO2	CO3	CO1	CO2	Total		
Roll Number	CO1	CO2	CO3	CO4	CO5	CO6	Roll Number	Q1	Q2	Q3	Q4			Q5					
											A	B	C	A	B	C			
160116736001	6	8	1	0	0	0	160116736001	2	2	1	2	3		0		2	4	16	
160116736002	4	14	2	0	0	0	160116736002	2	2	2	2	5		7		0	0	20	
160116736003	6	12	2	0	0	0	160116736003	2	2	2	2	5		0		2	5	20	
160116736004	5	11	2	0	0	0	160116736004	2	1	2	2	5		0		2	5	18	
160116736005	5	7	0	0	0	0	160116736005	1	2	0	2	2		0		2	3	12	
160116736006	3	8	0	0	0	0	160116736006	1	2	0	2	2		4		0	0	11	
160116736007	6	8	1	0	0	0	160116736007	2	2	1	2	2		0		2	2	13	
160116736008	4	8	1	0	0	0	160116736008	1	2	1	2	4		0		1	2	13	
160116736009	7	11	2	0	0	0	160116736009	2	2	2	2	5		0		3	4	20	
160116736010	4	12	2	0	0	0	160116736010	1	2	2	2	5		0		1	5	18	
160116736011	4	11	1	0	0	0	160116736011	1	2	1	2	5		0		1	4	16	
160116736012	0	0	0	0	0	0	160116736012											0	
160116736013	5	8	2	0	0	0	160116736013	1	2	2	2	4		0		2	2	15	
160116736014	3	10	1	0	0	0	160116736014	1	1	1	2	2		7		0	0	14	
160116736015	3	9	2	0	0	0	160116736015	2	2	2	2	4		0		2	3	17	
160116736016	5	10	0	0	0	0	160116736016	1	2	0	2	5		0		1	3	15	
160116736017	4	8	0	0	0	0	160116736017	0	2	0	2	3		0		2	3	12	
160116736018	3	10	2	0	0	0	160116736018	1	2	2	2	5		0		0	3	15	
160116736019	0	0	0	0	0	0	160116736019											0	
160116736020	5	11	2	0	0	0	160116736020	1	2	2	2	5		0		2	4	18	
160116736021	5	7	1	0	0	0	160116736021	1	2	1	2	2		0		2	3	13	
160116736022	3	12	2	0	0	0	160116736022	1	2	2	2	4		5		0	0	17	
160116736023	4	7	1	0	0	0	160116736023	2	2	1	2	3		0		0	1	12	
160116736024	3	8	1	0	0	0	160116736024	0	2	1	2	5		0		1	2	13	
160116736025	5	4	1	0	0	0	160116736025	2	2	1	2	2		0		1	0	10	
160116736026	4	9	1	0	0	0	160116736026	1	2	1	2	4		0		1	3	14	
160116736027	4	9	1	0	0	0	160116736027	0	2	1	2	5		0		2	2	14	
160116736028	5	11	1	0	0	0	160116736028	2	2	1	2	4		0		1	5	17	
160116736029	5	8	1	0	0	0	160116736029	1	2	1	2	3		0		2	3	14	
160116736030	4	14	2	0	0	0	160116736030	2	2	2	2	5		7		0	0	20	
160116736031	3	14	2	0	0	0	160116736031	1	2	2	2	5		0		0	0	19	
160116736032	5	2	1	0	0	0	160116736032	1	0	1	2	0		0		2	2	8	
160116736033	3	13	2	0	0	0	160116736033	1	2	2	2	5		6		0	0	18	
160116736034	5	10	1	0	0	0	160116736034	1	2	1	2	5		0		2	3	16	
160116736035	1	3	1	0	0	0	160116736035	1	2	1	2	1		0		1	0	8	
160116736036	2	3	0	0	0	0	160116736036	0	0	0	2	0		3		0	0	5	
160116736037	2	7	1	0	0	0	160116736037	0	2	1	2	2		3		0	0	10	

P. Sreedh

PROFESSOR & HEAD
 Department of Mechanical Engineering
 Chaitanya Bharathi Institute of Technology (A)
 Gandipet, Hyderabad-500 075. Telangana

Step 3: Calculation of CO Attainment

CO Attainment is the function of Percentage of Students above Threshold Value

Threshold Value is base for the attainment calculation. The attainment level is decided by the percentage of students above threshold value. For example, in R-16, 45% is considered as threshold value and the attainment levels are decided as follows

Level 1 – 55 Percentage of Students > Threshold Value

Level 2 – 65 Percentage of Students > Threshold Value

Level 3 – 75 Percentage of Students > Threshold Value

Therefore, Attainment level = No of students scoring above threshold value / Total number of students.

