Some Initiatives in EIM course for Outcome Based Education

T.Anushalalitha, Assistant Professor
Dept. of TCE,
BMS College of Engineering Bangalore, India
anusha.tce@bmsce.ac.in

***Abstract*—This paper deals with PO attainment through additional methods of increasing student involvement in the teaching learning process through conduction of seminars by students on advanced topics of interest relevant to electronic instrumentation and measurement. The attempt turned to be a forum for students to exhibit their presentation, oratory and technical reading skills and prepare them for teamwork, time management and reporting and hence march towards OBE.**

Keywords—Electronic instrumentation, student seminar, PO attainment, OBE

I. INTRODUCTION

Electronic instrumentation and measurement (EIM) course consists of topics from transducers, data acquisition, signal conditioning, measuring instruments including virtual instruments. The subject gives a blend of understanding of topics across various courses such as analog electronic circuits, digital electronics, analog signal processing, network theory as applied to instrumentation. New developments in software based instrumentation calls for updating of developments in this field. An attempt was made to include student seminars right in the third semester. Students were assessed based on topics presented. Students They were divided into groups and asked to present and submit report on those topics. They also presented posters on their topics. They were asked to perform self-study from specific websites and assessed based on them. All these served as alternate ways of attaining course outcomes and hence program outcomes through COs.

II. OUTCOME BASED EDUCATION (OBE)

OBE is a kind of system that facilitates a participative and measurable environment for all the stakeholders of the program in a way of continuously improving the objective of providing a meaningful and deliverable education. India has its own tradition of a rich past excelling in different domains of education. So, embracing OBE will add value to handling the diverse problems and opportunities each locality in the country poses and can prepare the engineers in a systematic way where every effort in learning in the course is accountable. The department starts out with a vision and mission to achieve the vision in line with the institution. The Program outcomes (POs) are set in line with the program educational objectives (PEOs). Each course instructor assigns several course outcomes (COs) before start of the course to begin with the end in mind (Table 1). These COs can be tuned in due course taking the demand and change into consideration. The whole process is transparent and conveyed to the students well in advance to prepare them for their participation. At the end of the course the PO attainment calculation is submitted and analysed for improvements. This being a closed loop process, the system can be tuned continuously and improved performance can be obtained while traditionally it happened to be an open loop process. [1]

III. ELECTRONIC INSTRUMENTATION AND MEASUREMENT (EIM)

EIM is an inter-disciplinary course introduced in the III semester which encompasses topics from transducers, signal conditioning to measuring devices and their characteristics.

The students come with a preliminary idea of most topics except probably digital instruments. Measurement is an area that applies for any field, but we limit to instruments for measurement in electronics and communication generally. Students often find it obsolete to study analog instruments but we retain them to give that spice as all quantities are first analog in nature. Some of the measuring instruments such as DSO, spectrum analyzer are included apart from the conventional meters and signal generators. Block diagrams plus some sample circuits are discussed for each instrument although multiple methods do exist.

The need for measurement of real time signals was felt and data acquisition, signal conditioning and virtual instruments were included. Students were assigned presentation of seminars on advanced topics in EIM as a group and submit report of the same.

One could observe that in addition to the regular conduction of written assessment tests, alternate assessment through oral presentations in groups, quiz on them, self-study from suggested materials from websites, datasheets, quiz on them, using Multisim for simulation of experiments are conducted. This helped in attaining better course outcomes and hence program outcomes through course outcomes.

The following are the course outcomes set for the course.

CO1 through CO4 are the ones that are pertaining to the course syllabus and CO5 and CO6 were introduced later for better outcomes attained by alternate assessment methods such as seminars, quizzes, self-study etc., Although some of

the components like demonstration of experiments were there before, they were never taken for assessment.

TABLE 1: COURSE OUTCOMES FOR EIM COURSE

Course outcomes
CO1: *Ability to apply the knowledge of acquisition, processing and transmission of data in measurement systems*
CO2: *Ability to identify, formulate and solve problems using static characteristics of measuring instruments*
CO3: *Ability to design and analyze analog and digital instruments to measure electrical parameters*
CO4: *Ability to select appropriate instruments to measure characteristics of a dynamic signal*
CO5: *Ability to work as an individual to conduct experiments using engineering simulation tool 'Multisim' to design and demonstrate a measurement system*
CO6: *Ability to engage in independent learning, submit a report and use ICT for effective presentation of the study on assigned topics related to electronic instruments*

IV. PO ATTAINMENT

Program outcomes (POs) are defined for the program. The POs are attained through the Cos. COs for each course are set with the objective of attaining better outcomes in an outcome based education. The COs are mapped to the POs, so that each course outcome helps in attainment of program outcomes and ultimately reflects in the progress of the student particularly. It should be noted that the cognitive, psychomotor and affective learning domains cannot be isolated from each other and are interrelated and hence cannot be neglected in preparation of students as Engineers for the society.[2]

