TEACHING LEARNING PRACTICES FOR METROLOGY & QUALITY CONTROL SUBJECT IN OUTCOME BASED EDUCATION

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ABSTRACT - Outcome-Based Education (Obe) Is An Educational Philosophy Where The Teaching And Learning Approach That Is Based Upon A Predetermined Set Of Expected Outcomes. The Term Outcomes In This Matter Would Be A Set Of Values Or Attributes On What A Student Should Acquire Upon Completion Of A Certain Level Of Learning.This Paper Represents Review Of Learner Centred Learning System Of Metrology & Quality Control Subject In Mechanical Engineering Department. Different Teaching Learning Activities Are Designed And Evaluation Of Students Are Carried Out. Co Po Mapping Is Done And Internal Evaluation Of Students Is Carried Out By Using Different Methods. The Result Of Co Attainment Shows Learner's Centric Approach, Leading To The Conclusion That The Obe Approach Introduced Was A Success.

Introduction

OBE is often expressed in terms of what students know, are able to do, or are like as a result of their education. It generally refers to a set of learner outcomes (what happens to individual students) as a result of his/her attendance at an institute of higher education and/or participation in a particular course of study. [1]. Students learn best when the following characteristics are present: (1) variability in teaching methods and materials, (2) interest, (3) clarity, (4) task-oriented behaviour, (5) teacher use of structuring comments, (6) student opportunity to learn the material, (7) multiple levels of questions, and (8) enthusiasm. [2].This paper define the student learning outcomes, and outlines the steps for the implementation of out-come based education, The graduate engineering attributes are compared with the CO,PO, PSO and PEO criteria and identify the design components in meeting the attributes of complex engineering problems.

MeasurementModel for Outcome Based Education (OBE)

The OBE model measures the progress of the graduate in three parameters, which are

1. Program Educational Objectives (PEO)
2. Program Outcomes (PO)
3. Course Outcomes (CO)

Program Educational Objectives (PEO) is broad statements that describe the career and professional accomplishments that the program is preparing the graduates to achieve.The method of assessment of the candidates during the program is left for the institution to decide. The various assessment tools for measuring Course Outcomes include Mid -Semester and End Semester Examinations, Tutorials, Assignments, Project work, Labs, Presentations.

Program Educational Objectives (PEO)

1. To be able to demonstrate application of knowledge gained from study of science, engineering, mathematics and latest software's to analyze and solve technical problems leading to environmental protection, use of green energy, improvisation of medical facilities and improvement in conservation of water.
2. To be able to demonstrate ability to work in teams as member or as a leader in diverse and multidisciplinary teams. To be able to communicate verbally and in writing. To be able to write reports / Root cause analysis (RCAs) / Failure modes and effects analysis (FMEA) and other similar documents. To be able to give presentations. To be able to give and take clear instructions.
3. To be able to demonstrate the ability to be life-long learner so that the student will continuously upgrade skills as per the job requirement for the benefit of society. During functioning in industry or otherwise student should be able to demonstrate ability to assess impact of knowledge on environment, safety, health, legal and cultural issues.
4. To be able to demonstrate ability of project management and financial management. Student should be aware of ethical principles and norms of good engineering practices.

Program Outcomes (PO)

PO's are written in line with the graduate attributes listed in NBA Manual

1. To train student to apply knowledge of engineering, science and mathematics to problem solving.
2. To analyse engineering problems.
3. To design solution to problems.
4. To train student to be able to carry out methodical investigation.
5. To be able to use modern IT tools.
6. To be able to assess societal, cultural, health, safety and legal issues.
7. To be able to understand effect of solution on environment.
8. To be able to take ethical decisions.
9. To be able to work in multidisciplinary teams as team member or team leader.
10. To be able to communicate orally and in writing. To be able to give presentations.
11. To be able to manage a project.
12. To be able to update knowledge continuously and be lifelong learner.

Course Outcomes (CO) of Subject Metrology & Quality Control

1. To apply knowledge of various tools and techniques used to determine geometry and dimensions of components in engineering applications
2. To perform experiments, as well as to analyze and interpret data.
3. To understand the advances in Metrology such as use of CMM, Laser, Machine Vision System for Metrology etc
4. To understand of Quality Control Techniques and its applications in engineering industries.
5. To use/apply Quality Control Techniques/ Statistical Tools appropriately.
6. To apply appropriate Quality Management Tool and suggest appropriate Quality Management System (QMS).

On basis of PEO, PO and CO mapping student get education, and from student outcomes describe what students are expected to know and be able to do by the time of graduation

