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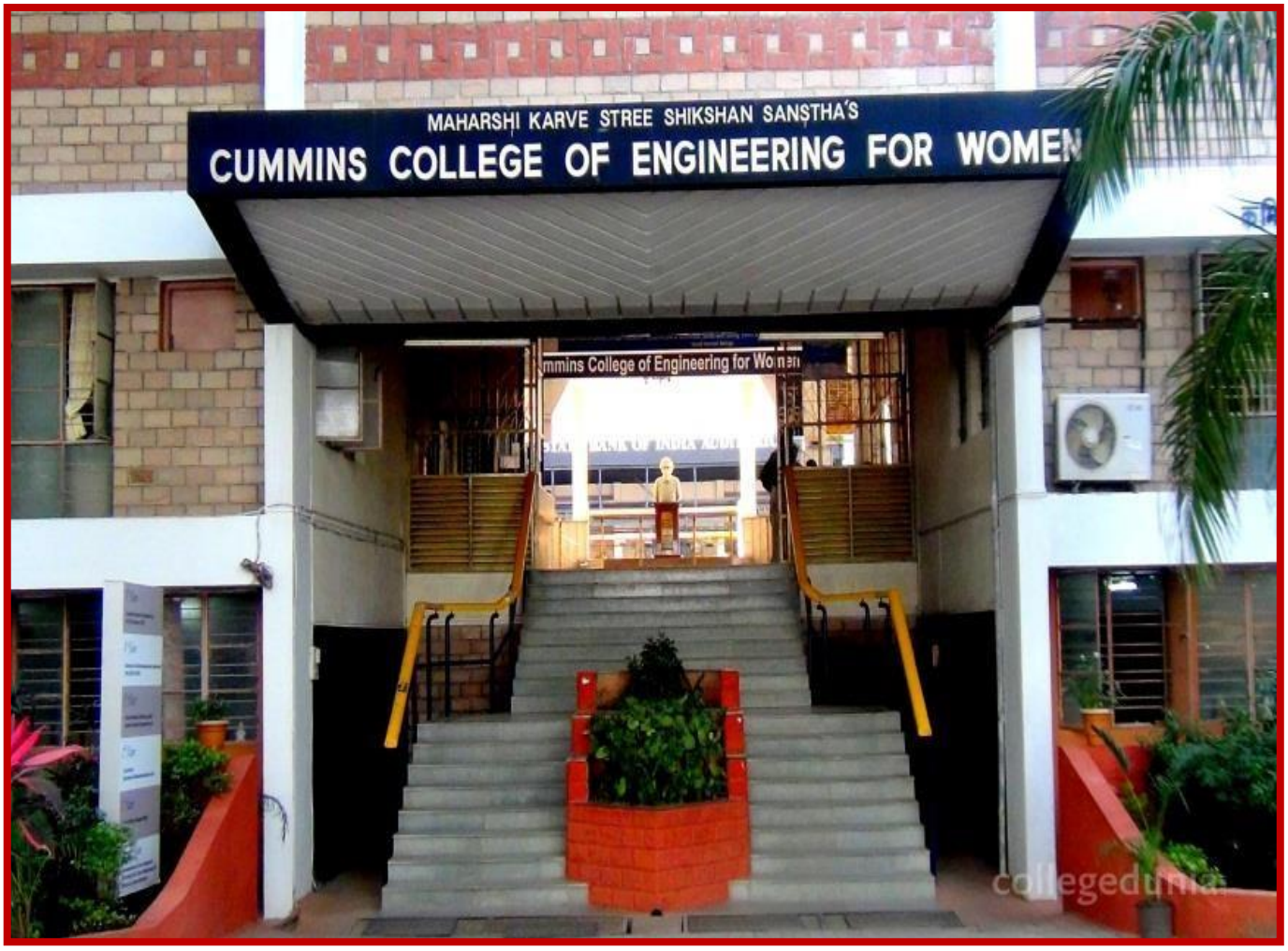

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Digest Overview

- *The **Cummins College Digest of Engineering Education (CCDEE)*** serves to cultivate, disseminate, and archive scholarly research in engineering education.

The Purposes of *CCDEE*

- To provide a platform for publishing original research in engineering education.
- To provide a forum for sharing innovative practices for imparting engineering education.
- To provide a forum for sharing innovative strategies issues which are unique to engineering education in India and abroad.
- To foster international collaboration and discourse for the betterment of different aspects of engineering education.

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- The *Cummins College Digest of Engineering Education (CCDEE)* is an independent journal. It aims to serve as a platform for sharing scholarly research related to engineering education. The Journal publishes single-issue per year. This issue can be adding up with special issues on specific engineering education topics as well.
- Only manuscripts that have a focus on engineering education will be considered for publication.

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- CCDEE will be published once in a year.
- Articles for publication are encouraged from emerging issues in Engineering Education that calls for action from engineering education community.
- Research articles in engineering education theory and practice.
- Articles on best practices to enhance the quality of engineering education, supported by assessment.
- Short communications related original thoughts on certain issues in Engineering Education; significant work in progress aimed at stimulating discussion are accepted.
- Brief Digest items about upcoming events and conferences, achievements by faculty, students or institutions; book reviews, case studies, interviews of eminent personalities.

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- Cummins College is also accredited by **NAAC at "A" grade** in 2012 and 2017 for next five years.

Vision: To be globally renowned institute for imparting quality education and to develop women leaders in engineering and technology.

Mission: To develop women professionals who are academically & technically competent with strong professional ethics.

Contents

UNDERSTANDING '5 GOGY': PEDAGOGY, ANDRAGOGY, PEERAGOGY, HEUTAGOGY, AND CYBERGOGY

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ABSTRACT

Education lies in the core of our society; educators developed various learning theories and teaching methods framework, to impart the knowledge to the different age group learners. In this review paper, frameworks evolved in past few decades that is from Pedagogy to Andragogy, Peeragogy, Heutagogy and Cybergogy ('5 gogy') are described with reference to its origin, definition, principles and teacher's role. In addition, comparative study and implementation of these '5 gogy' by different educators are discussed. Based on the comparative study and implementation work of educators, the paper, evaluates the frameworks that could be used different age group learners and concludes with authors views on '5 gogy'.

INTRODUCTION

Learning theories deal with principles of how an individual gains, holds and recalls knowledge. There are many different learning theories in education mainly: Behaviorism, Cognitivism, Constructivism, Experimental learning, Humanism, Pedagogy and Andragogy, Collaborative learning [1]. **Teaching methods,** encompasses the principles and methods used by teacher to enable student learning, are broadly classified into three types viz teacher-centered methods, learner-centered methods, content-focused and interactive/participative methods. Pedagogy, most commonly understood as the approach to teaching, is the **theory and practice of learning**, and how this process influences, and is influenced by, the social, political and psychological development of learners [2] [3]. Learning theories, teaching methods and Pedagogy all three are supplementary to each other's. Thus, teaching theories try to understand the nature and working of teaching process and actual learning takes place by implementing the learning methods.

Modern education foundation was laid by Socrates in 5th century BC in Ancient Greece. The word 'modern' is used here because until this period, education was divided into two groups – physical, training to boy in gymnasium to prepare for war and another intellectual, dance, poetry and music. With philosophers such as Socrates education started focusing on mathematics, harmonics, astronomy. With change of requirements of the learner, many new teachings learning theoretical framework significantly evolved in past few decades, an evolution of learning theories from Pedagogy to Andragogy and Heutagogy. Peeragogy is being practice from ages. Cybergogy was introduced the year 2003 [4]. **Understand** oxford dictionary meaning is (a) "to **perceive** the intended meaning of (words, a language, or a speaker)" (b) "interpret or **view** (something) in a particular way". This paper attempts to **perceive** concisely without losing the essence, Pedagogy, Andragogy, Peeragogy, Heutagogy and Cybergogy. The origin, definition, principles and teachers' role of each 'gogy' is presented in introduction section. The comparative study and implementation work of these 'gogy' are discussed in discussions section. The paper is concluded rendering the author's **views** on '5 gogy'.

Pedagogy

The word Pedagogy, comes from the ancient Greek word paidagogos, "paidos" (child) and "agogos" (leader). According to Merriam-webster online dictionary, Pedagogy is the art and science of teaching. Frequently, Pedagogy is referred to the methods and strategies used by teachers in order to help students learn [5][6]. More than learning content, Pedagogy focusses on teaching methods. In teaching learning process, Pedagogy tries to find answers of following three questions.

1) What do we want the students to learn?
2) How will teacher help them learn it?
3) How will teacher know when or if they learned it?

Pedagogy principles deals with teaching a youth, where teacher is motivation and learner is dependent on teacher for study materials, often the learning happens in a classroom lecture-based method.

At the outset of the year 1990 start the Web 2.0, which was the second stage of development of internet, with increase in technology clouding effect was seen in study and technology. Information was consumed by learner through internet and were active in social platform life. In, 2007 McLoughlin and Lee [7] put forth "Pedagogy 2.0". The learner ability to acquire information, creating, inquiring and interacting with different learners are main characteristics of Pedagogy 2.0. It is based on web 2.0 tools, such as software, Edmodo, twitter, YouTube, moodle, various blog and so on. Now, we are in full arena of Web 3.0 tools, also known as "Semantic Web" this term was phrased by Tim Berners Lee, best known as the inventor of the World Wide Web. The Semantic web allows much highly integrated web content.
Pedagogy 3.0 was coined by Jim Vanides at Hewlett Packard in 2010. Pedagogy 3.0 refers to the attitudes, competencies and skills required by teachers and educators working in a Web 3.0 enabled world [8].

In Pedagogical approach, role of teacher is to design curriculum and decide the teaching methods. A teacher should impart the right knowledge to students as learners wholly follows the teacher.

Andragogy

At the end of adolescence age of learner, maturity increases, learner who enters in higher education system (undergraduate) have his/her own views, can decide the content to be learned and method of learning as well. Malcolm Knowles, an American educator recognized that there is difference between child and adult learning way and he in the year 1984 introduced his theory of Andragogy [9][10]. In Greek Andra-gogy means "man-leading" (Peda-gogy means "child-leading) and is defined as understanding of the science and practice of adult learning. The term "Andragogy" was originally coined by Lindeman, German native in 1925 [11], with five principal assumptions to his theory of Andragogy, later Knowles [12] himself set similar assumptions and put forth theory of Andragogy. These principles assumptions are

1. Self-questioning: As the dependent learner matures, the learner self-question the content being learning
2. Learner experience: As the learner matures, his/her experiences become resources in classroom
3. Eagerness to learn: As the learner matures, his/her eagerness to learn a subject-area increases that enhances personality and carrier
4. Problem-based learning: As the learner matures, his/her orientation shift from subject centered learning to problem centered learning
5. Self-motivation: As the learner matures, there is self-motivation of learning

To put these assumptions in practice by the educators, following seven steps process were suggested by Knowles

a. Setting up cooperative learning environment
b. Learner involvement in setting goal line
c. Identifying learner interests and its future need
d. Assistant provided to the learner to articulate objectives
e. Work on the flow of the course to archive learners' objectives
f. Provide the required materials and resources to fulfil the objectives
g. Analyze the quality of learning for future needs

Self-directed learning increases at maturity in learner increases [13]. The role of the teacher in an andragogical approach is that of faciliatory encouraging the learner to uplift his or her skills to be more self-directed in his or her learning. The teacher guides the learner in the learning process and encourages to apply it take a real-life situation. Teachers establish objectives and curriculum and guide students while the responsibility for learning lies with the student.

Peeragogy

Peeragogy also referred as Paragogy, theory introduced by Joe Corneli and Charles Jeffrey Danoff, is the theory of peer-to-peer learning and teaching, it is a gathering of the best practices of effective peer learning [14]. Peer learning together and helping each other to learn, learner support peer and peer support learner to achieve an educational goal. Foundation of Peeragogy principles were developed by adapting the Knowles's principles of andragogy to peer-based learning context [15]. The need for a different 'gogy' arouse out of the challenges educators faced implementing peer-based learning. Peeragogy is a set of proposed principles to understand working at the same time learning of peers together. Peeragogoy are ideas that grows and modify according to needs and becomes more of an approach.

The concept of Peeragogy is based on the following principles

1. Empowering the self-motivated learners to connect with peer (all over the world) and co-construct their knowledge and learn
2. Leaner becomes social and actively involves in peer learning
3. Learner develops himself while teaching other what he/she knows and enhance his/her personality by new-learning from peers
4. The knowledge of self-directed group can lead to their own courses (online)

The key role of teacher is to be motivating the learners for active participation, supportive and ready to supervise the groups as and when needed.

Heutagogy

Heutagogy, derived from Greek verb 'heuristic' meaning an approach allowing students to explore thyself, is the extension of self-directed learning theory i.e., Andragogy. Argyris and Argyris, C. and Schon, D. A. in 1978 [16], presented two kinds of loop of learning namely single loop of learning and double loop of learning Figure 1. These learning loops deals with people (learner), groups or organizations. In single loop learning, an action is performed by the learner to reach an expected result. Let say, a learner solves (action) a physics numerical problem starting with assumptions, involving velocity, time and acceleration to get unknown distance (result). While solving the numerical problem if learner faces problem or error to

get expected result, then learner changes method to solve (action) to get the expected result. Whereas, in the double loop learning, instead of changing the action, the learner, starting with assumptions try to finds root cause of the problem or error and try to fix it to get expected results. In double loop learning, the learner investigates and evaluates the situation (numerical problem in this case) wholly.

Built on the concept of double learning, Hase and Kenyon [17] define heutagogy as form of self-determined learning. According to Hase and Kenyon, heutagogy approach isn't a smoothly from one level to next level, rather the development is simultaneously in different directions. The development depends on the learner's cognitive strategies, their accomplishment, learning methods (learner defined content, adjustable syllabus, options in assignments, collaborative learning), interaction with people and technologies and appreciating their experiences.

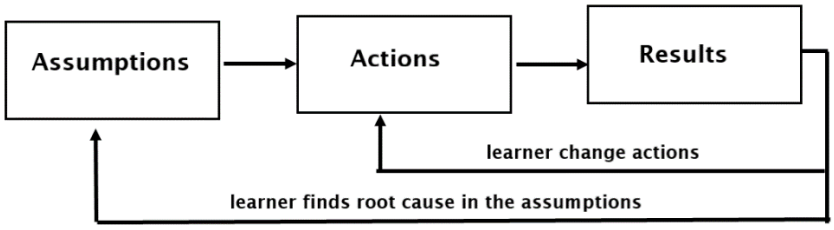

Figure 1. Single and double loop learning

Principles of heutagogy are as follows [18]

1. Emphasis on learning process more than the content
2. Know how to learn
3. Learning is multidisciplinary
4. Learning through self-chosen and self-directive methods

The main role of teacher is to provide the subject-context and underline the 'problem', its complexity which enable the students to **discover** the subject area and its relative fields comprehensively through subject-content provided by teacher or through technology (internet, digital library and so on) or both.

Cybergogy

'Cyber' word gives the sense of something related with internet, modern computing and technology. Thus, new 'gogy' emerged due to extensive use internet and computing technologies by the learner to gain information and knowledge. The concept of 'Cybergogy' [19][20] refers to online self-formative process. Cybergogy is a resultant of principles of pedagogy and andragogy, along with web learning models whose outcome is in the distance/online learning courses. Today, internet and computing technologies are used from young to adult students, thus Cybergogy helps students of all ages to learn according to their own space, its student-centered learning and collaborative learning in the virtual environment.

Minjuan Wang, proposed Cybergogy model in 2008 [21] and it got recognized as instructional innovative model. Built on the concept of "Engaged learner", i.e., a true engaged learners are behaviorally, intellectually and emotionally involved in their learning tasks [22], Cybergogy model (Engaged learning model) examine the learners in three different domains – cognitive, emotive and social, Figure 2.

The role of teacher in Cybergogy for engaged learning model proposed by Wang (2008) is to outline the learning needs and characteristics of each student based on cognitive, emotive and social domains. These three domains are important input factors in the online learning system. To make this approach/model successful the teacher has to implement the following

1. Right learner (for various online courses), fundamentals and resources to be rightly placed
2. With defined learning outcomes of the course evaluate the results
3. Balancing the educational and social goals by taking feedbacks during ongoing online course and taking necessary action to uphold the orientation

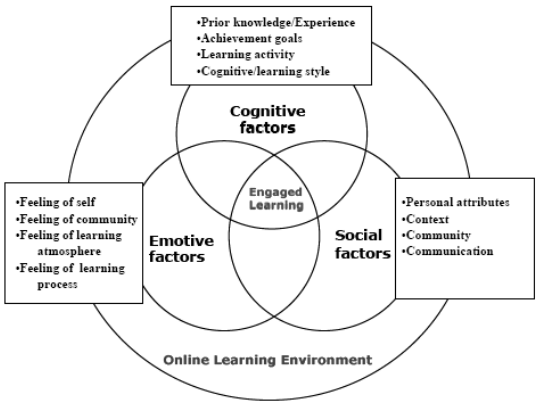

Figure 2. The "MM" Model
Adpated from Wang and Kang (2008)

For online and Open distance learning university of Mauritius, Perienen Appavoo et.al [23]. coined a term 'Webagoy' and presented a model (which author feel is quite similar to Cybergogy with approaches required for open university learning) in 2018. The approach is 'TELEPHONE' approach – **T**utoring, **E**xperimental learning, **L**everage, **E**xcitement, **P**eer, **H**armony, **O**rientation, **N**eutral, **E**ngagement.

Table 1: The Pedagogy, Andragogy and Heutagogy Continuum

Aspect	Pedagogy	Andragogy	Heutagogy
Dependence of learner	Dependent Learner depends on teacher for learning content and study materials.	Independent Self-sufficient and self-direction learners.	Interdependent Past, on-going experiences and Self-determined learning.
Study material for learning	The learner wholly depends on teacher for study material and understanding as well.	Learner may or may not use study material provide by teacher to build their own study materials.	'pathway' of learning is decided by learner, so study materials may be used if required in the learning process
Learning Goals	Learning to move in class (level), classroom-based learning	Learn, when learner identify significance of knowing and performing efficiently.	Non-linear learning, based on the identification of the potential to learn in diverse situations.
Learning	Subject-centred	Task or problem centred.	Pro-active as well as problem-solving learning
Learning method	Understand or rote learning	Single-loop learning	Double-loop learning
Motivation	External	Internal	Internal and Self-efficacy driven
Teacher's Role	Develop curriculum, study materials and learning process	Mentor and establish a fearless environment to collaboratively learning	Faciliatory and capacity-builder

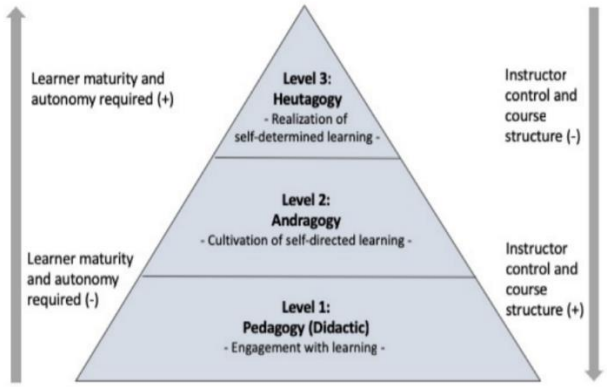

Figure 3. Padagogy - Andragogy - Heutagogy Continuum (Blaschke, 2012, adapted from Canning 2010)

DISCUSSIONS

With foregoing understanding of the '5 gogy', a continuum of Pedagogy, Andragogy and Heutagogy is summed in Table 1 and in Figure 3. Peeragogical approach is being used for all the age group learners. The Cybergogy model extensively came into use with increased ICT usage.