Threshold Mark (% of Max Marks)	45
<i>Attain Level 3</i>	75
<i>Attain level 2</i>	65
<i>Attain level 1</i>	55

Step 4: Setting of Target value for COs:

Target value of CO is taken as 1 for the batch of 2016 -20. The target value for the successive batch is increased by 30- 50% of previous target or the attained value of respective CO (whichever is less) if and only if the target is reached. Otherwise, the target is same as the previous target.

CO computations for the assignments, class tests and SEE (as a sample one assignment, one Class test and SEE) for a course is shown below as a sample



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Department of Mechanical Engineering
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Assignment / Slip-Test-1 Course Outcome Analysis

This Table Contains the complete Analysis of the Marks. Fill the Marks and Then view

CO-Analysis	Assignment / Slip-Test-1 Course Outcome Analysis					
	<u>CO1</u>	<u>CO2</u>	<u>CO3</u>	<u>CO4</u>	<u>CO5</u>	<u>CO6</u>
Total_number_of_students	137	137	137	137	137	137
No_of_studts_attempt:	135	135	0	0	0	0
Max_Allotted:	5	5	0	0	0	0
Max_Attained:	5	5	0	0	0	0
Threshold Mark:	2.25	2.25	0	0	0	0
No_of_stu_above_threshold	131	131	0	0	0	0
%ge Above Threshold:	95.62	95.62	0	0	0	0
IS Target_Atained?	YES	YES	NA	NA	NA	NA
Level_Of_Atainment	3	3	0	0	0	0

Mid-I Course Outcome Analysis

Co-Analysis	Mid-I Course Outcome Analysis					
	<u>CO1</u>	<u>CO2</u>	<u>CO3</u>	<u>CO4</u>	<u>CO5</u>	<u>CO6</u>
Total_number_of_students	137	137	137	137	137	137
No_of_studts_attempt:	125	124	112	0	0	0
Max_Allotted:	6	12	6	0	0	0
Max_Attained:	5	10	7	0	0	0
Threshold Mark:	2.7	5.4	2.7	0	0	0
No_of_stu_above_threshold	83	17	44	0	0	0
%ge Above Threshold:	60.58	12.41	32.12	0	0	0
IS Target_Atained?	YES	NO	NO	NA	NA	NA
Level_Of_Atainment	1	3	0	0	0	0

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Department of Mechanical Engineering
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Final Internal Course Outcome Analysis						
Instrument	Total Internal -Attainment					
	<u>CO1</u>	<u>CO2</u>	<u>CO3</u>	<u>CO4</u>	<u>CO5</u>	<u>CO6</u>
Assign-1	3	3	NA	NA	NA	NA
Assign-2	NA	NA	3	3	NA	NA
Assign-3	NA	NA	NA	3	3	NA
Avg- Assigt-Attainment	3	3	3	3	3	NA
Mid-I	1	0	0	NA	NA	NA
Mid-II	NA	NA	1	1	0	NA
Avg-Mid-Attainment	1	0	0.5	1	0	NA
IS Target_Attained?	YES	YES	YES	YES	YES	NOTADR
Attainment Level - Internal	1.67	1	1.33	1.67	1	NOTADR

SEE Course Outcome Analysis						
Result of SEE	SEE					
	<u>CO1</u>	<u>CO2</u>	<u>CO3</u>	<u>CO4</u>	<u>CO5</u>	<u>CO6</u>
Total_number_of_stu	133	133	133	133	133	133
No_of_studts_attempt:	132	131	126	132	71	129
Max_Allotted:	12	24	2	31	10	11
Max_Attained:	12	22	2	28	10	15
Threshold Mark:	5.4	10.8	0.9	13.95	4.5	4.95
No_of_stu_above_threshold	101	65	125	88	46	99
%ge Above Threshold:	75.94	48.87	93.98	66.17	34.59	74.44
IS Target_Attained?	YES	NO	YES	YES	NO	YES
Level_Of_Attainment	3	0	3	2	0	2



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Step 5: Calculation of Overall Direct Attainment of COs

COx attainment of Assignment = (AS1+AS2+AS3)

x refers CO number, AS1, AS2, AS3 are attainments COs in Assignment 1, Assignment 2 and Assignment 3 respectively

CO attainment of Class test = (C1+C2)

C1, C2 are attainments COs in class test 1 and class test 2 respectively

Direct attainment of CO in CIE = 0.33 * CO attainment of Assignment + 0.66 * CO attainment of Class Test

Final direct attainment of CO = 0.3 * Direct attainment of CO in CIE + 0.7 * Attainment of COx in SEE