Correlation between PEO, PO and CO

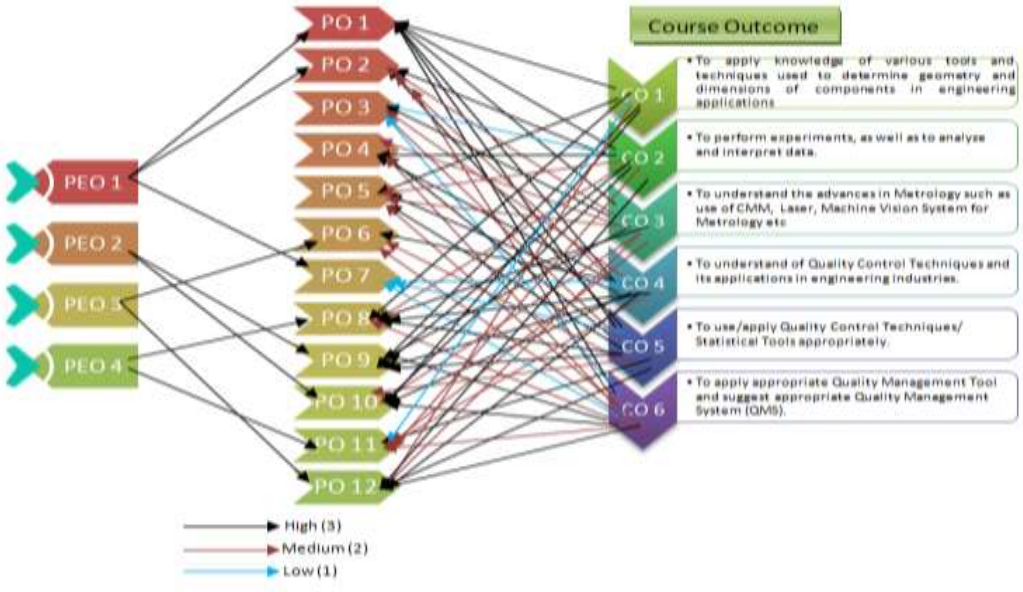

Figure1: Outcome Based Process Model with its correlation

Vision statement gives direction to the organisation. It is the future of the business, which then provides the purpose. The vision statement is about what you want to become. It is aspirational.Mission statement drives the organisation. It is what you do the core of the business, and from it come the objectives and finally, what it takes to reach those objectives. It also shapes your organisation's culture. Program Education objectives, Program Specific Objectives are planned to achieve the Mission in an Educational Institution. Course Outcome attainment and Program Outcome attainments are calculated to achieve the objectives. Outcome based Education system is an educational theory that bases each part of an educational system around outcomes. There is no single specified style of teaching or assessment in OBE; instead, classes,

opportunities, and assessments should all help students achieve the specified outcomes. For the success of OBE, faculty commitment also required along with documented process.

Course attainment of the course Metrology & Quality Control

CO-PO Mapping

The PO's /PSO's are mapped with Metrology and Quality control course in Mechanical Engineering Programme. Program Outcomes emphasizes the expectations of students from their bachelor engineeringProgramme. PO/PSO Attainment depends on the mapping strength and Co Attainment. Co Po mapping done in three levels. High (3), Medium (2) & Low (1). Method used for allotting the mapping strength depends on the number of hours given for a particular CO which addresses the given PO. Co-Po mapping is shown below wherein the mapping strength levels are kept as 1 for low, 2 for medium and 3 for High. "-" has been given for no correlation.

Table 1:-CO-PO Mapping

CO-PO Matrix: Metrology & Quality control												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1) An ability to apply knowledge of various tools and techniques used to determine geometry and dimensions of components in engineering applications	3	-	-	-	3	-	-	3	3	3	1	2
CO 2) An ability to perform experiments, as well as to analyze and interpret data	3	3	1	3	2	-	-	2	3	3	2	3
CO 3) An ability to design gauges to meet desired needs within realistic constraints	3	2	3	2	2	-	-	3	3	2	2	2
CO 4) An understanding of Quality Control Techniques and its applications in engineering industries	3	2	2	3	3	3	1	3	3	3	2	3
CO 5) Understand the quality system and the need for a quality system.	3	3	2	3	3	2	1	3	3	2	3	3
CO 6) Perform the job of an inspector and help the industries to produce quality products	3	2	1	2	2	2	1	2	3	3	2	3
C-PO Matrix:Metrology & Quality control												
MQC	3	2	2	2	3	1	1	3	3	3	2	3

Internal Evaluation scheme

For internal evaluation, tools like Unit test, Assignment, MCQ test are conducted. For metrology and Quality control subject 25 internal Marks is taken for total assessment. Therefore, the attainment calculation will be 25% of obtained attainment in internal assessment. The Evaluation tools with Course outcome wise weight age in the test is tabulated below.

Sr. No.	Description	Weightage allotted in each CO's					
		CO1	CO2	CO3	CO4	CO5	CO6
1	UnitTest-1	50%	50%	--	--	--	--
2	UnitTest-2	--	--	50%	50%	--	--
3	MCQ Test	33%	33%	33%	--	--	--
4	Assignment	--	--	--	33%	33%	33%
5	Prelim Exam	12%	12%	12%	22%	22%	20%

Unit test, MCQ Test, Prelim exams and assignments are added and will be converted into 10% Weightage. And finally, marks are given out off 25.

Observation and Corrective action

CO No.	Observation	Corrective action
CO 5 & CO 6	Strength of Mapping is very low. Need	Organised industrial visit and expert lecture

Conclusion:

According to guidelines given by NBA attainment are carried out in this paper. The CO attainment carried out for Metrology and Quality control subject for internal marks. From the study it is clear that, the attainment was less for CO5&

CO6. To minimise the gap industrial visit and expert lecture carried out. This analysis will help the faculty to plan new strategy for delivery, assessment &students' involvement in learning for improvement.

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