Various pedagogical approaches have been practiced by educator till today, with advancement in knowing the learner Andragogy, Heutagogy and recently Cybergogy framework came into existence. Serval educators have implemented various approaches in their teaching of course.

Dr. Abeni El-Amin, Assistant Professor, form Shenyang Normal University, in her research paper "Andragogy: A Theory in Practice in Higher Education", present the theoretical and practical linkage between the Pedagogy and Andragogy. In her view, even though the Andragogy endure as the paramount in higher education still not adequate to shape future needs of adults in multidisciplinary fields. [24]

Nor'ain Mohd Tajudin conducted research project introducing programming language to undergrad students to evaluate 323 students' preferences to Andragogy or Pedagogy approaches to study this course. In their finding they concluded that not all students are fully preparing for Andragogy approach of learning, and student choice do matter. [25]. Further, in 2021, this author also introduced single framework which encompasses the heutagogy, Paragogy and Cybergogy in learning mathematics in higher education, whose validation is yet to be done [26]. Similar kind of study was done by Mathematics lecturer, Purna Bahadur Subba, Royal University of Bhutan, in his work was implemented in Samtse College of Education (SCE), his study concludes how to keep balance when working with both, Andragogy and Pedagogy, for undergraduate students. [27].

Steven. W. Schmidt et. al applied pedagogy and andragogical approaches to their ICT classroom students and study the transition effect in their students, based on their finding the presented some solutions to be implement during transition from pedagogy to andragogy. [28]

Today, creation and availability of electron portfolio is extensively done by learner, Lisa Marie Blaschke and Victroia Mairn, studied and develop a framework on application of Heutagogy in the educational use of E- portfolio in their work [29] [30].

According to Thomas V Chacko, with increasing maturity in learner, instructor can improve the adult learning process by engaging in continuing professional development, now this can be achieved by various teaching methods is discussed in great detail in his paper [31].

In the research article published in 2020 "Free will and Heutagogy", Raz Shpeizer and Amnon Glassner has augmented the heutagogy approach of self-determinist learning, according to them, there is no absolute freedom but different levels of freedom and certain conditions are required to go closer to higher levels of freedom in learning [32].

Many educators/research have presented the frameworks related to these '5 gogy' [33][34][35][36], and the reference list definitely continues.

CONCLUSIONS

For mature learners, in higher education system (undergraduates), educators/teachers shifted from pedagogical to andragogical approaches. While implementation these frameworks to undergraduate class, few aspects (**'Aspects'** discussed in table 1) of andragogy worked well whereas few needed to implemented from the pedagogy to get desired outcomes. The same is true in implementing at school level, school learners appreciate the aspects of andragogy such as autonomy and building their self-study content. There is overlap in implementing the Pedagogical and Andragogical approaches. Cybergogy, an Engaged learning model, is indeed an entire new framework specially for e-learning mode, where learning entirely shifts from face-to-face to online, the framework provides indicators for engaged learning (cognitive, emotional, Social) and also discussed the methods of their assessments. Among the discussed 'gogy' author feels that heutagogical approach will be effect for the undergraduate learners as it uses double loop method and make life long learner. Implementing the Cybergogy approaches ultimately uses the aspects of Heutagogy in three domains cognitive, emotional, social. Many frameworks are developed in Andragogy, Heutagogy and Cybergogy, and very few with the 'results' of implementation is reported. The educator starts with Andragogy or Heutagogy frameworks and since not fully aware of 'implementation and assessments' is being forced to parks back to Pedagogical approaches. Practical study with group of learners with results of these 'gogy' are required. Principally, the educator/teacher has to **understand and connect** with the learners in class and may use a 'gogy' or blend of '5 gogy'.

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STAKEHOLDERS' FEEDBACK FOR REVISING CURRICULUM OF UG MECHANICAL ENGINEERING PROGRAMME OF CCEW

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ABSTRACT

Stakeholders' feedback data can be used to define several aspects of the curriculum. This paper focuses on use of Stakeholders' feedback for revising curriculum for undergraduate programme in Mechanical Engineering at CCEW. Analysis of the data shows that the opinions of the stakeholders from various categories viz. Industry experts, experts from academics, alumni, current students, parents etc. resonate together for not only identifying one type of curriculum component like topics, units, courses, skill sets, abilities but also other components like need of revision in assessment, curriculum mapping, and even feedback mechanism as well. At the end of this paper revised programme structure is attached for further reference.

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INTRODUCTION

In every academic environment, the Curriculum – generally prescribed and described as the program of study, made up of a series of individual courses. Toombs & Tierney (1993) also describe Curriculum as 'an intentional design for learning negotiated by faculty in the light of their specialized knowledge and in the context of social expectations and student's needs. However, the curriculum is not static, but remains dynamic, ever changing. With learning being interpreted and experienced differently by diverse stakeholders, making it important we need to take their feedback and revise to update our curriculum Borin, P. (2010). Such a curriculum review process provides an evidence-based means to answer questions we may have about our program Dyjur and Kalu (2018).

PROCESS FOR DESIGNING THE PROGRAM CURRICULUM

The structure of the program curriculum provides the information of courses offered in each program to award the degree at the end of program. The structure is uniform for all the programs and describes courses to be studied Information about the course code, course name, teaching scheme, examination scheme and the credits of the courses offered in the respective semester. Process for designing the program curriculum at Cummins College of Engineering for Women (CCEW) is as follows,

Step 1: Formation of Curriculum structure

General guidelines about curriculum structure are decided centrally by the college level committee which includes the principal, dean academics and HOD's based on norms and guidelines given by UGC/AICTE. Generally the curriculum structure is uniform for all the departments and the curriculum structure is framed as follows,

- Distribution of number of credits and marks for respective years based on the total number of credits and marks for a four year program.
- Grouping of program curriculum, based on AICTE guidelines, course components like Basic Sciences, Engineering Sciences, Humanities, Program Core, Program/Professional Electives, Open Electives, Internships, (Major/Mini) Projects, Seminars etc.
- Distribution of credits, contact hours for the respective course components.
- Identification of teaching scheme and examination scheme for the course components.
- Approval of the curriculum structure by academic council and governing body.

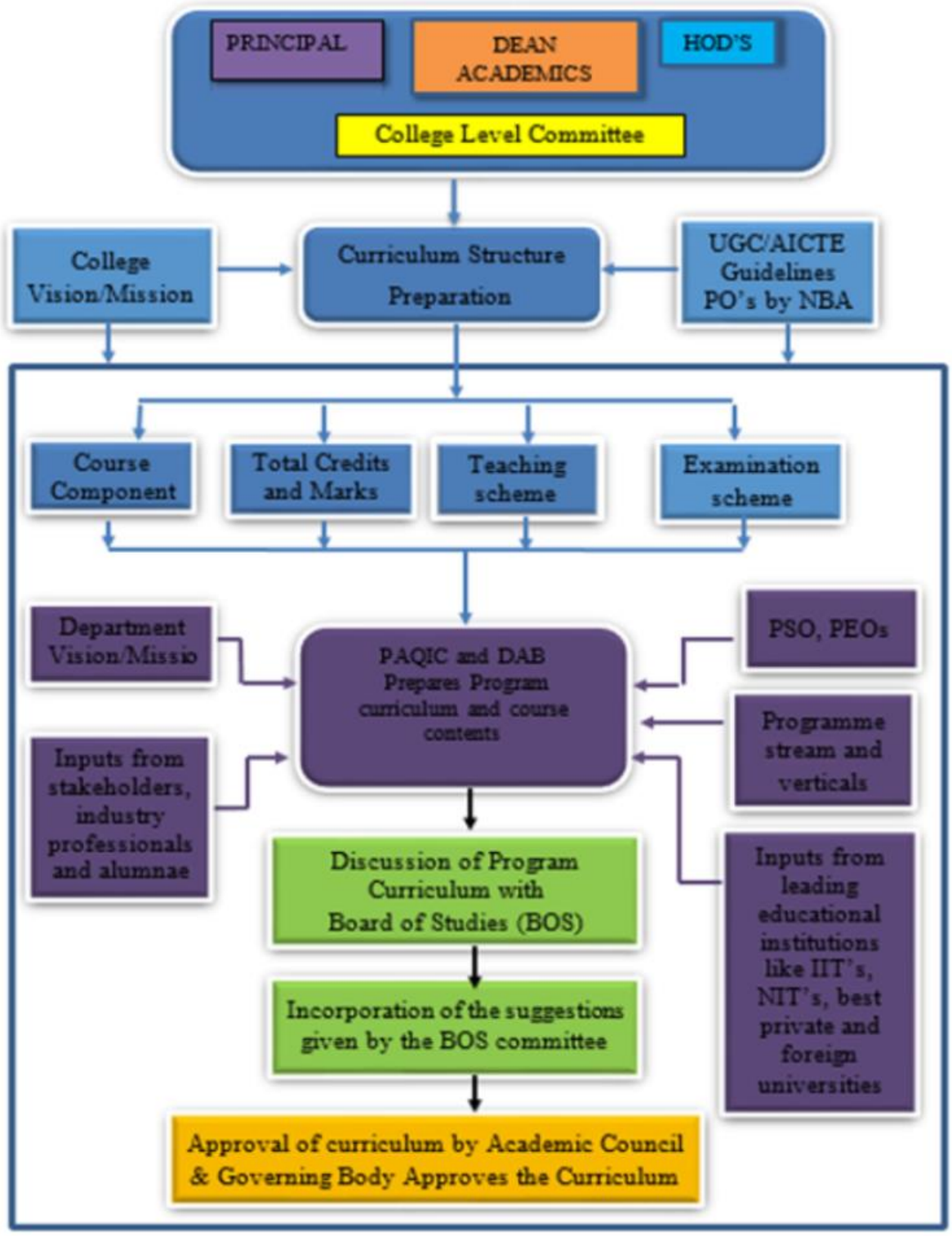


Fig. 1 Process for designing the program curriculum [5]

Step 2: Formation of Program Curriculum

- Curriculum formation is done by Program Assessment and Quality Improvement Committee (PAQIC) committee consist of Chairman, Secretary, Convener and department senior faculty members and the Department Advisory Board (DAB) which is composed of members from eminent institutions as well as members from industry, alumnae representative and senior faculty members of the institute and the department.

- Preparation of Program Curriculum in accordance to (i) Program outcomes by NBA[4], (ii) Department Vision and Mission, Program Specific Outcomes (PSO) and Program Educational Objectives (PEO); (iii) Inputs from stakeholders, industry professionals and alumnae.
- The subject verticals are identified. Based on the subject verticals and faculty interest areas, faculty groups are formed.
- The courses are identified and classified as Core Courses, Program Electives and Open Electives within the respective verticals, by faculty groups.
- Course objectives and course outcomes are identified by referring to guidelines of Bloom's revised Taxonomy.
- Standard references for learnings (Text Books, Reference Books etc.) and contact hours (Lectures, Tutorials, Laboratory) are identified and accordingly the first level draft of syllabus contents is prepared by the subject groups.

Step 3: Approval of the Program Curriculum

- The program curriculum drafted is reviewed by the Board of Studies (BOS) committee consisting of experts nominated by the Vice Chancellor of SPPU, two subject experts from outside Parent University, industry experts, eminent academicians etc.
- The suggestions given by the BOS committee in the program curriculum are incorporated.
- The program curriculum is then presented to the Academic Council for approval of the designed program curriculum.
- The curriculum structure finalized by the Academic Council (AC) is presented to the Governing Body(GB) of the institute for its approval and implementation.

➔ Process for designing the program curriculum is shown in the flowchart format (refer Fig.1),

DATA COLLECTION AND RESULTS

As discussed earlier, taking feedback from all stakeholders is an important part of the curriculum development process. Feedback is collected through different channels like personal interviews/interactions, online meetings, offline meetings and through structured questionnaires.

Detailed information in terms of number of respondents and category of respondents involved in curriculum review and development is given in Table 1.

Table 1: Respondents information

Sr. No.	Catagory of respondents	DAB	BoS	AC	GB	Questionnaire / Meetings
1.	**Industry experts**	2	1	3	6	-
2.	**Academician out of CCEW**	1	3	2	2	-
3.	**Dept./College Faculty & Management representatives**	14	14	16	10	-
4.	**Alumni**	1	1	-	-	11
5..	**Current students SY**	-	-	-	-	5
6.	**Current students TY**	-	-	-	-	4
7.	**Current students Final Yr.**	1	-	-	-	8
8.	**Parents**	-	-	-	-	8

Feedback from students, parents and alumni is obtained using a questionnaire. The questionnaire is circulated through Google Form. The responses were recorded from more than 90% of the students of the department.

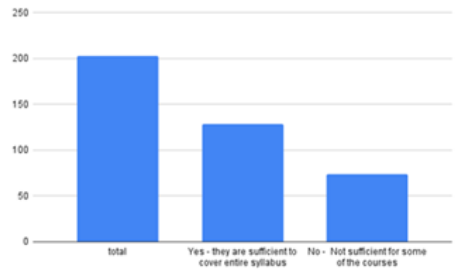
Around 60 alumni have responded to the questionnaire. Industry feedback plays a vital and pivotal role in the curriculum design. In view of the same, their feedback is obtained through personal interaction and meetings instead of circulating standard questionnaires.

Feedback is taken from more than 20 industries having operations in India and across the globe. The industries are chosen so as to cover all the verticals of Mechanical Engineering. Faculty having expertise in the concerned area had interacted with the persons from industry Woking in particular sector for more than 15 years.

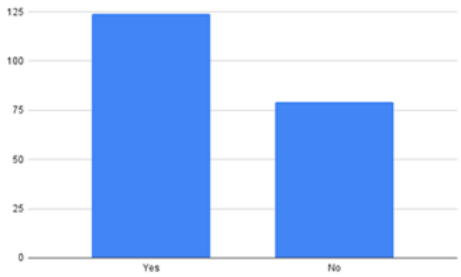
Questionnaire of the students feedback has been divided into two parts. The first part, which is about the general curriculum, is the same for all the years of undergraduate studies. The second part of the questionnaire consisted of the questions pertaining to the curriculum specially designed for that particular year. E.g Questions about readiness to undergo internship is asked to third year students and feedback about the internship is posed to the final year students who have completed the internship. Alumnae have given the feedback about the effectiveness of the curriculum from industry readiness point of view and the usefulness of knowledge gained to solve the industrial problems.

Following are different question asked during different stages of feedback collections and graphical representation of its

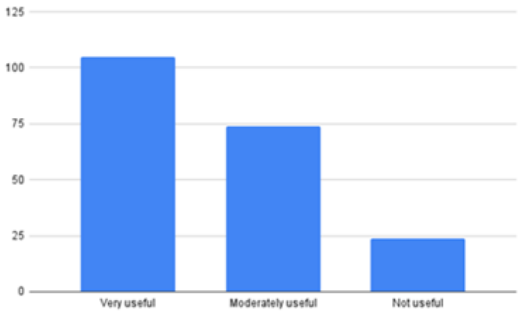
Q1: Do you think the number of allotted lectures/practical is sufficient to cover the entire syllabus of most of the courses in your curriculum?



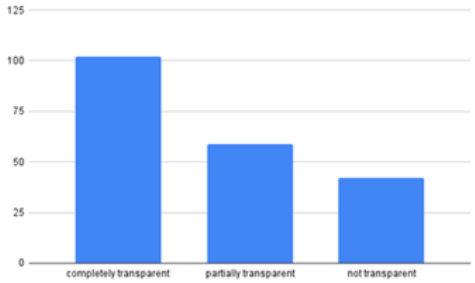
Q2: With the given number of courses per semester do you get sufficient time for self-study and other activities?



Q3: How do you rate the usefulness of the curriculum content in terms of concepts building?

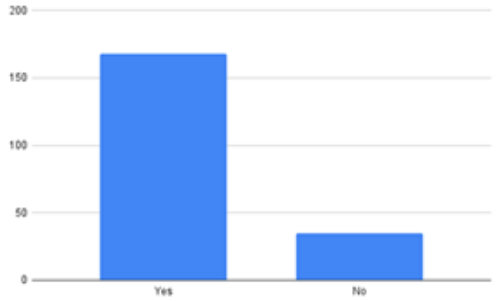


Q.4 How do you rate the transparency of the assessment process?

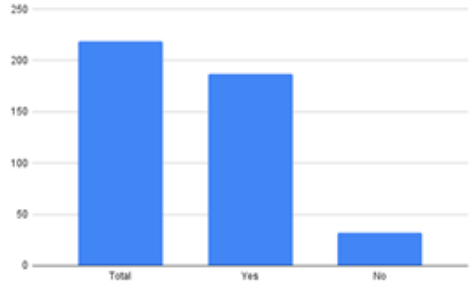


responses.

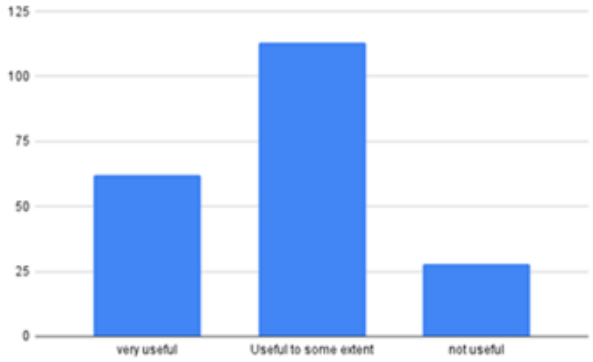
Q.5 Are adequate and appropriate learning resources available for the course? (Availability of reference books, text books, e-books, reading material, etc.



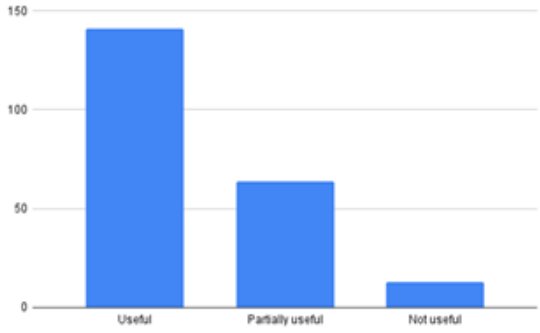
Q. 8 Do you think audit courses (like self-expression..., Courses without examination) should be included in the program?