<u>FINAL Course Outcome Analysis</u>						
Final CO Analysis	FINAL COURSE OUTCOME ANALYSIS					
	CO1	CO2	CO3	CO4	CO5	CO6
x = 0.7 y = 0.3						
DIRECT ATTAINMENT = (x * External_Attainment) + (y * Internal_Attainment)						
Internal Attainment Levels	1.67	1	1.33	1.67	1	NA
External Attainment Level	3	0	3	2	0	2
Direct_Attainment Level	2.6	0.3	2.5	1.9	0.3	1.7
Indirect_Attainment Level	3	3	3	3	3	3
u = 0.8 v = 0.2						
FINAL ATTAINMENT = (u * Direct_Attainment) + (v * Indirect_Attainment)						
FINAL_CO_Attainment	2.68	0.84	2.6	2.12	0.84	1.96
IS CO-Target Attained?	YES	NO	YES	YES	NO	YES
Target Attainment Levels	1	1	1	1	1	1



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Step 6: Calculation of Indirect Assessment

Indirect Assessment is done based on the Course Exit Survey conducted at the end of the semester. Student responses are summed up, averaged and scaled down to 3. A sample course exit form for a course is presented below.

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Course End Survey

Sub: Metal Casting and welding lab

1. To what extent were the outcomes of the course clear to you?

(5) Excellent

(4) Very good

(3) Good

(2) satisfactory

(1) unsatisfactory

2. How far the course contents/syllabus met your expectations?

(5) Excellent

(4) Very good

(3) Good

(2) satisfactory

(1) unsatisfactory



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3. To what extent the course exposed you to new knowledge and practices?

(5) Excellent

(4) Very good

(3) Good

(2) satisfactory

(1) unsatisfactory

4. The Quality of questions in assessment the Seminar/Project/Lab Course

(5) Excellent

(4) Very good

(3) Good

(2) satisfactory

(1) unsatisfactory

5. How confident are you in Preparing mould for a single piece and split pattern?

(5) Excellent

(4) Very good

(3) Good

(2) satisfactory

(1) unsatisfactory



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6. How conformable are you in testing moulding sand and analyzing the same?

(5) Excellent

(4) Very good

(3) Good

(2) satisfactory

(1) unsatisfactory

7. How familiar are you in testing of bead geometry of weldment and correlating the results?

(5) Excellent

(4) Very good

(3) Good

(2) satisfactory

(1) unsatisfactory

8. How confident are you in distinguishing the gas flames and recommend the same for different materials?

(5) Excellent

(4) Very good

(3) Good

(2) satisfactory

(1) unsatisfactory



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9. How familiar are you in usage of TIG, MIG and Spot welding machines?

(5) Excellent

(4) Very good

(3) Good

(2) satisfactory

(1) unsatisfactory

Step 7: Calculation of final attainment of COs (Direct and Indirect)

Final Attainment of CO = $0.8 * \text{Direct attainment of COx} + 0.2 * \text{Indirect attainment of COx}$

Step 8: Analysis, corrective & Preventive action and Impact analysis.

The CO attainments are compared with the target value and reasons for non-attainment, if any, are discussed in PAQIC meetings. PAQIC proposes the corrective actions and the same are discussed in department meetings. The results of the implemented corrective actions are evaluated by the PAQIC and the same is presented to the department meeting.

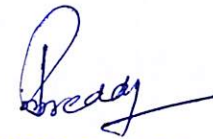


PROFESSOR & HEAD
Department of Mechanical Engineering
Chaitanya Bharathi Institute of Technology
Bandipet, Hyderabad-500 075, Telangana

Indirect Assessment

Indirect Assessment is based on the values obtained for each PO and PSO responses by means of Programme Exit Survey A sample of Programme Exit survey Form is enclosed and calculation of responses to the respective POs and PSOs is shown below as an example.

Programme Exit Survey	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Total No .of Responses	51	51	51	51	51	51	51	51	51	51	51	51	51	51	51
Excellent	13	10	8	9	9	6	8	11	14	14	11	12	10	10	9
Very Good	17	17	17	19	10	18	17	21	20	17	19	21	19	20	17
Good	14	16	17	14	20	16	17	12	13	14	12	11	17	15	20
Satisfactory	5	5	6	6	7	8	6	4	2	3	6	4	3	3	2
Not-satisfactory	2	3	3	3	5	3	3	3	2	3	3	3	2	3	3
AVERAGE	3.67	3.51	3.41	3.49	3.22	3.31	3.41	3.65	3.82	3.71	3.57	3.69	3.63	3.61	3.53
AVERAGE ON SCALE OF 3	2.20	2.11	2.05	2.09	1.93	1.99	2.05	2.19	2.29	2.22	2.14	2.21	2.18	2.16	2.12



PROFESSOR & HEAD
Department of Mechanical Engineering
Savitribai Phule Institute of Technology (A)
Sindipet, Hyderabad-500 075. Telangana