A. Student seminars

Students need to look at the input; output and the transfer function for electronic systems and gain an understanding of the whole system in a black box approach, only then they will be able to handle complex systems at ease. The Macro approach consists of two primary elements:
(i) lecture-based topics chosen by the instructor—later complemented by topics derived from student projects, and
(ii) project-based learning to increase motivation, highlight important topics, and facilitate knowledge integration. [3]The students were given a system level understanding of the subject and after the first internal assessment, they were asked to form groups and submit topics for seminar related to EIM. [4]They showed good interest and came out with the following topics. In the process one could see some confidence, style, co-ordination and enthusiasm in them as to challenge or project their expectations of a typical classroom amidst their hectic classes. They could answer questions posed by the teacher and fellow students as well. A quiz was conducted on the presentation topics and taken for PO attainment. Very few were reluctant to give and it is for those few it was actually aimed to address. Table 2 gives the list of about 13 groups in size of six maximum and respective topics.

TABLE 2: SEMINAR TOPICS WITH GROUP DETAILS

TOPIC OF SEMINAR	GROUP
Spectrum Analyser	G1
MRI	G2
Laser Range Finder	G3
X-Rays	G4
Oscilloscope	G5
ECG	G6
Logic Analysers	G7
Geiger Counter	G8
EEG	G9
Delta-Sigma Converter	G10
SMPS	G11
RADAR	G12
Wave Analyser	G13

B. Additional assessments

Although it was not self-study, an attempt was made to assess students through topics relevant to course syllabus by asking them to prepare from materials from suggested websites and a quiz was conducted on it. Students may be asked to go through the datasheets of the instruments they use in the department laboratory.

C. Some observations -Assessment

On the positive note, alternate assessment methods have helped in achieving better outcomes. While it takes time to ensure conduction of seminars for so many groups, conducting a quiz on those topics did not help much in considering for attainment. May be a short quiz should have been given or sufficient time for preparation should have been given for them. The presentation skills assessed for seminar includes ability to convey in a lucid, loud, interesting and responsible manner accommodating their fellow team members. Table 3 shows the rubrics for seminar and assessment of seminar through quiz. About 74 students took the course. Assessment of individual performances within the group was done as part of the presentation skills. However relative assessment of group performances was not done but can be tried in future. [6]Although they could score pretty well in the quiz, they could not score above 85% marks and hence did not improve attainment much.

Some batch of students submitted simulation using multisim alongwith the seminar, relevant to the subject. These marks huge differences in the individuals as compared to the previous batch since anything other than the regular assessments are also accountable. They could also try to do practical experiments with software control as to the needs of the time in future. [5]

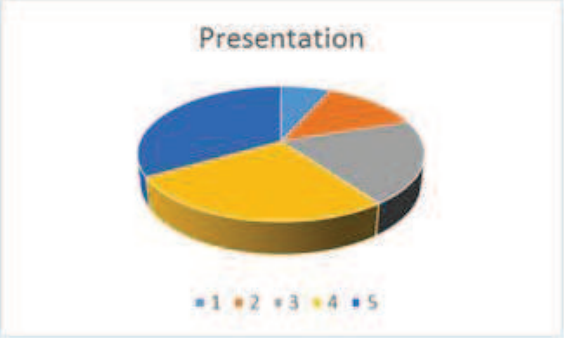

Fig.1: Presentation skills assessed on 5

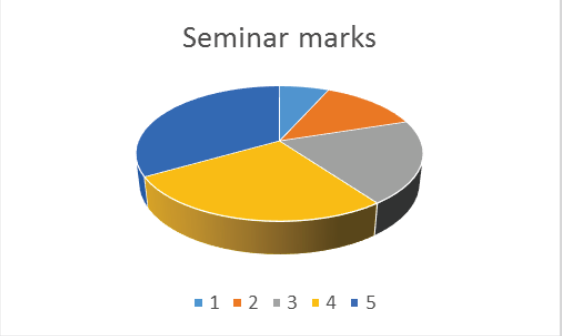

Fig.2: Marks obtained by students for seminar

TABLE 3: RUBRICS FOR ALTERNATE ASSESSMENT

Presentation **Report** **Q/A** **Time management** **Total seminar**	**5M** **3M** **1M** **1M** **10M**
Final Seminar	**05M**
Quiz 1 on seminar	**05M**
Quiz 2 on referred website	**05M**
Final quiz	**05M**
Total Seminar + Quiz	**10M**