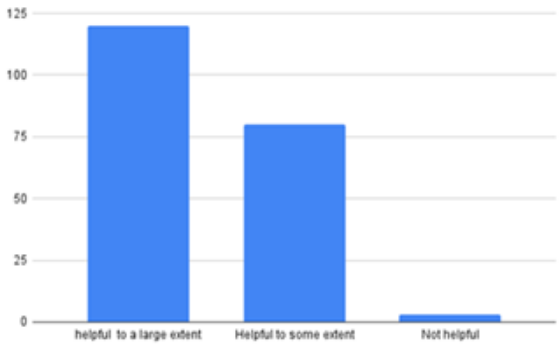
Q.6 Do you find laboratory sessions useful to get hands-on experience related to the course content?



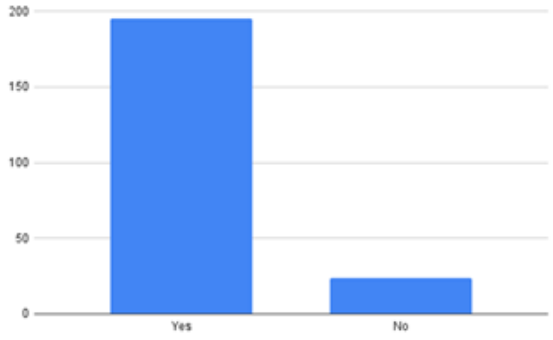
Q.9 Do you think that humanities courses like Principles of Economics and Finance are useful for getting exposure in the related fields?



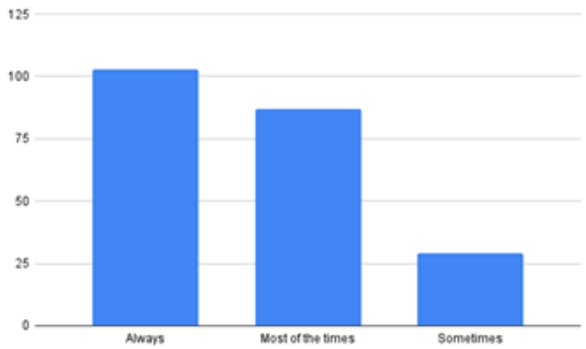
Q.7 Do you think tutorials help for better understanding of the subject?



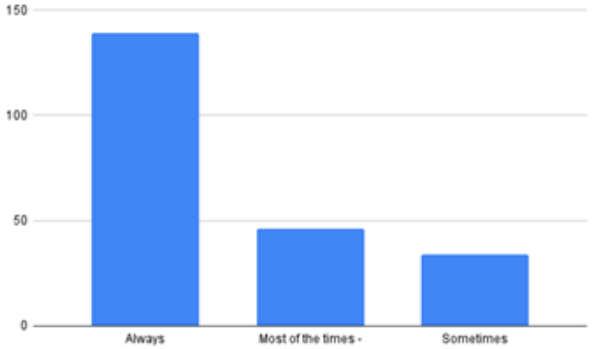
Q.10 For the offered program electives, were the prerequisite courses covered in the previous semesters?



Q.11 Are the program electives offered in relation to the Technological advancements



Q.13 Would you like to undergo an internship in the industry?



DISCUSSION AND SUMMARY

Incorporation of the suggestions received and outcome of internal department meetings resulted in various changes in old curricula. The analysis of the feedback taken from students indicated that the students were satisfied with the course contents and its execution. Considering the current need reveled from steak holders, following points broadly summarize these changes. Revisions in the positioning of a few courses and program electives in the structure is changed, new courses are identified and added as programme electives, internship duration is increased from two months to six months and credits are alloted for the internship work.

In summary, the newly offered curricula in Mechanical Engineering Program offers : UG Degree with total 165 Credits, syllabus was designed in line with Institute and department Vision, Mission also it is by following ASME guidelines, revised Bloom's Taxonomy is referred while defining course outcomes to specific cognitive levels. recent trends in technology in courses can be reflected. Major change as consideration of full 7th semester is dedicated for internship/Project. Further, one Programme elective dedicated to MOOCs for making students to acquire lifelong learnability; more number of programme and multidisciplinary open electives.

ACKNOWLEDGMENT

- We would like to acknowledge the efforts by all stake holders for giving valuable inputs for revising the curriculum.

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ANNEXURE – I

	Courses Title SY BTech.Sem-3	**Code**	**Courses Title SY BTech.Sem-4**
20BS301	Engineering Mathematics-III	20ME401	Analysis and Synthesis of Mechanisms
20ME301	Strength of Materials	20ES401	Elements of Electrical and Electronics Engineering
20ME302	Fluid Mechanics	20ME402	Engineering Metallurgy
20ME303	Machining and Machine Tool Operations	20ME403	Engineering Thermodynamics
20HS 301	UHV-2	20ME404	Metal Casting, Forming and Joining Processes
20ME304	Solid Modelling lab	20ME405	Numerical Methods
AC	Self Expression	20ME406	Design Lab (SOM & ASM)
		AC	Self Expression

Code	**Courses Title TY BTech.Sem-5**	**Code**	**Courses Title TY BTech.Sem-6**
20ME501	CAD/CAM/CAE	20ME601	Powertrain design
20ME502	Heat Transfer	20ME602	Applied Thermodynamics
20ME503	Machine Design	20ME604	Industrial Automation
20ME504	Industrial Inspection & Quality Control	20PEME601	Programme Elective -III (MFG)
20PEME501	Programme Elective - I (DESIGN)	20DEHS601	Humanities Subject (Department Specific) Industrial Engg and Operation Research
20PEME502	Programme Elective - II (Online Swayam)	20OE601	Open Elective II (DEPT)
20ME504	Thermal Lab (AT&HT)	20ME605	Design Lab (MD&PTD)
20OEHS501	Open Elective I Humanities		

Code	**Courses TitleFinal Year BTech.Sem-7**	**Code**	**Courses Title Final Year BTech.Sem-8**
20ME701	Internship/Project		**Programme Elective - I**
20HS702	Economics and Personal Finance - (Online) Recorded	20ME801	Dynamics modelling and controls
		20ME802	Turbomachines
		20PEME801	Programme Elective - IV (Thermal)
		20PEME802	Program Elective - V (Allied)
		20OE801	Open Elective III (DEPT)
		20OE802	Open Elective IV (OPEN ALL)

USE OF STAKEHOLDERS' FEEDBACK FOR CURRICULUM REVISION OF UG INFORMATION TECHNOLOGY PROGRAM OF CCEW

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ABSTRACT

Education is a continuous process. Engineering education in particular requires evolution with a fast rate. This demands frequent curriculum revisions. There are various stakeholders who view the curriculum from different angles. This paper focuses on the inclusion of the suggestions of the stakeholders obtained through their feedback. The stakeholders covered are employers, alumni, experts from academics, parents and current students. The analysis of the feedback leads towards the identification of new elective courses, introduction of skill-based laboratory courses, up-dation in certain topics of the theory courses and figuring of new methods of course assessment. The paper includes the structure of the revised curriculum.

INTRODUCTION

Undergraduate engineering students are taught a series of courses starting from basic science, engineering science, humanities, social sciences, core courses from the program and elective courses of the program. This series is accompanied with laboratories which are technology based. This combination constitutes to curriculum of the program. This develops the understanding of scientific principles, analytical skills, design skills, ability of computation in diverse domains of applications, soft skills, technical skills and impact of science and technology on society [1]. The laboratories, mini-projects and major project develop their ability of self-learning.

PROCESS FOR DESIGNING PROGRAM CURRICULUM

The institution collects feedback about the curriculum from the stakeholders. The stakeholders include employers, alumni, parents and students. These feedbacks serve as an input for curriculum revision. There are two committees in the department, the Program Assessment and Quality Improvement Committee (PAQIC) and Department Advisory Board (DAB) committee. These committees are instrumental in revising the curriculum. The committees frame the structure of the curriculum and then the draft of the curriculum.

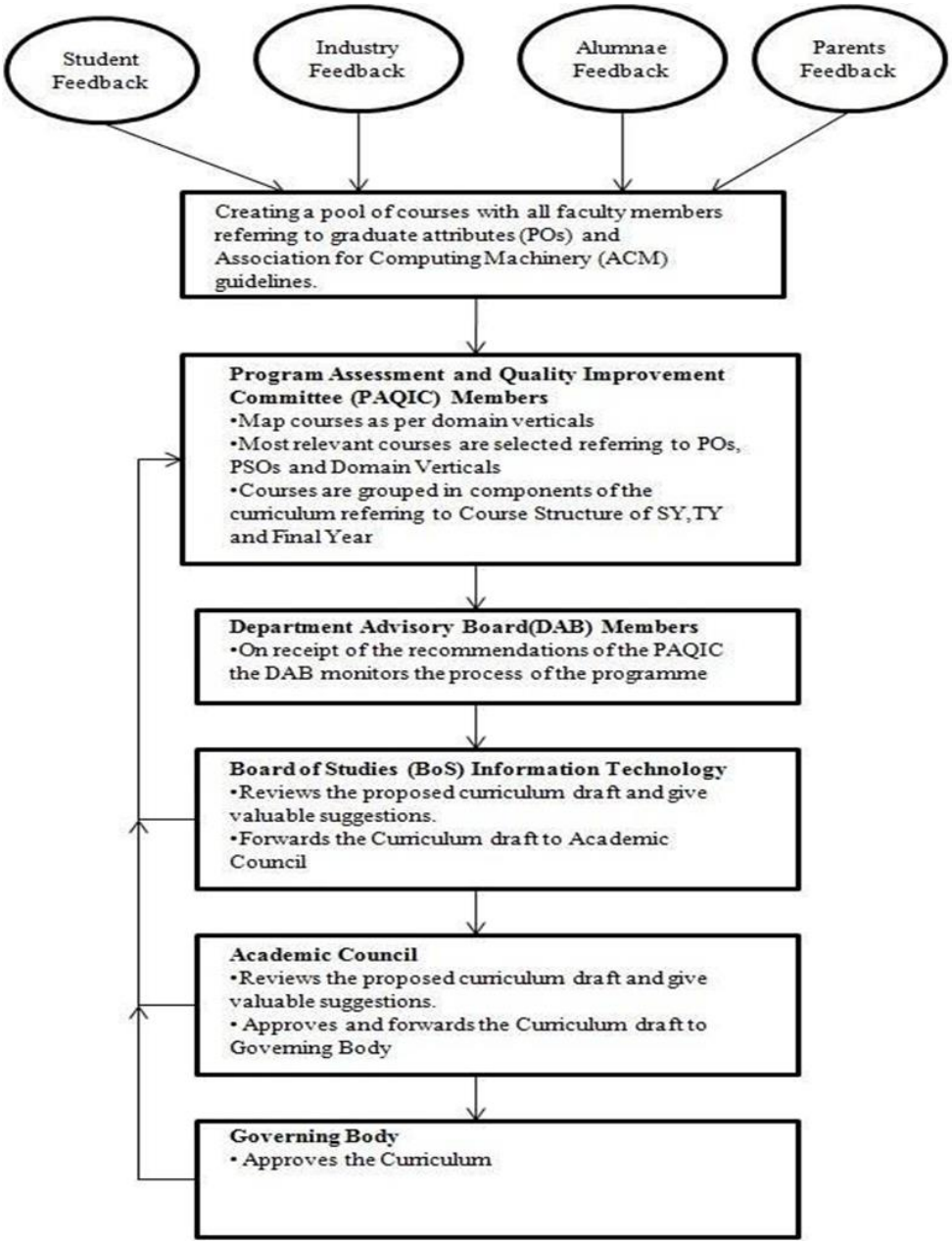
The structure of the program curriculum provides information of the courses offered in each program, its teaching scheme, its evaluation scheme and the credits. This is common across all the UG programs.

The process for designing the program curriculum at Cummins College of Engineering for Women (CCOEW) is shown below:

PAQIC consists of the senior faculty members of the department. The DAB is formulated from members of eminent institutions as well as members from industry, alumnae representatives and senior faculty members of the institute and the department. DAB guides PAQIC for incorporating necessary components in the curriculum such as the current industry trends, latest technologies and thereby leading to overall development of students.

The structure is prepared on the basis of the guidelines lead down by UGC and AICTE as a reference. The detailed syllabus draft is prepared after the structure is finalized at the institute level. The structure and syllabus of the Program is reviewed by the Board of Studies, Information Technology – BoS (IT), CCEW.

The suggestions from the BoS (IT) are incorporated in the draft of the curriculum. This updated draft is then presented in the Academic Council (AC) meeting. The academic council gives suggestions on the draft of the curriculum. These suggestions are incorporated in the curriculum. The Academic Council approves the curriculum and it is forwarded to the Governing Council (GC) committee. The GC approves the curriculum. This curriculum is circulated to all the students and faculty members.



DATA COLLECTION

As mentioned earlier, taking feedback from all the stakeholders is an important part of the curriculum development process. Feedback is collected through personal interviews, informal interactions, online meetings, meetings in person and structured questionnaires. The details of respondents and their category involved in the curriculum review are given in Table 1.

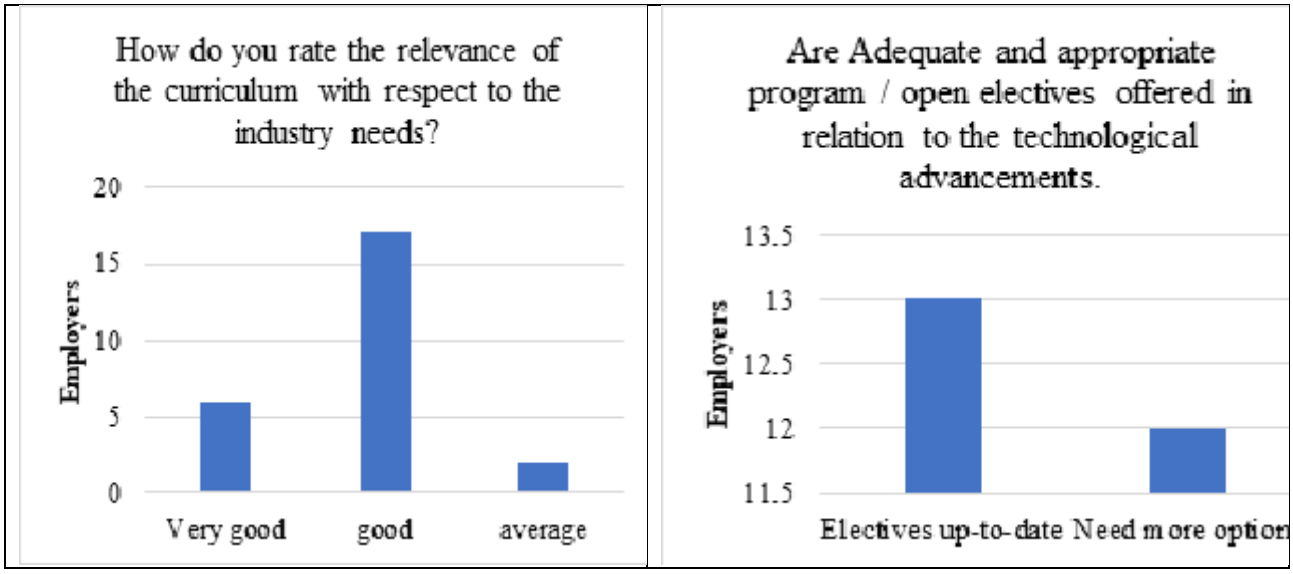
Sr no	Category of Respondents	Department Advisory Board	Board of studies	Academic council	Governing Body	Mode of Feedback	Total Respondents
1	Industry experts	2	4	-	-	Questionnaire	23
2	Academician out of CCOEW	1	4			Meetings	5
3	Department/ college faculty and management representatives	3	11	-	-	Meetings	14
4	Alumni	2	1	-	-	Questionnaire	110
5	FY Students					Questionnaire	55
6	SY Students					Questionnaire	65
7	Third Year students					Questionnaire	43
8	Final Year Students					Questionnaire	29
7	Parents					Questionnaire	137

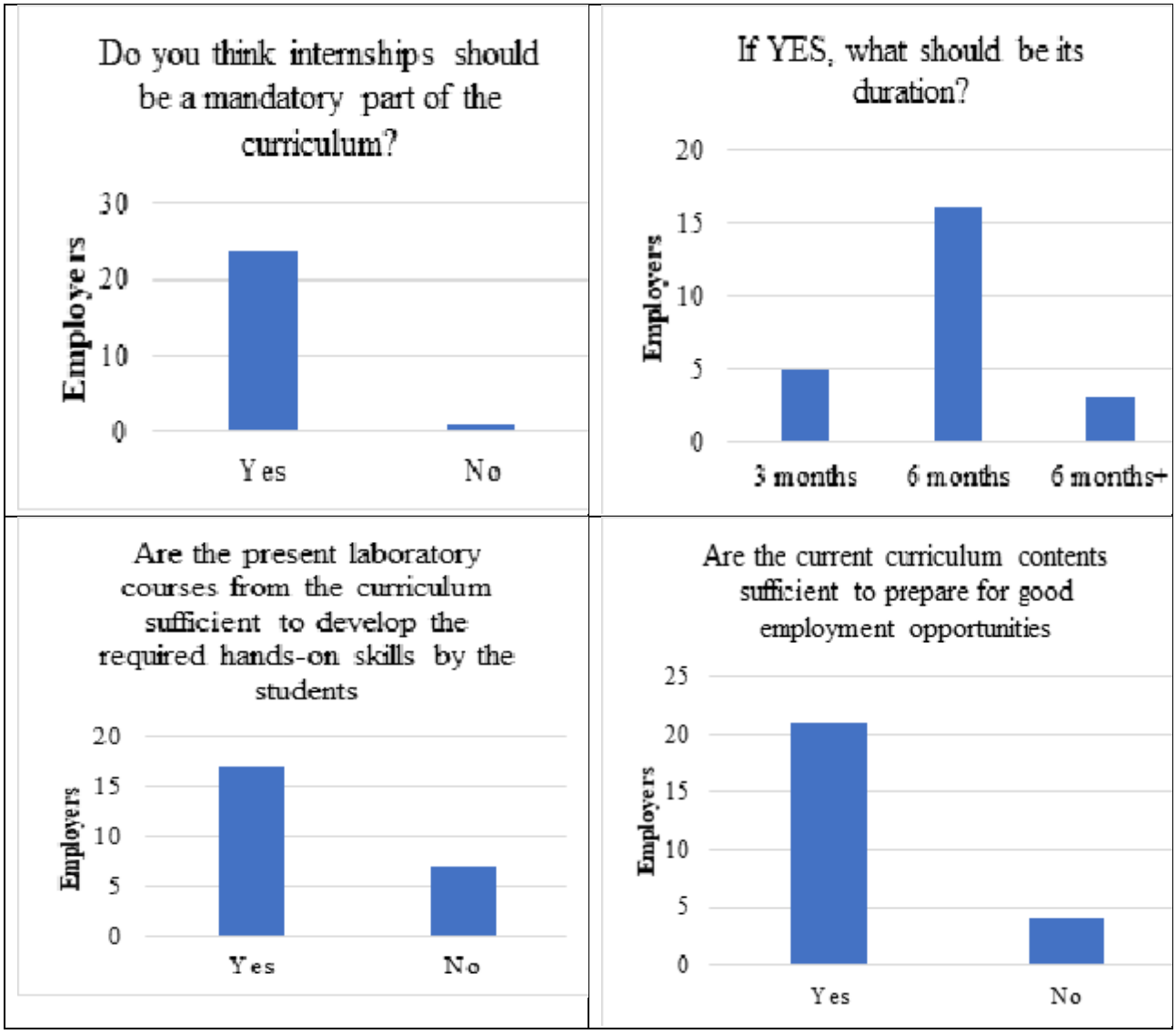
Table 1: Consolidation of stakeholders

Questionnaire for the employers

The employers look for technical competency, soft skills and gelling with the corporate environment from the freshers. Keeping this in mind, here are the questions asked to them:

Sr no	Question Description
1	How do you rate the relevance of the curriculum with respect to the industry needs?
2	Are adequate and appropriate program / open electives offered in relation to the technological advancements.
3	Do you think internships should be a mandatory part of the curriculum? What should be its duration?
4	Are the present laboratory courses from the curriculum sufficient to develop the required hands-on skills by the student?
5	Are the current curriculum contents sufficient to prepare for good employment opportunities?

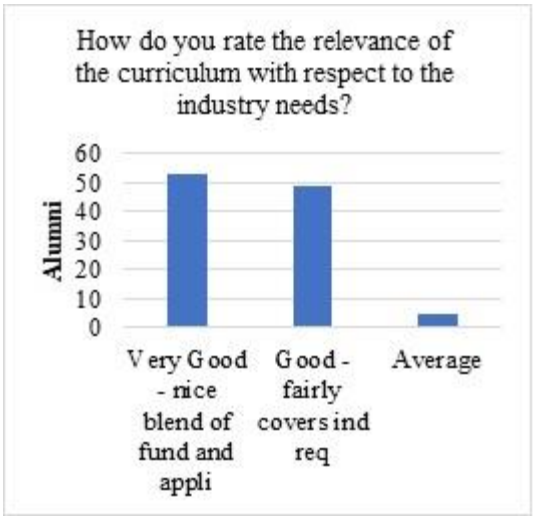


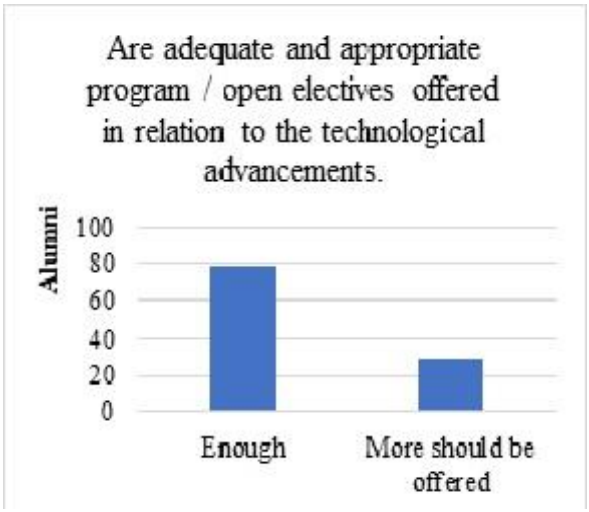


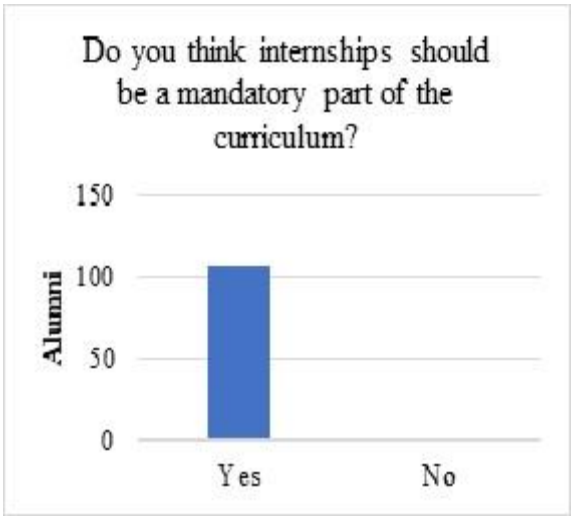
Questionnaire for the alumni

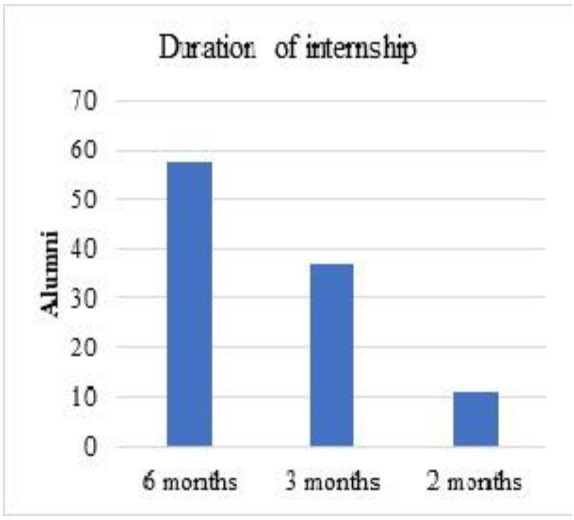
As the freshers join enter the corporate world, they try to catch up with the industry expectations. They give their best to prove themselves technically and as a team member. At the same time, they look back and accumulate the gaps in the curriculum and the industry expectations. The questions to the alumni were framed from this perspective. The representative questions are:

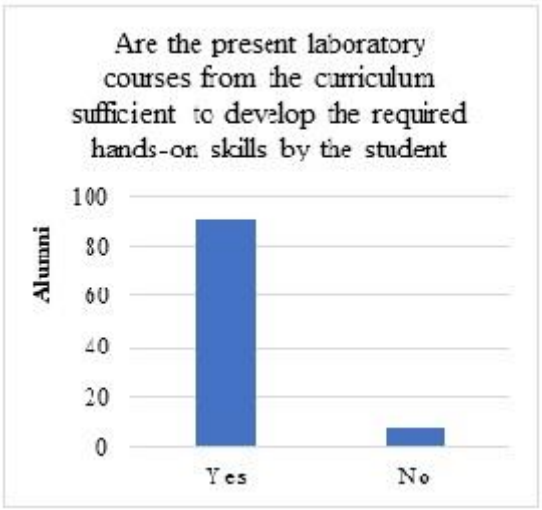
Sr No	Question Description
1	How do you rate the relevance of the curriculum with respect to the industry needs?
2	Are adequate and appropriate program / open electives offered in relation to the technological advancements?
3	Do you think internships should be a mandatory part of the curriculum? What should be the duration?
4	Which of the following abilities, do you think, final year projects provide opportunity to develop Problem solving, Teamwork, Presentation skills, Project Management, Innovation
5	Are the present laboratory courses from the curriculum sufficient to develop the required hands-on skills by the student?
6	Rate the effectiveness of curriculum for placements, higher studies and entrepreneur development.

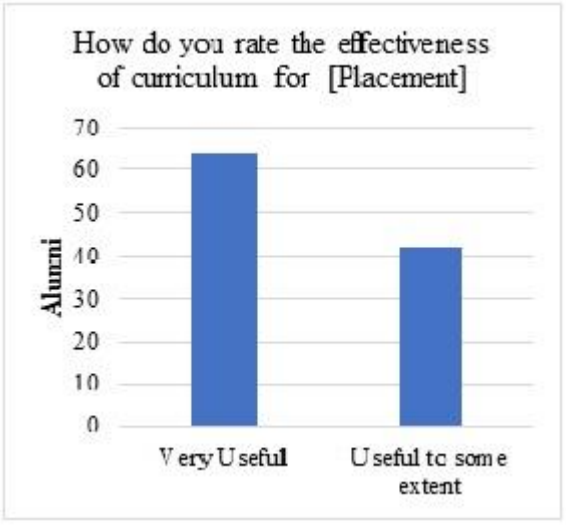

How do you rate the relevance of the curriculum with respect to the industry needs?
Alumni
60
50
40
30
20
10
0
Very Good - nice blend of fund and appli
Good - fairly covers ind req
Average

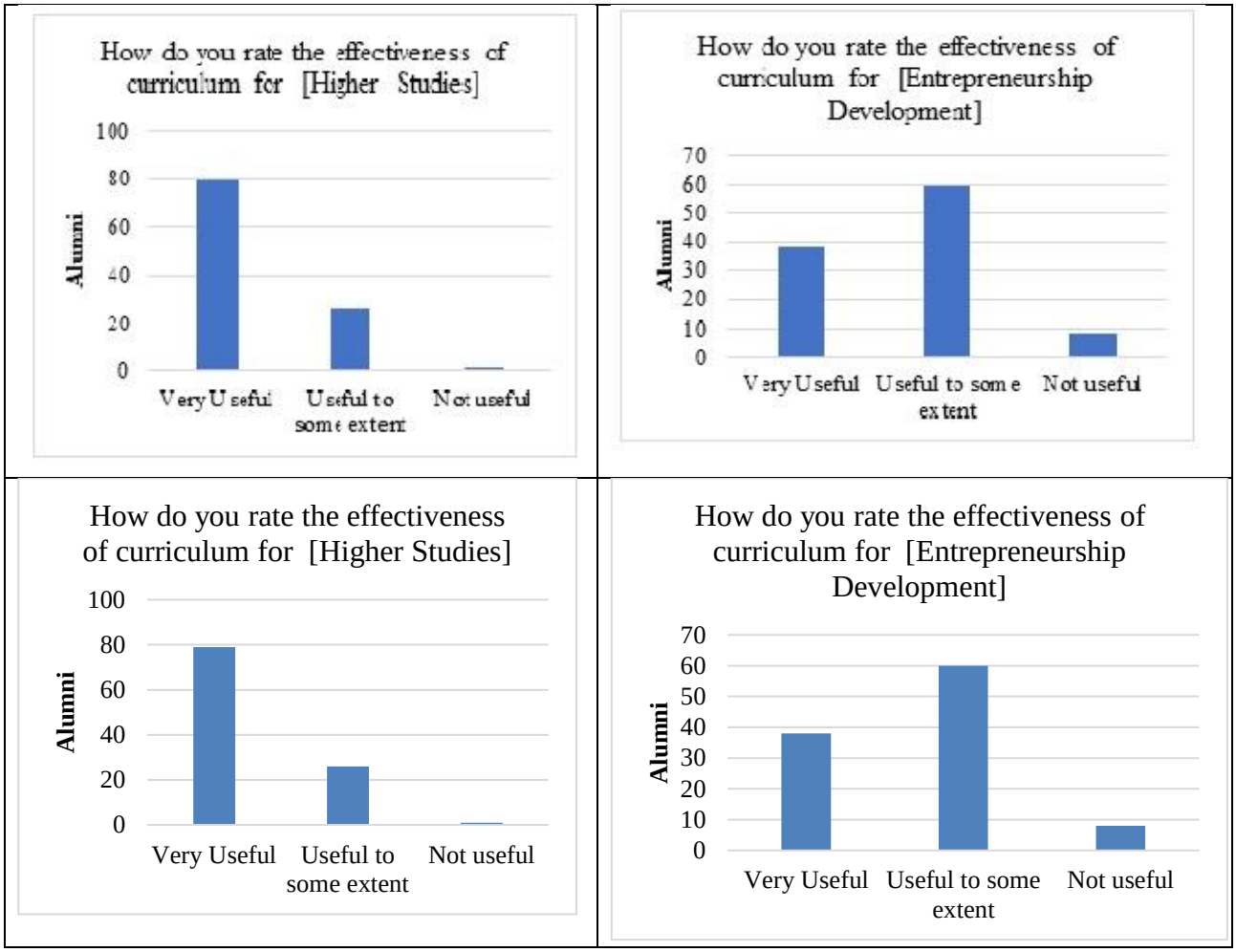

Are adequate and appropriate program / open electives offered in relation to the technological advancements.
Alumni
100
80
60
40
20
0
Enough
More should be offered


Do you think internships should be a mandatory part of the curriculum?
Alumni
150
100
50
0
Yes
No


Duration of internship
Alumni
70
60
50
40
30
20
10
0
6 months
3 months
2 months


Are the present laboratory courses from the curriculum sufficient to develop the required hands-on skills by the student
Alumni
100
80
60
40
20
0
Yes
No


How do you rate the effectiveness of curriculum for [Placement]
Alumni
70
60
50
40
30
20
10
0
Very Useful
Useful to some extent



Questionnaire for the students

The students were asked whether they find the theory courses useful for concept building, laboratory courses help them to get sufficient hands-on. They commented on the adequacy of the lectures, practical to cover the entire syllabus and the availability of the learning resources for study. They expressed themselves about the transparency of the assessment.

Questionnaire for the parents

The parents were asked about their views about the time balance within college hours and free hours of a day, the environment in the college for studies to their ward, transparency in the assessment process etc.

Suggestions from the stakeholders

The stakeholders responded to the feedback questionnaire, attended the meeting for giving the feedback. Apart from this they gave the following suggestions:

Suggestions from the employers

1. The courses are suitable for current industry demand.
2. A course with an introduction to finance and economics can be part of curriculum.
3. The students should be more hands-on experience.
4. More focus should be on hand on experience.
5. Major gap is with practical approach of the students towards industrial needs. It will be covered with more lab practice, industrial visits, and monthly small-medium projects by students under good guidance and internship with small scale but core subject industry. If possible, this should be in regular practice for third and final year students.

Suggestions from the alumni

1. There should be an introduction to GitHub, Docker, DevOps, and Kubernetes in the curriculum.
2. The laboratories should have a larger extent of problem solving approach. The students should be introduced with competitive programming.
3. More focus should be on Java and Python in place of C/C++.
4. The students should explore these cloud computing environment via AWS, Google cloud etc. The educational accounts of such vendors should be made available to the students to explore.
5. Design Analysis of Algorithms course should be in semester four or so. This will help the students for internship. That would be very beneficial to the students in cracking aptitudes and interviews
6. The internship should be for six months.

Suggestion from parents

1. Reduce college timing by one hour.
2. Bring more transparency in evaluation.
3. The internship should not be made mandatory.

Suggestions from students

1. The laboratory of data structures should be done in java.
2. Incorporate Operating systems in second year.
3. The quantitative aptitude course should be introduced in second year.
4. There should be internship in the last semester so that it exposes the students to good opportunities to learn from mistakes and provides considerable corporate experience before turning into employees.
5. Focus on java and OOP concepts because one course does not provide enough practice or scope to understand use cases of java in corporate codes.
6. Design and analysis of algorithm course should be in the second year.
7. It would be great if we could add some sessions about money management, taxes, investment etc. More hands-on approach needs to be promoted and some courses/alternatives related to full stack development should be offered.

ANALYSIS

Seventy percent of the employers have found that the curriculum fairly covers industry requirements. They are of the opinion that the students are given exposure to industry advancements and standards. The employers felt that internship should be a mandatory part of curriculum and most of them feel that six month internship is more productive. Humanity sciences and multi-disciplinary courses are useful and relevant as felt by the recruiters.
The alumnae of the department find the curriculum of IT is competitive and has been designed considering industry needs. Fifty percent alumnae feel it contains a good blend of core and advanced courses. Seventy five alumnae feel that enough number of electives is offered to them so that they could study the courses of their choice and they are in line with the latest advancements in the industry. All our graduates felt that internships should be mandatory and should be at least of 3 month duration. The past students are happy with the co-curricular and extra-curricular opportunities they get in the campus. As students, they gained many skills such as problem solving, team building, while working on projects. Overall, our alumnae are satisfied with curriculum which has helped them in placements and higher studies. There is a scope for improvement by introducing more courses on Entrepreneurship.

The students felt the difficulty level of courses was manageable and the courses were not very difficult. More than ninety percent students are of the opinion that pre-requisites required for the courses were covered and also that the contact hours assigned for the courses were sufficient so they did not have much difficulty understanding advanced courses. The students felt that practical and tutorial sessions help them in understanding the concepts. Around eighty percent students found audit courses interesting and useful.

RESULT

The graphical representations of the answers and the suggestions from the stakeholders were discussed in PAQIC and DAB meetings. Common suggestions from all the stakeholders were listed down. Brain storming sessions were held for the validating the feasibility of including the maximum possible suggestions in framing the new curriculum. The AICTE guidelines for the curriculum structure were overlaid over the suggestions. A golden mean was taken out from it and the new structure was framed.

CONCLUSION

The revised curriculum is framed to accommodate maximum suggestions from the stakeholders. It lead to inclusion of new elective courses, laboratory courses, the selection of courses for minor and honor degree and updating in the theory course topics.

REFERENCES

1. K Mohanasundaram,"Curriculum Design and Development" J. Appl. Ad.Res.vol3, p. 4, 2018, doi:10.21839/jaar.2018.v3iS1.56 .

Annexure –I

Course Code	Course Title
20IT 301	Data Structures
20IT 302	Discrete Mathematics
20IT 303	Digital Electronics and Computer Architecture
20IT 304	Network Fundamentals
20HS 301	Universal Human Values - 2
20IT 305	Digital Electronics and Computer Architecture Lab
20IT 306	Data Structures Lab
20IT 307	Object Oriented Analysis and Design Lab
20AC 301	Audit Course

Course Code	Course Title
20BSIT 401	Calculus and Statistics
20IT 401	Computer Network
20IT 402	Operating Systems
20IT403	Database Mana gement System
20IT 404	Human Computer Interaction
20IT 405	Computer Network Lab
20IT 406	Operating Systems Lab
20IT 407	Database Management System Lab
20AC 401	Audit Course

Course Code	Course Title
20IT 501	Theory of Computation
20IT 502	Design and Analysis of Algorithms
20IT 503	Machine Learning
20PEIT 501	Programme Elective-I
	A. Artificial Intelligence
	B. Business Intelligence
	C. Computer Graphics and Animation
20PEIT 502	Programme Elective-II (NPTEL/ Swayam Course)

Course Code	Course Title
20IT 601	Information Security
20IT 602	Cloud Computing
20IT 603	Object Oriented Software Engineering
20HS 601	Green Computing
20PEIT 601	Programme Elective-III
	A. Advanced Computer Network
	B. Natural Language Processing
	C. Multimedia Techniques

	A. Blockchain Architecture Design and Use Cases
	B. Internet of Things
20OEHS 501	Open HS Elective –I
20IT 504	Design and Analysis of Algorithms Lab
20IT 505	Machine Learning Lab
20PEIT 503	Programme Elective Lab-I
20AC 501	Self Expression

20OE 601	Open Elective-II(Design Thinking)
20IT 604	Information Security Lab
20IT 605	Object Oriented Software Engineering Lab
20PEIT602	Programme Elective Lab-III
20IT 601	Information Security
20IT 602	Cloud Computing
20IT 603	Object Oriented Software Engineering
20HS 601	Green Computing
20PEIT 601	Programme Elective-III
20OE 601	Open Elective-II

Course Code	**Course Title**
20IT-P 701	Internship / Project
20HS 701	Economics and Personal Finance (EPF)-(Online) Recorded

Course Code	**Course Title**
20IT 801	Distributed Systems
20PEIT 801	Program Elective-IV
	A. Advanced Machine Learning
	B. Introduction to DevOps
	C. Design Patterns
20PEIT 802	Program Elective-V
	A. Advanced Databases
	B. Unified Communication
	C. Information Retrieval
20OE 801	Open Elective-III(Software Testing and Quality Assurance)
20OE 802	Open Elective-IV (Applied Statistics with R Programming)
20IT 802	Distributed Systems Lab
20PEIT 803	Program Elective–IV Lab

CURRICULUM REVISION OF UG COMPUTER ENGINEERING PROGRAMME OF CCEW USING ANALYSIS OF STAKEHOLDERS' FEEDBACK

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ABSTRACT

Like any other system , an educational system is complete only after getting the feedback. The Computer Engineering Department of Cummins College of Engineering for Women has a streamlined process of getting feedback from the stakeholders. The department strives to get the maximum utilization of these feedbacks to enhance structure and contents of the courses offered. This paper narrates the design process and effective implementation of curricula to achieve program outcomes and program specific outcomes.