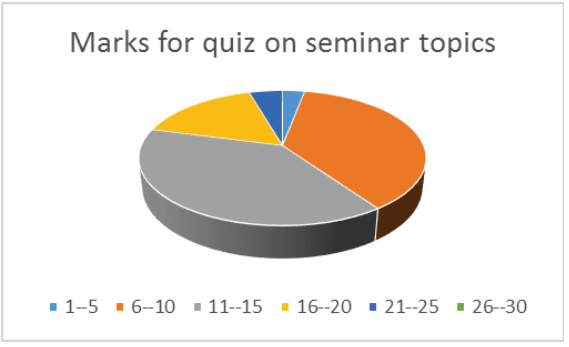

Fig.3: Assessment on seminar by quiz

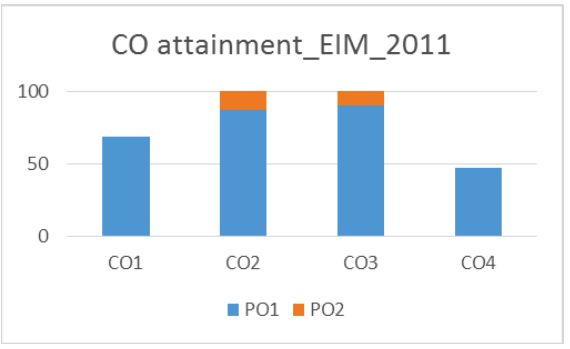

Fig.4 CO –PO mapping before alternate assessment like seminar where only PO1 and PO2 were addressed

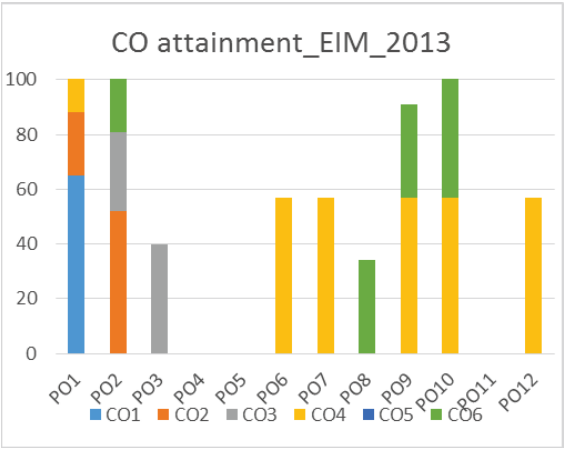

Fig.5 CO –PO mapping after alternate assessment like seminar where additional POs were addressed

V. CONCLUSION

Teaching EIM for III semester students is always exciting as it gives an opportunity to mend the young minds towards system based approach and emphasis the need for designing solutions to societal problems and learn ways of

improved measurement methods. But, there are concerns as one could only get an understanding in breadth and not so much in depth as the students are still getting their fundamental courses in parallel. Exposing them to developments in medical instrumentation, virtual instrumentation, data acquisition, etc., can be a challenge. To begin with, an attempt was made to involve students by way of giving seminars, self-study etc., and assessing them based on those and it turned out to be quite successful in attainment of further course outcomes and hence program outcomes compared to the previous year without all these components. However it is aimed to improve further through other methodologies such as prototype development, industrial visits etc., in future.[6] The students can be given a choice for selection of required hardware and software and come out with more intelligent systems through prototype development and if successful and can be deployed for society and can gain financially.

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REFERENCES

[1] An Instrument for Measuring the Learning Outcomes of Laboratory Work , Kamilah RADIN SALIM Rosmah ALI ,Noor Hamizah HUSSAIN ,Habibah Norehan HARON ,Universiti Teknologi Malaysia, Kuala Lumpur, Malaysia, Proceedings of the IETEC'13 Conference, Ho Chi Minh City, Vietnam.2013

[2] Assessment of BEEE and BEPE program as part of continual quality improvement, Farah Hani Nordin ,Ungku Anisa Ungku Amirulddin,Fazrena Azlee Hamid ,Azrul Mohd Ariffin ,Chau Chien Fat *Center for Engineering Education, Campus Putrajaya, Jalan IKRAM-UNITEN, Kajang, Selan,* Special Issue: International Conference on Teaching and Learning in Education, 2013, International Journal of Asian Social Science, 2014, 4(2): 177-186

[3] Macro-I: Instrumentation Education with Projects, Stephen A.Dyer, John L.Schmalzel, Robert R.Krchnavek, ShreekanthA Mandayam,S2E, 31**st** ASEE/IEEE Frontiers in Education Conference, October 10 - 13, 2001 Reno, NV

[4] Multimedia, Animation, and Computer Graphics – Mapping of study of virtual characters to cognitive understanding. Suma Dawn Dept. of CSE & IT, JIIT, Noida, India,suma.dawn@gmail.com, IEEE International Conference in MOOC, Innovation and Technology in Education (MITE)2013

[5] Micro Flow rate Infusion Pump Prototype, Prof. Smita R.Dikondwar, *Department of Instrumentation and Control, College of Engineering Pune, Shivaji Nagar, Pune- 411005, India,* International Journal of Advanced Research in Computer Science and Software Engineering, Volume 3, Issue 7, July 2013

[6] Prototype development for Electronic Instrumentation and measurement course, IJETMAS, vol,2, Issue 3,August 2014, ISSN 2349-4476.