INTRODUCTION

Stakeholders feedback plays an important role in Curriculum Design and Development by providing useful insights for upgrading various aspects of teaching, learning and evaluation processes. Department collects regular feedback on curriculum from various stakeholders such as Students, Faculty, Industry, Alumnae, Parents and employers. The collected feedback is analyzed and observations are shared with the Program Assessment and Quality Improvement Committee (PAQIC), Department Advisory Board (DAB) and Board of Studies(BoS). This feedback is considered while designing and revising computer engineering curricula.

PROCESS FOR DESIGNING THE PROGRAM CURRICULUM

Considering the inputs of stakeholders and experts, along with the Program Assessment and Quality Improvement Committee (PAQIC) and Department Advisory Board (DAB), the program curriculum is framed and drafted. The draft of curriculum is reviewed in the Board of Studies (BoS) meetings, which is further presented to the Academic Council for approval.

The curriculum structure finalized by the Academic Council (AC) is presented to the Governing Body of the institute for its approval and implementation.

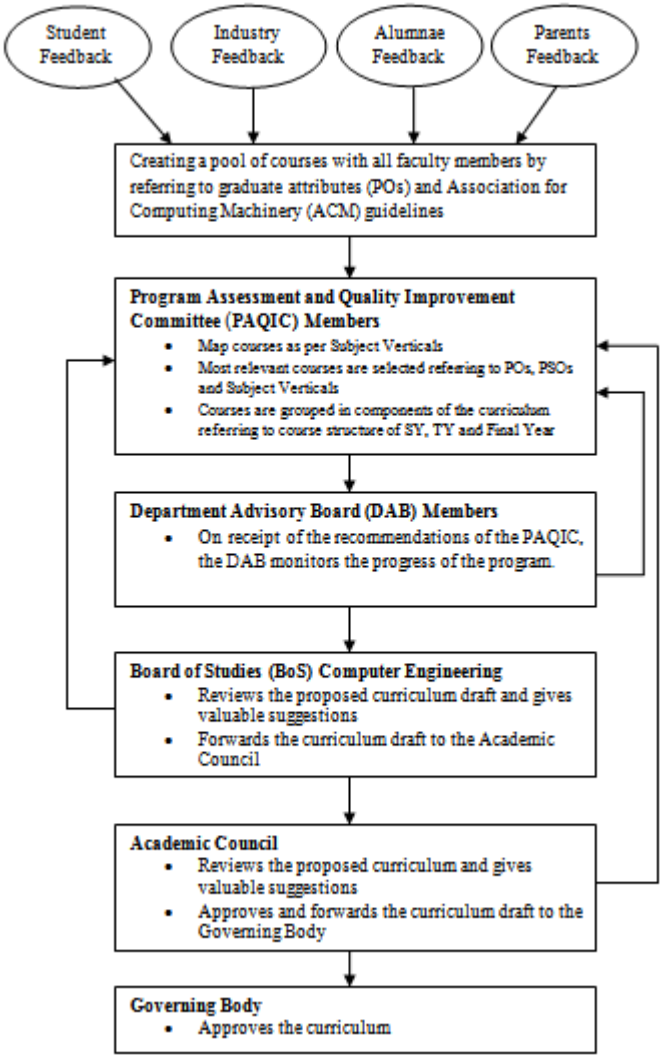


Figure 1: Curriculum Formation Process

PAQIC consists of the senior faculty members of the department. The DAB is composed of members from eminent institutions as well as members from industry, alumnae representative and senior faculty members of the institute and the department. DAB guides PAQIC for incorporating necessary components in the curriculum such as the current industry trends, latest technologies and thereby leading to overall development of students.

The structure and syllabus of the Computer Engineering (CE) Program of Cummins College of Engineering for Women (CCEW) is reviewed by the Board of Studies, Computer Engineering – BoS (CE), CCEW, by following the UGC and the AICTE guidelines.

A well thought process of designing curriculum is a must for any department. The Department of Computer Engineering considered the following points while designing the new curricula :

- Consideration of POs, PSOs ,Course Outcomes ,Competencies and roles
- Experiences while teaching
- Latest / industry trends in IT
- Discussions among faculty members
- Interactions with industry and academia
- Overall Feedback/Suggestions from various stakeholders
- Course specific Feedback from Industry/Academia Experts

DATA COLLECTION AND ANALYSIS

The stakeholders for the getting the responses over curriculum are:

- Industry experts
- Academicians
- College/ Department faculty
- Alumni
- Parents
- Employers
- Students

These stakeholders shared their opinion through the specially designed forms or in person / online interactions. Total of 1170 responses were received. The following table shows respondents' information for the year 2020-2021.

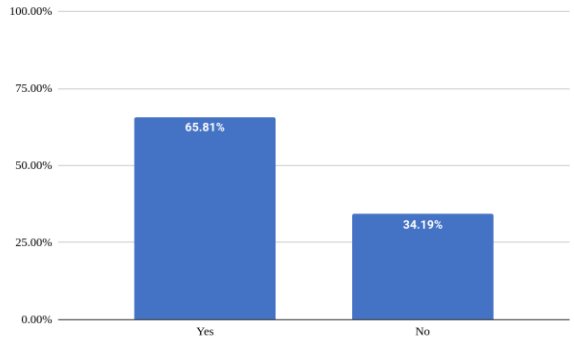
Table 1: Respondents' information

Sr. No.	Category of respondents	DAB	BoS	AC	GB	OTHER	Questionnaire / Meetings
1	**Industry Experts**	1	3	2	2	47	Meetings
2	**Academician out of CCEW**	1	5	2	2		Meetings
3	**Dept./College Faculty & Management Representatives**	16	30	9	9	1	Meetings
4	**Alumni**	1	1	-	-	147	Meetings/ Questionnaire
5	**Parents**	-	-	-	-	286	Questionnaire
6	**Employers**	-	-	-	-	22	Meetings/ Questionnaire
7	**Students**	-	-	-	-	349	Questionnaire

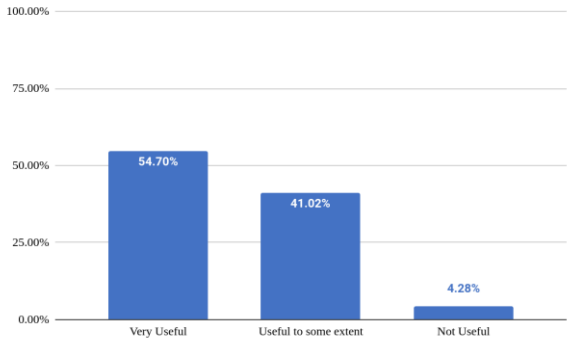
Experts from various industrial domains reviewed the curriculum structure and contents of the courses and shared their views in one on one meetings. To name a few companies associated during these interactions were IBM, Walmart, Veritas, Dell Technologies, VMWare, Infosys, Tech Mahindra. Course chairpersons conducted individual meetings with experts in their domain to revise course contents. The experts were from renowned companies such as IBM, C-DAC, Eaton, Capgemini, Siemens, Tata Consultancy Services, Persistent Systems, Google, Veritas Technologies, National Bank of Dubai (NBD), VMWare, VJTI Mumbai.
Following are different questions asked during different stages of feedback collections and graphical representation of its responses. Following are some of the questions and their responses received from various stakeholders.

Table 2: Example Graphs of Responses Received from various Stakeholders

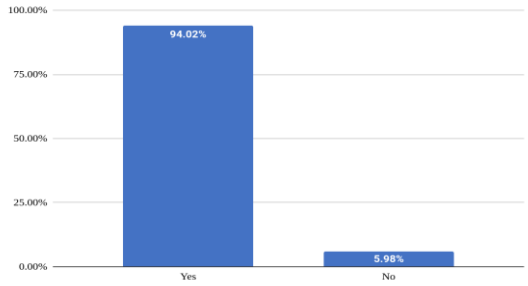
Student Feedback
Do you think the number of allotted lectures/practical are sufficient to cover the entire syllabus of most of the courses in your curriculum?



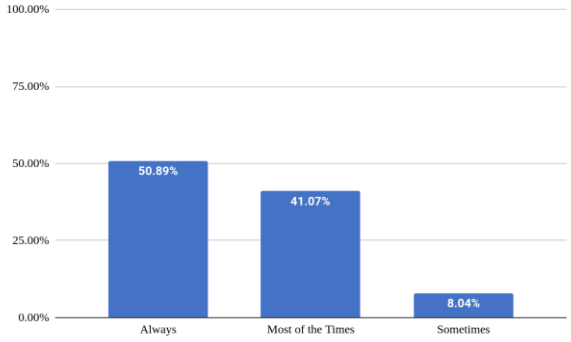
Student Feedback
Do you find laboratory sessions useful to get hands-on experience related to the course content?



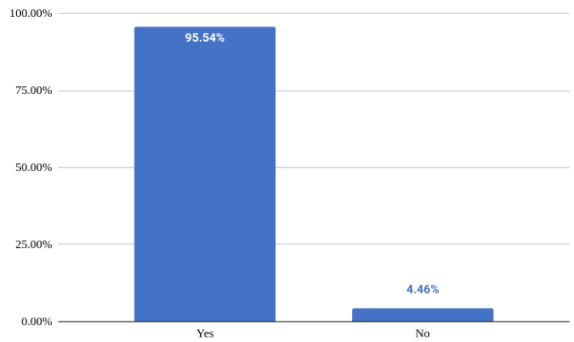
Student Feedback
Do you think audit courses (like self expression..., Courses without examination) should be included in the program?



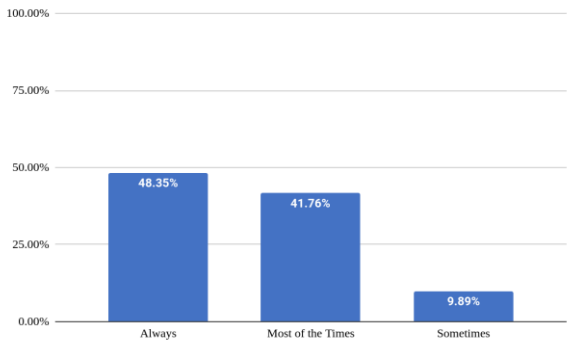
Student Feedback
Are the program electives offered in relation to the Technological advancements?



Student Feedback
Would you like to undergo an internship in the industry?

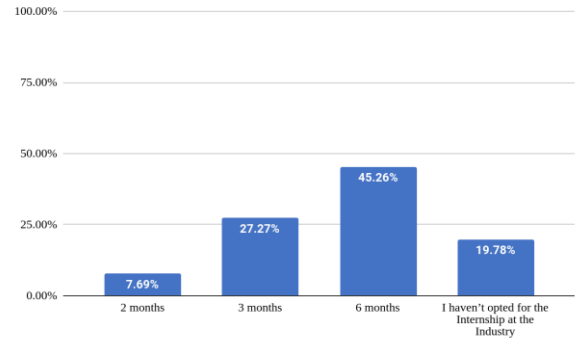


Student Feedback
Did the courses stimulate interest in the engineering field?



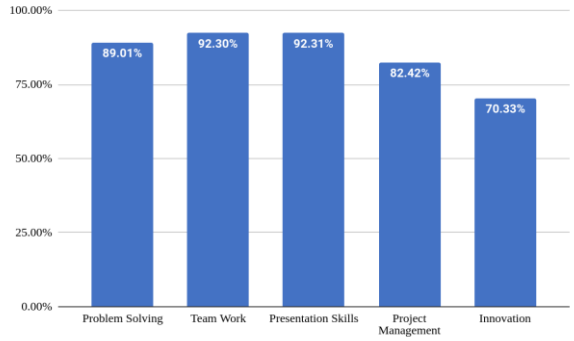
Student Feedback

Based on your experience of internship , how much should be the duration of the internship?



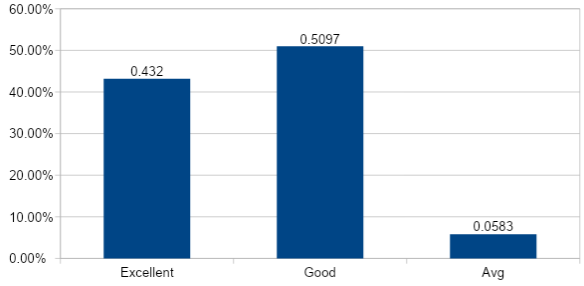
Student Feedback

Did the final year project help you to develop the following abilities;Problem Solving,Team Work, Presentation Skills, Project Management, Innovation



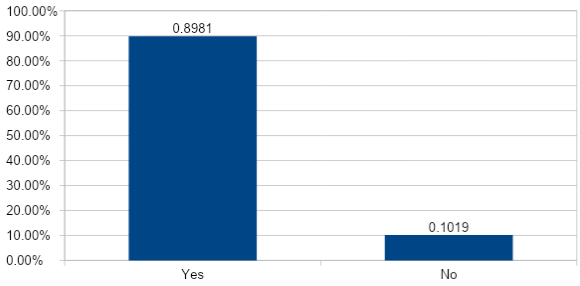
Parents Feedback

How do you rate the overall personality development of your ward while studying at the college



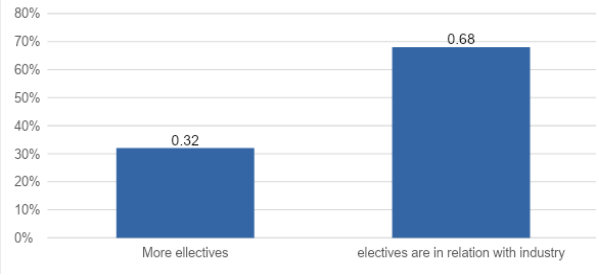
Parents Feedback

Do you think Internship should be the mandatory part of the curriculum



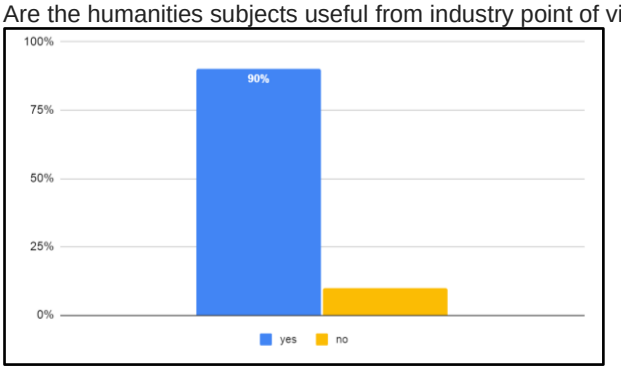
Alumnae Feedback

Are adequate and appropriate program/open electives offered in relation to technological advancements



Employer Feedback

Are the humanities subjects useful from industry point of view



DISCUSSIONS

After reviewing the comments/feedback received from all stakeholders new curricula of computer Engineering is designed.

Table 3: Summary of Feedback Received and Action taken

S.N	Feedback Received	Action taken/Implementation
1	Audit courses should be included in the curriculum.	**Audit courses offered** **Second Year** ➔ Leadership and Personality development ➔ Professional ethics and Etiquette ➔ Women and well being ➔ Yoga and Meditation. ➔ Communication skills ➔ Quantitative Analysis **Third Year** ➔ Self expression
2	Internship should be of 6 months duration.	Internship duration is increased from 2 months to 6 months. Credits are offered for the internship.
3	More program/open elective courses should be added.	**More elective subjects are offered like** ➔ Introduction to Blockchain ➔ Devops Fundamentals ➔ User Experience Design (UX/UI) ➔ Artificial Intelligence ➔ Internet of Things ➔ Distributed Systems ➔ Information Retrieval ➔ Introduction to Blockchain ➔ Geographical Information System ➔ Gamification ➔ Data Science using Python ➔ Data Analysis and Visualization ➔ MOOC Courses New HS course offered by department: Professional and Societal Awareness for Engineers.
4	Subjects related to Economics and Finance should be included in the curriculum.	Curriculum offers Humanities course: Economics and personal Finance.

Highlights of the newly offered curricula in Computer Engineering Program are as follows:

- Total Credits : 165
- Syllabus was designed by following ACM guidelines for Computer Engineering
- Revised Bloom's Taxonomy is used while defining course objectives and outcomes to capture cognitive levels
- Addition of recent trends in technology in courses
- 7th semester dedicated for internship/Project
- More programme and open electives; One Programme elective dedicated to MOOCs; Multidisciplinary open elective
- Addition of new elective courses, based on new trends

RESULTS

Incorporation of the suggestions received and outcome of internal department meetings resulted in various changes in old curricula. Following points broadly summarize these changes.

- The positioning of a few courses and program electives in the structure is changed.
- The Cloud Computing Course is a core course instead of programme elective.
- New courses are identified and added as programme electives.
- Internship duration is increased from 2 months to 6 months. Credits are offered for the internship.

Table 4: Courses Added in New Curricula of Computer Engineering

Programme core	● Fundamentals of Programming Languages I & II ● Cloud Computing
Program core Laboratories	● Fundamentals of Programming Languages I & II Laboratory ● Programming Skills Development-I Laboratory ● Cloud Computing Laboratory ● Digital Electronics Laboratory
Programme Electives	● DevOps Fundamentals ● User Experience Design (UX/UI) ● Artificial Intelligence ● Internet of Things ● Distributed Systems ● Information Retrieval ● Introduction to Blockchain
Open Electives	● Geographical Information System ● Gamification ● Data Science using Python ● Data Analysis and Visualization
Audit courses	● Leadership and Personality development ● Professional ethics and Etiquette ● Women and well being ● Yoga and Meditation ● Communication skills ● Quantitative Analysis ● Third Year students. ● Self expression
HS Course	● Professional and Societal Awareness for Engineers

CONCLUSIONS

Computer Engineering is an ever-changing field. The awareness about the requirements and trends in this field can be gained through various stakeholders of the educational system. Online and offline methodologies can be used for getting feedback about the curricula. These techniques are proved to be effective in proposing and executing the program. The feedback on earlier cycle received from various stakeholders was very useful in designing curricula. Department has offered the latest program elective and open electives and core courses offerings. Revised curriculum imparts all the necessary technical skills to the students as per current industry needs.

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2. Self-Assessment Report (SAR) (2021) uploaded with Tier-I format, submitted to National Board Of Accreditation (NBA) New Delhi.
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CURRICULUM DEVELOPMENT OF ELECTRONICS AND TELECOMMUNICATION DEPARTMENT OF CCEW

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ABSTRACT

In this paper the design process of curriculum development of the Electronics and Telecommunication Department is elaborated. On the onset the aspects considered are college mission and vision and AICTE guidelines. Meetings and feedback from stakeholders provided a base for selection of courses and their contents. The designed contents were further discussed in formal committees of the department and college. The suggestions and feedback received helped to modify and finalize the curriculum.

INTRODUCTION

The first cycle of CCEW E&TC department autonomy started from the academic year 2016-17. This batch graduated in 2019-20. In the autonomous institute, the structure and syllabus is revised after the completion of every cycle. In [1] the need for the improvement of higher engineering education and the development of strategies for solving important issues for the future of engineering education, such as recruitment, the need for new competencies and the ability to deal with new types of interdisciplinary and complex knowledge is explored. Three aspects are considered namely: design approach, teacher development, and participation and collaboration in communities. The process [2] of methodological designing and preparation of all courses for an engineering curriculum is the outcome of a complex design of educational activity. This also includes design of assessment and instruction procedures. A thorough study is conducted of the course curriculum, highlighting both the positives and the negatives. Subsequently, recommendations are made for changes to the course curriculum and conclusions are drawn from the report [3]. In this process [4] stress is on innovative learning and assessment methods. Curriculum development should give more control to students over the learning process. The process mentioned above aided in the design of the program curriculum.

PROCESS FOR DESIGNING THE PROGRAM CURRICULUM

Step 1-Structure Design:
The new structure of the curriculum (from 2020-21) is framed keeping in mind the vision and mission of the college and revised AICTE guidelines. Multiple meetings were held with the principal, dean academics, and HODs of other departments to discuss and decide the rationale behind the structure.
General guidelines about curriculum structure are decided centrally by the college level committee which includes the principal, dean academics and HOD's based on norms and guidelines given by UGC/AICTE [5,6].

Following are the highlights of the structure:

- Grouping of program curriculum, based on AICTE guidelines, course components like Basic Sciences, Engineering Sciences, Humanities, Program Core, Program/Professional Electives, Open Electives, Audit courses, honors and minors courses, Internships, (Major/Mini) Projects, Seminars etc.
- Distribution of credits, contact hours for the respective course components.
- Identification of teaching scheme and examination scheme for the course components.
- Approval of the curriculum structure by academic council and governing body.

The process of curriculum development is given in figure 1

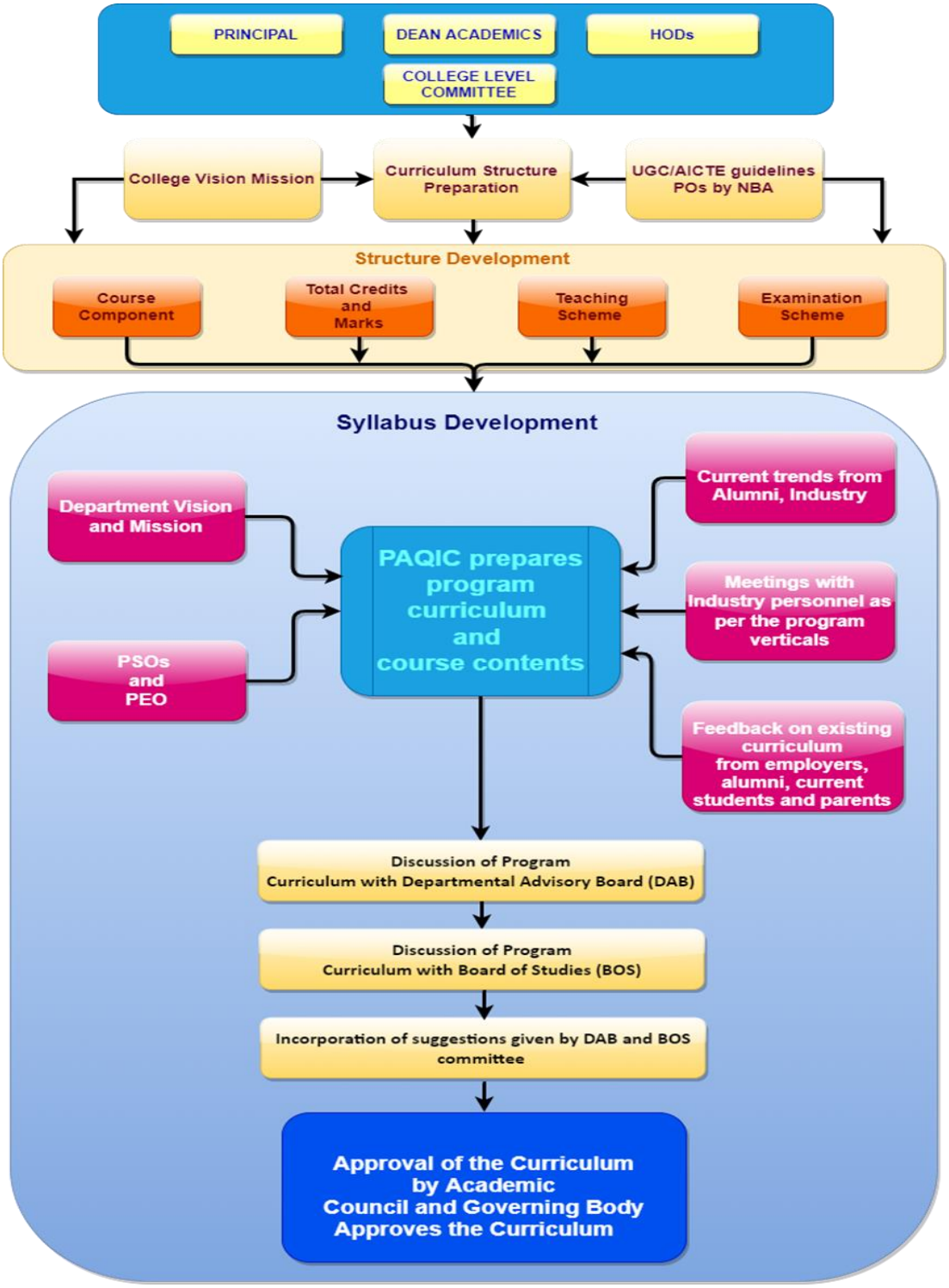


FIG 1: Process of curriculum development

Step 2: Formation of Program Curriculum

- Curriculum formation is done by Program Assessment and Quality Improvement Committee (PAQIC) committee consisting of Chairman, Secretary, and department senior faculty members and the Department Advisory Board (DAB) which is composed of members from eminent institutions as well as members from industry, alumnae representative, current student representatives and senior faculty members of the institute and the department.
- Preparation of Program Curriculum in accordance to
    - Program outcomes defined by NBA [5],

- Department Vision and Mission, Program Specific Outcomes (PSO) and Program Educational Objectives (PEO);
- Inputs from stakeholders (Employers, industry professionals, alumnae and current students

- The subject verticals are identified. Based on the subject verticals and faculty interest areas, faculty groups are formed.
- The courses are identified and classified as Core Courses, Program Electives and Open Electives within the respective verticals, by faculty groups.
- Course objectives and course outcomes are identified by referring to guidelines of Bloom's Revised Taxonomy.
- Standard references for learnings (Text Books, Reference Books etc.) and contact hours (Lectures, Tutorials, Laboratory) are identified and accordingly the first level draft of syllabus contents is prepared by the subject groups.

Step 3: Approval of the Program Curriculum

- The program curriculum drafted is reviewed by the Board of Studies (BOS) committee consisting of experts nominated by the Vice Chancellor of SPPU, two subject experts from outside Parent University, industry experts, eminent academicians etc.
- The suggestions given by the BOS committee in the program curriculum are incorporated.
- The program curriculum is then presented to the Academic Council for approval of the designed program curriculum.
- The curriculum structure finalized by the Academic Council (AC) is presented to the Governing Body (GB) of the institute for its approval and implementation.

DATA COLLECTION

Every year, feedback regarding the curriculum is taken from the students, alumni, parents, industry experts, academicians, and employers. While designing the curriculum, this feedback is taken into consideration.

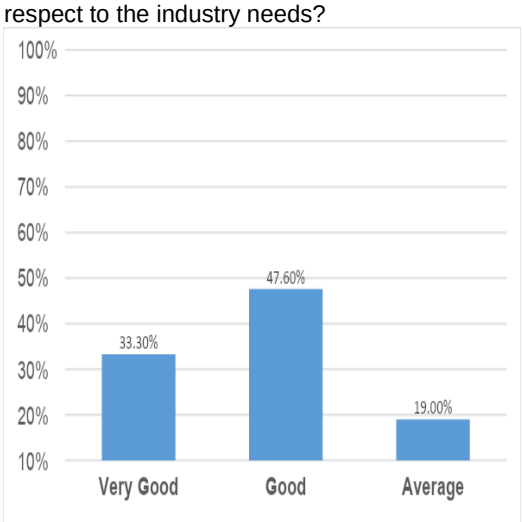
Feedback from Stakeholders:

a) EMPLOYERS

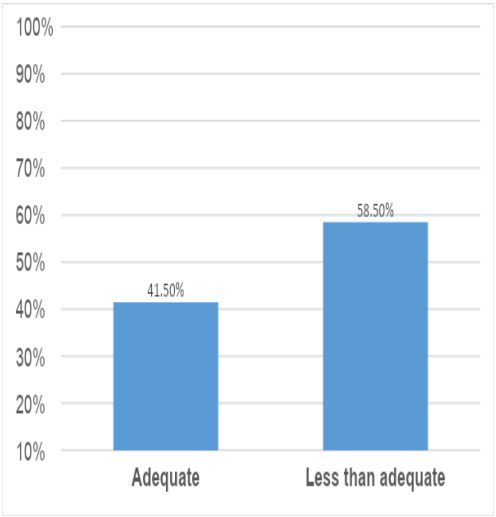
The department of E&TC had an exclusive and exhaustive exercise for getting the feedback/comments/suggestions for the existing syllabus and the structure.

The questionnaire was prepared and shared with the employers. The questionnaire embraced facets and areas related to the contemporary and would be contemporary domains with space for paradigm shifts.

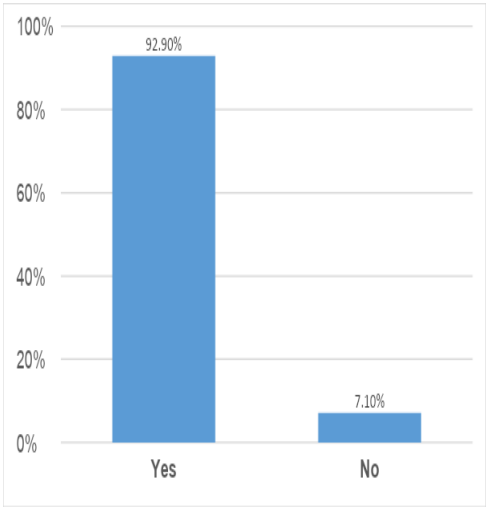
Q.1 How do you rate the relevance of the curriculum with respect to the industry needs?



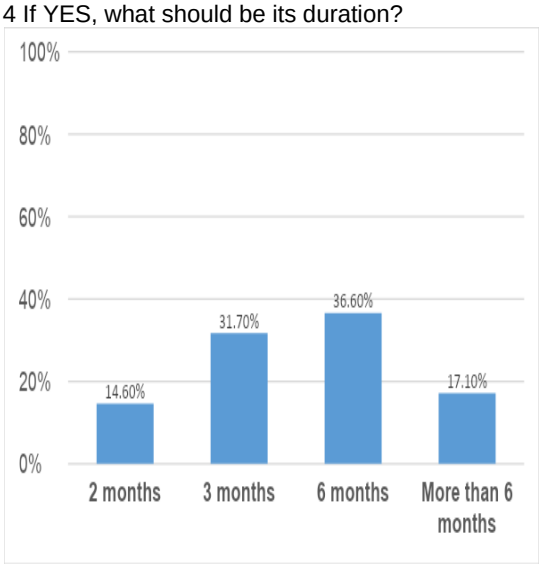
Q.2 Are Adequate and appropriate program / open electives offered in relation to the technological advancements?



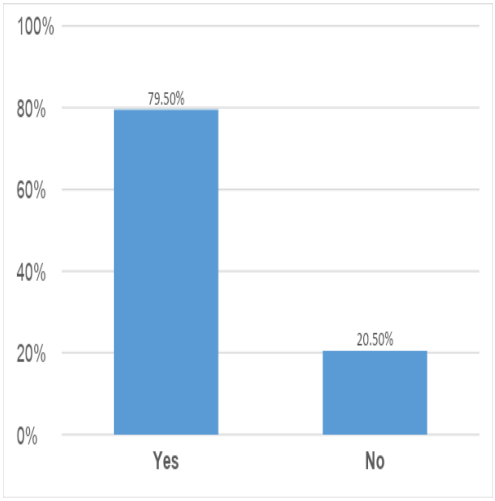
Q.3 Do you think internships should be a mandatory part of the curriculum?



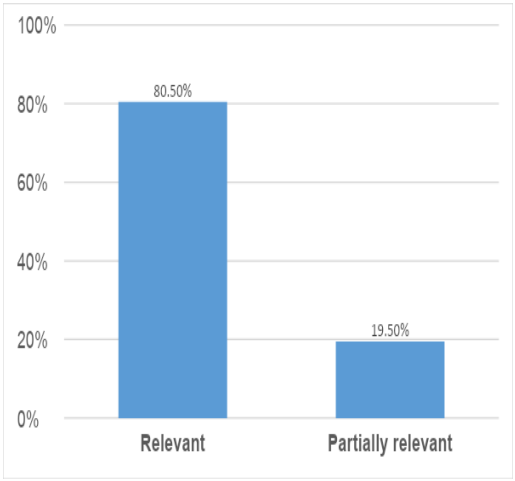
Q. 4 If YES, what should be its duration?



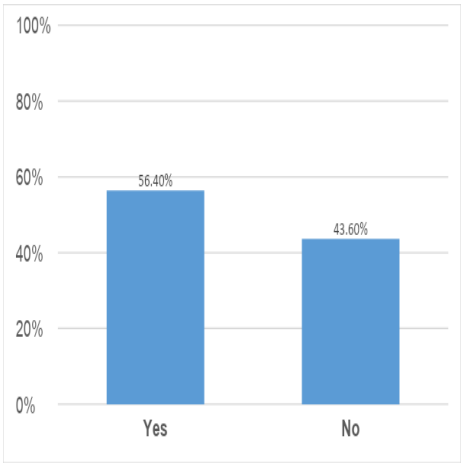
Q.5 Are the humanities subjects useful from an industry point of view?



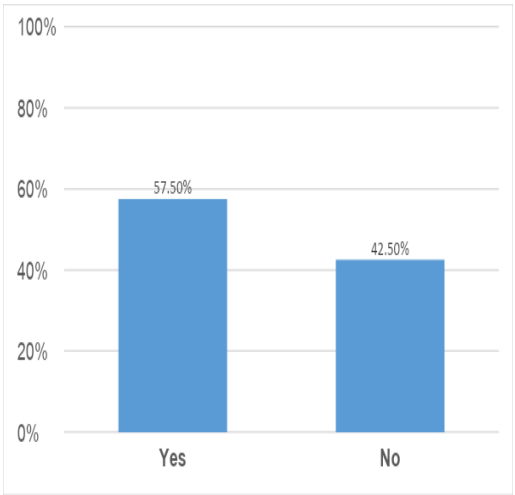
Q.6 Do you think the multidisciplinary courses offered are relevant to the branch?



Q.7 Are the present laboratory courses from the curriculum sufficient to develop the required hands-on skills by the students?



Q. 8 Are the current curriculum contents sufficient to prepare for good employment opportunities?



b) Meetings with Industry Personnel:

Several online meets were conducted with the industry personnel and the course teachers. In these meetings, alumni working in the industry participated wholeheartedly. A total of 14 meetings were held in the domain of VLSI, Data Science, Power Electronics, Communication & Networking, AI/ML, Image Processing, PLC, Automotive Electronics. Suggestions and opinions were majorly sought for the relevance of our curriculum concerning the industry needs with a factor to foresee the same in the near future if not distant.

c) Feedback on Trends:

Feedback from Industry and Alumni was taken on current trends and training aspects as given,

- Skills expected from fresh engineering graduates while joining the organization
- Topics on which technical and Soft Skill training is given to the fresh engineering graduates after joining the organization
- Current trends / Project domains / Technologies in the organization
- What are the Expected Future trends in the organizations?
- Any other suggestions / Comments / Remarks

d) Alumni

The questionnaire was sent to all the alumnae of the E&TC department. 146 feedback forms were received. The question and received responses are given in Table

Questions	Options	Feedback taken in year	
		2020	2021
Q.1 How do you rate the relevance of the curriculum with respect to the industry needs?	Very Good – The syllabus is a nice blend of fundamental and applied subjects helpful for current and near future industry trends	**20%**	**30%**
	Good – The syllabus fairly covers the current industry requirements	**60%**	**55%**
	Average – Syllabus contents are not sufficient to cater industry requirements	**17%**	**15%**
Q.2 Are adequate and appropriate program / open electives offered in relation to the technological advancements?	The electives are in relation with the technological advancement in the industry	**57%**	**58%**
	More number of electives should be offered to cater the advancement in the industry	**43%**	**42%**
Q.3 Do you think internships should be a mandatory part of the curriculum?	Yes	**98%**	**90%**
	No	**2%**	**10%**
Q. 4 If YES, what should be its duration?	2 months	**17%**	**23%**
	3 months	**29%**	**40%**
	6 months	**59%**	**28%**
	No, Internship should not be the part of the curriculum	**2%**	**9%**
Q.5 Are adequate and appropriate program / open electives offered in relation to the technological advancements?	The electives are in relation with the technological advancement in the industry	**58%**	**56%**
	More number of electives should be offered to cater the advancement in the industry	**36%**	**38%**
Q.6 Which of the following abilities , do you think, final year projects provide opportunity to develop?	Problem Solving	**83%**	**82%**
	Team Work	**81%**	**88%**

		Presentation Skills	**68%**	**82%**
		Project Management	**69%**	**82%**
		Innovation	**71%**	**64%**
Q.7 Are the present laboratory courses from the curriculum sufficient to develop the required hands-on skills by the student?		Yes	**73%**	**76%**
		No	**27%**	**24%**
Q.8 How do you rate the usefulness of co-curricular and extra-curricular activities undertaken in the college for development of students' personality?		Very useful	**46%**	**51%**
		Useful to some extent	**52%**	**47%**
Q.9 How do you rate the effectiveness of curriculum for	Placement	Very useful	**42%**	**60%**
		Useful to some extent	**57%**	**37%**
		Not useful	**4%**	**5%**
	Higher Studies	Very useful	**33%**	**35%**
		Useful to some extent	**62%**	**57%**
		Not useful	**7%**	**8%**
	Entrepreneurship Development	Very useful	**20%**	**27%**
		Useful to some extent	**67%**	**61%**
		Not useful	**15%**	**12%**

e) Students and Parents:

Feedback forms were shared with current students and parents. The following responses were received and presented as follows,

SY Students

Questions	**Options**	**Feedback Year (SY)**	**Feedback Year (SY)**
		2020(%)	**2021(%)**
Do you think the number of allotted lectures/ practicals are sufficient to cover the entire syllabus of most of the courses in your curriculum?	Yes - they are sufficient to cover entire syllabus	**85**	**85**
	No - Not sufficient for some of the courses	**15**	**15**
With the given number of courses per semester do you get sufficient time for self-study and other activities?	Yes	**64**	**60**
	No	**36**	**40**
How do you rate the usefulness of the curriculum content in terms of concepts building?	Very useful	**32**	**33**
	Moderately useful	**66**	**63**

	Not useful	**2**	**4**
How do you rate the transparency of assessment process?	Completely transparent	**48**	**53**
	Partially transparent	**48**	**46**
	Not transparent	**4**	**1**
Are adequate and appropriate learning resources available for the course? (availability of reference books, text books, e-books, reading material, etc.)	Yes	**83**	**85**
	No	**17**	**15**
Do you find laboratory sessions useful to get hands-on experience related to the course content?	Very useful	**50**	**34**
	Useful to some extent	**46**	**58**
	Not useful	**4**	**8**
Do you think tutorials help for better understanding of the subject?	Helpful to a large extent	**63**	**59**
	Helpful to some extent 62	**37**	**40**
	Not helpful	**0**	**1**
Do you think audit courses (like self expression..., Courses without examination) should be included in the program?	Yes	**91**	**91**
	No	**9**	**9**
Do you think that humanities courses like Principles of Economics and Finance are useful for getting exposure in the related fields?	Useful	**63**	**68**
	Partially useful	**32**	**27**
	Not useful	**5**	**5**

TY Students

Questions	**Options**	**Feedback Year (SY)**	**Feedback Year (SY)**
		2020(%)	**2021(%)**
Do you think the number of allotted lectures/practical are sufficient to cover the entire syllabus of most of the courses in your curriculum?	Yes - they are sufficient to cover entire syllabus	**96**	**80**
	No - Not sufficient for some of the courses	**4**	**20**
	Yes	**75**	**51**

With the given number of courses per semester do you get sufficient time for self study and other activities?	No	**25**	**49**
How do you rate the usefulness of the curriculum content in terms of concepts building?	Very useful	**33**	**40**
	Moderately useful	**65**	**59**
	Not useful	**2**	**1**
How do you rate the transparency of assessment process?	Completely transparent	**53**	**62**
	Partially transparent	**44**	**36**
	Not transparent	**3**	**2**
Are adequate and appropriate learning resources available for the course? (availability of reference books, text books, e-books, reading material, etc.)	Yes	**88**	**86**
	No	**12**	**14**
Do you find laboratory sessions useful to get hands-on experience related to the course content?	Very useful	**43**	**51**
	Useful to some extent	**54**	**47**
	Not useful	**3**	**2**
Do you think tutorials help for better understanding of the subject?	Helpful to a large extent	**52**	**60**
	Helpful to some extent 62	**48**	**39**
	Not helpful	**0**	**1**
Do you think audit courses (like self expression..., Courses without examination) should be included in the program?	Yes	**95**	**97**
	No	**5**	**7**
Do you think that humanities courses like Principles of Economics and Finance are useful for getting exposure in the related fields?	Useful	**62**	**62**
	Partially useful	**33**	**35**
	Not useful	**5**	**3**
Do you think that humanities courses like Principles of Economics and Finance are useful for getting exposure in the related fields?	Useful	**62**	**62**
	Partially useful	**33**	**35**
	Not useful	**5**	**3**
	Yes	**92**	**96**

For the offered program electives, were the prerequisite courses covered in the previous semesters**?**	No	**8**	**4**
Are the program electives offered in relation to the Technological advancements?	Always	**48**	**60**
	Most of the times	**46**	**37**
	Sometimes	**6**	**3**
Did the courses stimulate interest in the engineering field?	Always	**47**	**52**
	Most of the times	**40**	**43**
	Sometimes	**13**	**5**
Would you like to undergo internship at the industry	Yes	**90**	**97**
	No	**10**	**3**

Final Year B.Tech. Students

Question	**Options**	**Feedback Year**	**Feedback Year**
		2020(%)	**2021(%)**
1. Do you think the number of allotted lectures / practical's are sufficient to cover the entire syllabus of most of the courses in your curriculum?	Yes - they are sufficient to cover entire syllabus	**92**	**90**
	No - Not sufficient for some of the courses	**8**	**10**
2 With the given number of courses per semester do you get sufficient time for self-study and other activities?	Yes	**89**	**86**
	No	**11**	**14**
3 How do you rate the usefulness of the curriculum content in terms of concepts building?	Very useful	**40**	**36**
	Moderately useful	**59**	**61**
	Not useful	**1**	**3**
4 How do you rate the transparency of assessment process?	Completely transparent	**66**	**48**
	Partially transparent	**33**	**47**
	Not transparent	**1**	**5**
	Yes	**88**	**91**

5 Are adequate and appropriate learning resources available for the course? (Availability of reference books, text books, e-books, reading material, etc.)	No	**12**	**9**
6 Do you find laboratory sessions useful to get hands-on experience related to the course content?	Very useful	**52**	**55**
	Useful to some extent	**48**	**45**
	Not useful	**0**	**0**
7 Do you think tutorials help for better understanding of the subject?	Helpful to a large extent	**71**	**68**
	Helpful to some extent 62	**27**	**30**
	Not helpful	**01**	**2**
Do you think audit courses (like self-expression..., Courses without examination) should be included in the program?	Yes	**95**	**92**
	No	**5**	**8**
Do you think that humanities courses like Principles of Economics and Finance are useful for getting exposure in the related fields?	Useful	**77**	**69**
	Partially useful	**22**	**26**
	Not useful	**1**	**5**
For the offered program electives, were the prerequisite courses covered in the previous semesters?	Yes	**85**	**91**
	No	**15**	**9**
Are the program electives offered in relation to the Technological advancements?	Always	**52**	**50**
	Most of the times	**41**	**40**
	Sometimes	**7**	**10**
Did the courses stimulate interest in the engineering field?	Always	**44**	**47**
	Most of the times	**47**	**42**
	Sometimes	**10**	**12**
Do you get an opportunity to choose multidisciplinary subjects through open electives offered?	Always	52	**47**
	Most of the times	45	**49**
	Sometimes	3	**4**
Would you like to undergo internship at the industry**?**	Yes	**90**	**78**
	No	**10**	**22**

Did you find the internship useful ?	Useful	**47**	**Yes**
	Partial Useful	**16**	**No**
	Not Useful	**1**	**1**
	I haven't Opted in Industry	**7**	
Based on your experience of internship, how much should be the duration of the internship?	2 Months	**32**	**26**
	3 Months	**30**	**16**
	6 Months	**27**	**14**
	I haven't Opted in Industry	**11**	**44**

SY Parents:

Questions	**Options**	**Feedback Year (SY)**	**Feedback Year (SY)**
		2020(%)	**2021(%)**
With the given number of courses per semester does your ward get sufficient time for self-study and other activities?	Yes	**68**	**64**
	No	**32**	**36**
How do you rate the transparency of assessment process?	Completely transparent	**49**	**52**
	Partially transparent	**47**	**47**
	Not transparent	**4**	**1**
Are adequate and appropriate learning resources available for the course? (availability of reference books, text books, e-books, reading material, etc.)	Yes	**68**	**86**
	No	**32**	**14**
Do you think internship should be the mandatory part of the curriculum?	Yes	**84**	**90**
	No	**16**	**10**
Do you think the college provides a conducive environment for learning?	Yes	**88**	**93**
	No	**12**	**7**
How do you rate the overall personality development of your ward while studying at the college?	Excellent	**26**	**31**
	Good	**63**	**57**
	Average	**11**	**12**

TY Parents:

Questions	**Options**	**Feedback Year (SY)**	**Feedback Year (SY)**
		2020(%)	**2021(%)**
With the given number of courses per semester does your ward get sufficient time for self study and other activities?	Yes	**88**	**66**
	No	**12**	**34**
How do you rate the transparency of assessment process?	Completely transparent	**60**	**55**
	Partially transparent	**38**	**42**
	Not transparent	**2**	**3**
Are adequate and appropriate learning resources available for the course? (availability of reference books, text books, e-books, reading material, etc.)	Yes	**95**	**85**
	No	**5**	**15**
Do you think internship should be the mandatory part of the curriculum?	Yes	**77**	**95**
	No	**23**	**5**
Do you think the college provides a conducive environment for learning?	Yes	**94**	**93**
	No	**6**	**7**
How do you rate the overall personality development of your ward while studying at the college?	Excellent	**34**	**42**
	Good	**60**	**53**
	Average	**6**	**5**

Final Year BTech Parents:

Questions	**Options**	**Feedback Year (SY)**	**Feedback Year (SY)**
		2020(%)	**2021(%)**
With the given number of courses per semester does your ward get sufficient time for self study and other activities?	Yes	**100**	**87**
	No	**0**	**13**
How do you rate the transparency of assessment process?	Completely transparent	**68**	**55**

	Partially transparent	**32**	**40**
	Not transparent	**0**	**5**
Are adequate and appropriate learning resources available for the course? (availability of reference books, text books, e-books, reading material, etc.)	Yes	**92**	**92**
	No	**8**	**8**
Do you think internship should be the mandatory part of the curriculum?	Yes	**92**	**90**
	No	**8**	**10**
Do you think the college provides a conducive environment for learning?	Yes	**96**	**95**
	No	**4**	**5**
How do you rate the overall personality development of your ward while studying at the college?	Excellent	**48**	**54**
	Good	**52**	**40**
	Average	**0**	**6**

Table 1: Respondent's information

Sr. NO.	Category of Respondents	PAQIC	DAB	BoS	AC	GB	Questionnaire (Existing Curriculum)	Meetings For Syllabus	Trends Feedback
1	**Industry Experts**	**-**	**1**	**2**	**3**	**5**	**41**	**21**	**19**
2	**Academician out of CCEW**	**-**	**1**	**4**	**2**	**2**	**-**	**-**	**-**
3	**Dept./College Faculty**	**30**	**15**	**2**	**-**	**-**	**-**	**-**	**-**
4	**Alumni**	**-**	**1**	**1**	**-**	**-**	**141+146 =287**	**7**	**86**
5	**Current students SY**	**-**	**2**	**-**	**-**	**-**	**155+154**	**-**	**-**
6	**Current students TY**	**-**	**2**	**-**	**-**	**-**	**115+112**	**-**	**-**
7	**Current students Final Year**	**-**	**-**	**-**	**-**	**-**	**70+63**	**-**	**-**
8	**Parents**	**-**	**-**	**-**	**-**	**-**	**606**		

RESULT and DISCUSSION

The results of the surveys and discussions are given in this section,

Industry & Employers:

The inclusion of appropriate programs and open electives to supplement the core subjects were appreciated with a satisfactory nod along with the core subjects. The majority of the stakeholders insisted on the need and duration for Industry Internships for a minimum period of six months. The laboratory courses were found to be satisfactory although additional emphasis needed to be given to software labs with respect to contemporary grading tools and methods.

Suggestions like replacing VHDL with Verilog was implemented almost immediately. Advanced VLSI and advanced embedded systems were amongst other suggestions. Considering the future scope of Electric vehicles, subject with advanced automotive protocols and standards was suggested. Stakeholders showed content in terms of theory and practical labs to prepare the students for the industry as they graduate a few years from now. The inclusion of Cloud technology and computing was suggested by a few stakeholders as well. Other than the earlier GSM and CDMA technologies, the need for 3G, 4G, and beyond was termed essential.

Suggestions were received to cover subjects like Intellectual Property (IP) rights and more emphasis on PCB design related to routing, EMI, EMC study. Labs should have more hands-on recent CAD tools.

Interactive Web sessions or Talks from industry experts to keep the students updated on industry trends & developments. Inclusion of Java apart from the basic procedural languages. Encouraging students to use hacker rank, and geeksforgeeks to get exposure to interview type questions. Assignments based on Interview questions to be provided to the students.

A few subjects are shifted from the latter semesters to the previous ones, estimating profound benefits to the students' academics and careers. A complete semester dedicated to Industrial Internship/projects is planned. This would be experienced in second semester of their T.Y that is semester VI.

Alumni:

Alumni feels that Curriculum is good, the syllabus fairly covers the current industry requirements. Open electives and Program-specific electives are appreciated by the alumni. Also, they suggested including some more advanced subjects in electives. All alumni feel that internship should be kept mandatory in the curriculum and the duration of the internship should be 6 months or 3 months minimum. The final year project provides an opportunity to develop problem-Solving skills, presentation skills, management skills, and teamwork skills mostly. Alumni are satisfied with the practice taken in the laboratory courses.

Alumni rated that co-curricular and extra-curricular activities undertaken in the college for the development of students' personalities are very useful. More than half of the alumni feel that the curriculum is adequate effective for Placement, Higher Studies, Entrepreneurship Development, and 40 to 46 % of alumni feel that the curriculum is very much effective.

Some alumnae suggested that programming skill development subjects should include in the curriculum. More focus on the latest trends like Data Science, Data Analysis, Data Visualization, Machine learning, Deep learning, Automation, and Control. More electives should be offered to cater to the advancement in the industry.

As per Alumni feedback actions are taken.

Sr.No.	Alumni Feedback Points	Action taken
1	Need to develop programming skill	In order to develop programming skills in Data Structure, Object-Oriented Programming, Machine Learning is now in the second year.

2	More focus on latest trends like Data Science, Data Analysis, Data Visualization, Machine learning, Deep learning, Automation and Control	In order to focus on the latest trends in the curriculum, meetings were conducted with industry experts from various domains. As per their suggestions, new courses are included. Previous course contents were also modified. Honor courses in the field of VLSI, Wireless Communication, Data Science, and Machine Learning are included in the new cycle of Autonomy.
3	More number of electives should be offered to cater to the advancement in the industry	As per this feedback, more no. of program electives are added. PE I: 1. Information Theory and Coding Techniques, 2. Mechatronics 3. Digital Image Processing 4. Introduction to Internet of Things PE II:- NPTEL courses PE III:- 1. Robotics 2. Biomedical Electronics 3. Power Electronics 4. Deep Learning PE IV:- 1. Microwave and Radar Engineering 2. Remote Sensing 3. Industrial Automation 4. Embedded RTOS PE V:- 1. Advanced VLSI Design 2. Artificial Intelligence 3. Statistical Signal Processing 4. Mobile Communication
4	Add Industry oriented courses	In order to improve the relevance of the curriculum with respect to industry needs meetings were conducted with industry experts from the various domains. As per their suggestions, new courses are included. Previous course contents were also modified.
5	As per the Alumni, feedback effectiveness is moderate from a placement point of view, more for higher studies & less for entrepreneurship.	VLSI and Computer Networks are now in their third year so that students are well aware of the subject till the placement. In order to focus on entrepreneurship Open electives like Entrepreneurship Development, Intellectual Property Rights, Project Management, Law for Engineers are added to the curriculum.
6	More than 60% of Alumni says Internship should be of 6 months.	As per the new autonomy cycle in the Final year, BTech has 6 months internship or 6 months project or combination as 3 months (Internship)+ 3 months (Project)
7	Co-curricular and Extra-curricular activities are useful for the development of student's personality	In order to groom the overall personality of the student, they are encouraged to participate in various co-curricular & extra-curricular activities. Students participate in various co-curricular activities like paper presentations, projects, seminars, workshops. By participating in such events their technical knowledge is enhanced & their confidence is boosted. They also participate in various extra-curricular activities like cultural, sports, social & NSS. By participating in such activities their interaction with society improves they also come to know about the importance of human values.

8	Add Project-Based Learning (PBL) in multiple courses	In many subjects, project-based learning is added to the syllabus. (ECA, DSP, ES)

Students:

Feedback forms regarding Existing Curriculum were shared with current students and parents. Following responses were received and presented as follows, Feedback on curriculum was taken from second year to final year B.Tech. Students. Students were satisfied to get an opportunity for selecting multidisciplinary subjects as open electives. Students are interested in having internship for about 6 months and 90% students are interested to do internship in industry.

Students found final year projects useful in building the skills such as Problem Solving, Team Work and Presentation Skills. Students were satisfied with inclusion of the audit courses in syllabus and 95% of students commented that these courses helped them in their personality development.

Students are satisfied to get sufficient time for self-study. Students suggested that some of the courses like electronic circuit design, simulation software and PCB designing should be included in the curriculum.

Parents' Feedback on curriculum

Feedback on curriculum was taken from parents of second year to final year B.Tech students. Parents suggested that their ward should have six months internship duration. Parents feel that lecture timings should be reduced and more extracurricular activities should be conducted so that it will be helpful for personality development of their ward.

Parents feel that guidance should be provided by college to students for internship in second year as well as for building their resume. Library facility is available to all students and 88% parents are satisfied with it. Student should have Mini project in the second year which will enhance their technical skills & team work spirit. Project based learning can be introduced for some of the courses, in order to improve the practical knowledge.

Students' Feedback on curriculum:

Feedback on curriculum was taken from first year to final year B.Tech. Students. Students were satisfied with the program electives and 91% students satisfied with the prerequisites in the previous semesters. Students feel that Courses like CN, OS, DBMS in second year should be included. These are very important subjects for interviews and 78% Students are interested in having an internship for about 6 months.

Students feel humanities courses like Principles of Economics and Finance are useful and 69 % students said it will be useful in related fields. Students feel that more IT/Comp based courses should be included.

Second year courses should include preparation of internships, like practicing aptitude tests and revision lectures. Students also feel that project should be included in curriculum at second year. More focus should be given on coding skills. Tutorial sessions for all main courses makes the understanding of that course easy. Some of the TY course portion is shifted to SY and some more placement related courses/activities are added into TY curriculum as electives. It would be beneficial from students' point of view. Some of the students suggested for adding foreign language in curriculum. Students also feel that for E&TC, subjects like database, Java and computer networks should be mandatory and covered in second year. These subjects play vital role in internship as well as placements. Library facility is available to all students and 91% satisfied as all library facilities are available.

Parents' Feedback on curriculum

Feedback on curriculum was taken from parents of first year to final year B.Tech. Students get less time for doing extra courses because of long online college timings. Give some proper guidance to students regarding preparation of internships/ placements by arranging some sessions with seniors frequently.

More interactive sessions by external faculty and industry experts can be arranged. More industry exposure should be given since 2nd year. 95 % of parents commented that industry Internships should be mandatory.

PAQIC, DAB, BOS, AC

Every year, feedback regarding the curriculum was taken from the students, alumni, parents, industry experts, academicians and employers. While designing the curriculum of the new autonomy cycle, these feedbacks were taken into account.

PAQIC:

Following are some of the points discussed in PAQIC meetings and actions taken on it:- Different Innovative teaching ideas should be considered while framing and teaching the course. Innovative teaching ideas like Google Quiz, Animated Videos, Animated PPT were used by the faculty members to teach their courses more effectively. Engineering applications should be discussed in Mathematics course for this common meeting of course faculty like Engineering Mathematics III and Control System was held. Based on the pre-requisites of the courses, proper teaching sequence was decided after this meeting. Project based learning (PBL) should be included for better understanding of the course. In semester assessment can be done for PBL for which Rubrics/grades are predefined. PBL was introduced in the course DSP and its In Sem Examination T1 assessment was done. PBL is included in at least one course per semester from SY itself. In SY ECA (Electronic Circuit Analysis), Embedded Systems In TY DSP, AP these courses have PBL. Based on the latest trends in Industry courses are added in syllabus. VLSI & CN are included third year. Different university structure, syllabus was referred by faculty members for designing honour degree courses. In final year open elective courses one must be from Electronics domain and other courses from other branches so as to get a multidisciplinary approach. Hence following Open Electives (OE) are offered OEI: Cyber Physical Systems, Quantum Computing & OE II: Wireless Networks, Autonomous Robots are added in final year. While designing the course on the CV syllabus of ML was considered. CV is included in TY semester II as an open elective II. In TY BTech Sem II a course Wave Theory & Antenna is introduced which covers some of the Electromagnetics. Mobile communication course is shifted to final year. It includes introduction to 5G and Comparison between 4G and 5G. A course 'Automotive Electronics' is added as Open Elective II in TY Sem II. 'Automotive Communication Protocols' are included in this course. In the course 'Embedded Systems' for the entire lab students will work in 'Embedded C' & GPU is also added. Game theory related topics are included in AI. All lab courses are included with at least one open ended assignment.

Syllabus of some of the courses was modified based on the suggestions. To solve open ended assignments in lab courses 3-4 lab turns will be given. This assignment will be kept for 15 marks. Detail syllabus was designed for the honors program. Virtual Labs are used for the lab conduction in online mode

DAB:

Following are some of the points discussed in DAB meetings and actions taken on it:- While designing the COs of particular course syllabus of standard Institutes should be referred. While designing the new courses in the new autonomy cycle 2020-24, syllabus of standard universities are referred. Course outcomes and objectives must be discussed with the students at the start of every semester. Course feedback from students was considered while designing the syllabus of the courses. Faculty feedback should be discussed with individual faculty members so as to improve the performance of faculty which will be beneficial from students' understanding point of view. No. of Open Elective courses in the program should be increased. There are total 4 Open Elective courses in the structure of program, 2 in TY & 2 in final year. PBL should be increased in more no of courses. PBL is introduced for at least one course in every semester. Some courses that cater to the upcoming demand of Electronic devices manufacturing should be included. More interaction, visits and workshops with the electronics devices manufacturing industries should be organized. Many of the students have completed such courses. The project based learning (PBL) for the course Signal Processing was appreciated and also suggested to include the same in a few more courses. PBL is introduced for at least one course in every semester. The course 'Machine Learning and Deep Learning' from 'Data Science' honors program should include basic concepts of machine learning. If these concepts are covered in second year, advanced machine learning algorithms can be included else title of this course can be modified as 'Deep Learning'.

The structure of proposed honors program in 'VLSI Technology', 'Wireless Communication' which has total 18 credits was presented. The course 'Design and Testability' from VLSI Technology' honors program can be modified as 'Innovation and Design Thinking in VLSI Technology'. This type of course i.e; 'Innovation and Design Thinking' can be included in all honors programs. Students should be given more exposure to lab for honors program of 'Wireless Communication'. Software defined radio can be simulated, Qualnet simulator can be worked with, network simulator NS2, NS3 can be used. Mostly software labs will use MATLAB and Python. 5G work going on can be taken in practical. Wireless communication applications for electric vehicles with automotive techniques can be

included. Mini projects can be included in lab courses. Faculty should be upgraded to teach these honors courses. They can attend NPTEL courses and ATAL FDPs to upgrade themselves. List of 'Value Added' courses was displayed. There are no credits for these courses. Guidelines by AICTE need to be checked to decide the duration of these curses. 'Mental health' course can be taken in TY.

BoS:

Following are some of the points discussed in BoS meetings and actions taken on it:- Quality analysis of the results can be done comparing FY, SY and TY results of individual student. Result analysis of students per course was done. This Result analysis was shown as a graphical representation. Title of courses can be modified but no major changes should be done in Course structure very frequently. The point regarding changes in Course structure will be further communicated to Dean Academics. Open Elective for T.Y. B.Tech. Sem-II Numerical Techniques course can be replaced by subject like E-business and commerce, Multimedia, Optimization Techniques etc. Numerical Techniques subject was removed from the list of Open Electives. Internship/ Project can be considered in Sem-II or they might have an option of opting in any of the two semesters. Suggestion was further communicated to Dean Academics/AC. High weightage to Projects (more credits to BE projects)- More discussion is needed for their monitoring Regarding weightage to Projects the point was communicated to Dean Academics.

Academic Council:

Following are the suggestions given in the meeting related to the syllabus: For the course 'Signals and Systems' include book by 'Ganesh Rao' in the syllabus. For the course titled 'Fundamentals of Machine learning' title should be modified as 'Machine Learning in python'. 'Deep Learning' course should be included as 'Program Elective' with lab in third year 6th semester. From the course 'Analog and digital communication' which is in the second year 4th semester, one unit is completely removed i.e; 'Introduction to Information Theory and Data Compaction'. It is included in the new course 'Information Theory and Coding Techniques'. Title of the course 'Error Correcting codes' should be modified as 'Information Theory and Coding Techniques'. Edition of books for the course 'Analog and Digital Communication' should be verified. Add text book of "Modern Digital and Analog Communication Systems" by B. P. Lathi in this course. Include Image restoration topic in the course 'Digital Image Processing'. In the course 'RTOS' structure of 'MUCOS' is repeated. For all the courses total number of lectures should be modified to 42.

Once the syllabus is modified it is presented to the Governing Body. The Governing Body is the final authority to finalize the syllabus then it is displayed on the website.

CONCLUSIONS

In this paper curriculum design and development for Electronics and Telecommunication program is given. The inputs received from multiple stakeholders enriched the curriculum and have made it relevant and in line with recent trends in industry and education globally. The curriculum conduction will result in fruitful outcome for students and teachers alike.

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ANNEXURE-I
Developed Courses for E &TC Department

Table 1

Course Code	**Course SY B.Tech 3rd Sem**	**Course Code**	**Course SY B.Tech. 4th Sem**
20BSEC301	Calculus and Probability (C&S)	20EC401	Digital Electronics (DE)
20EC301	Electronic Circuits and Applications (ECA)	20EC402	Analog and Digital Communication (ADC)
20EC302	Signals and Systems (SS)	20EC403	Machine Learning with Python (MLP)
20EC303	Data Structures and Algorithms (DSA)	20EC404	Embedded Systems (ES)
20HS301	Universal Human Values-2	20EC405	Object Oriented Programming (OOP)
20EC301L	Electronic Circuits and Applications Lab (ECA Lab)	20EC401L	Digital Electronics Lab (DE lab)
20EC303L	Data Structures and Algorithms Lab (DSA Lab)	20EC402L	Analog and Digital Communication Lab (ADC Lab)
20AC301	Audit Course (AC)	20EC403L	Machine Learning with Python Lab (MLP Lab)
		20EC404L	Embedded Systems Lab (ES Lab)
		20EC405L	Object Oriented Programming Lab (OOP Lab)
		20AC401	Audit Course (AC)
Course Code	**Course TY B.Tech. 5th Sem**	**Course Code**	**Course TY B.Tech. 6th Sem**
20EC501	Digital Signal Processing (DSP)	20EC601	Wave Theory and Antenna (WTA)
20EC502	VLSI Design (VLSI)	20EC602	Computer Networks and Security (CNS)
20EC503	Advanced Processors (AP)	20EC603	Control Systems (CS)
	Programme Elective-I	20HS 601	Management for Engineers (MFE)
20PEEC501A	Information Theory and Coding Techniques (ITCT)		**Programme Elective-III**
20PEEC501B	Mechatronics (Mech)	20PEEC601A	Robotics (Robo)
20PEEC501C	Digital Image Processing (DIP)	20PEEC601B	Biomedical Electronics (BE)
20PEEC501D	Introduction to Internet of Things (IOT)	20PEEC601C	Power Electronics (PE)
	Programme Elective-II	20PEEC601D	Deep Learning (DP)
20PEEC502	**NPTEL/Swayam Courses**		**Open Elective-II**
	Open HS Elective –I		Refer Table – 2
20OEHS501A	Entrepreneurship Development	20EC601L	Computer Networks and Security Lab (CNS Lab)
20OEHS501B	Intellectual Property Rights		**Programme Elective-III Lab**
20OEHS501C	Introduction to Digital Marketing	20PEEC601LA	Robotics (Robo Lab)
20OEHS501D	Law for Engineers	20PEEC601LB	Biomedical Electronics (BE Lab)
20OEHS501E	Organizational Behaviour	20PEEC601LC	Power Electronics (PE Lab)
20OEHS501F	Project Management	20PEEC601LD	Deep Learning (DP Lab)
20EC501L	Digital Signal Processing Lab (DSP Lab)		
20EC502L	VLSI Design Lab (VLSI Lab)		
20EC503L	Advanced Processors Lab (AP Lab)		
20EC504L	Mini Project (MP)		
	Programme Elective-I Lab		
20PEEC501LA	Information Theory and Coding Techniques (ITCT Lab)		
20PEEC501LB	Mechatronics (Mech Lab)		

20PEEC501LC	Digital Image Processing (DIP Lab)		
20PEEC501LD	Introduction to Internet of Things (IOT Lab)		
20AC501	Audit Course (AC):Self Expression		
Course Code	**Course TY B.Tech 7th Sem**	**Course Code**	**Course TY B.Tech 8th Sem**
20EC701	Internship/Project	20EC801	Broadband Communication Systems (BCS)
20HS702	Economics and Personal Finance (EPF) (Online)		**Program Elective-IV**
		20PEEC801A	Microwave and Radar Engineering (MRE)
		20PEEC801B	Remote Sensing (RS)
		20PEEC801C	Industrial Automation (IA)
		20PEEC801D	Embedded RTOS (ERTOS)
			Program Elective-V
		20PEEC802A	Advanced VLSI Design (AVLSI)
		20PEEC802B	Artificial Intelligence (AI)
		20PEEC802C	Statistical Signal Processing (SSP)
		20PEEC802D	Mobile Communication (MC)
			Open Elective-III
			Refer Table – 3
			Open Elective-IV*
			Refer Table – 4
		20EC801L	Broadband Communication Systems Lab (BCS Lab)
			Program Elective–IV Lab
		20PEEC801LA	Microwave and Radar Engineering (MRE Lab)
		20PEEC801LB	Remote Sensing (RS Lab)
		20PEEC801LC	Industrial Automation (IA Lab)
		20PEEC801LD	Embedded RTOS(ERTOS Lab)

Table 2

20OE601 Open Elective-II			**Eligible Departments**				
Sr. No.	**Course Code**	**Course Title**	**E&TC**	**Comp**	**IT**	**Mech**	**Instru**
1	20OE601A	Automation and Control Engineering	Y	Y	Y	Y	Y
2	20OE601B	Automotive Electronics	Y	Y	Y	Y	Y
3	20OE601C	Avionics	Y	Y	Y	Y	Y
4	20OE601D	Bioinformatics	Y	Y	Y	N	Y
5	20OE601E	Computer Vision	Y	Y	Y	Y	Y
6	20OE601F	Design Thinking	Y	Y	Y	Y	Y
7	20OE601G	e-Business	Y	Y	Y	Y	Y
8	20OE601H	Electric Vehicles	Y	Y	Y	Y	Y
9	20OE601I	Gamification	Y	Y	Y	Y	Y
10	20OE601J	Geographical Information Systems	Y	Y	Y	Y	Y
11	20OE601K	Multimedia Systems	Y	Y	Y	N	Y

Table 3

20OE801 Open Elective-III			Eligible Departments				
Sr. No.	**Course Code**	**Course Title**	**E&TC**	**Comp**	**IT**	**Mech**	**Instru**
1	20OE801A	Big Data and Analytics	Y	Y	Y	Y	Y
2	20OE801B	Cyber Physical Systems	Y	Y	Y	N	Y
3	20OE801C	Digital Control	Y	N	N	Y	Y
4	20OE801D	Industrial Engineering and Management	Y	Y	Y	Y	Y
5	20OE801E	Introduction to Cyber-crime and Forensics	Y	Y	Y	Y	Y
6	20OE801F	Instrumentation in Food and Agriculture	Y	Y	Y	Y	Y
7	20OE801G	Medical IoT	Y	Y	Y	N	Y
8	20OE801H	Quantum Computing	Y	Y	Y	N	Y
9	20OE801I	Renewable Energy Sources	Y	Y	Y	Y	Y
10	20OE801J	Soft Computing	Y	Y	Y	Y	Y
11	20OE801K	Software Testing and Quality Assurance	Y	Y	Y	Y	Y

Table 4

20OE802 Open Elective-IV			Eligible Departments				
Sr. No.	**Course Code**	**Course Title**	**E&TC**	**Comp**	**IT**	**Mech**	**Instru**
1	20OE802A	Applied statistics with R Programming	Y	N	N	Y	Y
2	20OE802B	Automobile Engineering	Y	Y	Y	N	Y
3	20OE802C	Autonomous Robots	N	Y	Y	Y	N
4	20OE802D	Building Automation and Energy Audit	Y	Y	Y	Y	N
5	20OE802E	Data Analysis and Visualization	Y	N	N	Y	Y
6	20OE802F	Data Science using Python	Y	N	N	Y	Y
7	20OE802G	Industrial Drives and Control	Y	Y	Y	Y	N
8	20OE802H	Selection and Specification of Material for Engineering Application	Y	Y	Y	N	Y
9	20OE802I	Smart Sensors and Structures	Y	Y	Y	Y	N
10	20OE802J	Wireless Networks	N	Y	Y	N	Y

REVISION OF UNDER GRADUATE INSTRUMENTATION ENGINEERING PROGRAM CURRICULUM BASED ON STRUCTURED FEEDBACK

Anagha Panditrao, Dipali Ramdasi, Pratima Kulkarni, Amruta Bahulikar

1. Introduction

A feedback-rich culture shapes the development of a professional institute. The feedback system is an important tool for the growth of any institute. It provokes change and fuels growth. The responses from the stakeholders like students, parents, alumni, industry experts pave a path towards 360° development of the organization. These responses also comment on the existing pattern and offer suggestions to improve. The scope of improvements covers factors like infrastructural facilities and resources, assessment patterns and curriculum. Curriculum is a major component of a student's development and enhances employability. Inputs from the industry experts and alumnae, directs us to incorporate the latest trends and emerging technologies in curriculum. Curriculum review is a critical examination of academic programs for the purpose of optimization. It is an important component that improves the learner's abilities and confidence.

2. Literature Survey

Validation of the curriculum is carried out through the process of feedback. Feedback is considered as the effective way of improving the teaching-learning process. In autonomous institutes the adaption based on the feedback is faster helping graduating students from each cycle being compatible with the outside world. This feedback is taken from different stakeholders like students, alumni, industry experts and parents. The nature of feedback differs for each of these stakeholders. In the paper, 'Stakeholder Feedback System for Curriculum Design and Improvement' the authors, Rachita Misra and Rojalina Priyadarshini have focused on the importance of maintaining the quality of education through feedback on the suitably designed curriculum. The feedback is taken from various stakeholders categorized as – external and internal. The feedback questionnaire is drafted based on the category of the stakeholder. Based on these feedback responses, the required changes in structure and/or syllabus are carried out on approval by the concerned regulatory boards. Besides traditional feedback methods, e-feedback techniques are also being employed by certain institutes in the UK and Australia. In the paper, 'The Value and Effectiveness of Feedback in Improving Student's Learning and Professionalizing Teaching in Higher Education' the authors, Md. Mamoon-Al-Bashir, Md. Rezaul Kabir and Ismat Rahman explain the various e-feedback techniques like email, audio-video, screencasts and recycling written comments. According to them, these new e-feedback techniques will help in better improvement of the outcomes of the feedback process. There are a few innovative methods of taking feedback as well. Some institutes also offer certification courses based on the education leadership programs. The article 'Utilizing student feedback in the curriculum development process' posted on University of West Florida website enlists various innovative methods for obtaining student feedback like formal evaluation, simple survey, focus group discussion and individual conferences. The article also mentions an online certification course offered by them on 'master of education in education leadership program' which according to them will help develop the skill set required for becoming effective instructors.
The study focuses on various techniques and categories of stakeholders. This helped us to identify the stakeholders and methodology to be followed for an effective feedback mechanism.

3. Methodology

The study of related literature published by various institutes reveals that the feedback from all the stakeholders works as an important pointer in the growth of the institution. Detailed discussion and brainstorming sessions were conducted at various college level committees and the components of the feedback process were finalized. Based on the institute policy and these discussions, the following four pillars of the feedback mechanism for our institute were identified.

1. **Students:** The curricular aspects enable students to decide their approach towards problem solving, suggest solutions to complex engineering problems useful to the society. The dimensions like courses offered, course structure and contents based on concept building, evaluation strategies were included in the feedback questionnaire. In this context, feedback from the students was obtained by framing the following questionnaire.
2. **Employer:** Organizations generating employment are the key pillars of academic institutions. Industries look forward to candidates who are ready to pursue their careers in their organizations. Feedback from the employers related to technology advancements, adequacy of theory and lab sessions, choice based courses, effectiveness of curriculum for higher studies and entrepreneurship is collected.
3. **Alumnae:** Strong and supportive alumni network is crucial for the success of the institution. 26 batches have graduated from the institute and our eminent alumni are at senior positions in renowned organizations. Hence, feedback from the alumni working in a large spectrum of the industry contributes to the progress of the institute. This feedback includes suggestions in the curriculum based on job opportunities and skill sets required.
4. **Parents:** The branding of any institution is dependent on the faith and trust of the parent fraternity. They look for a conducive environment in terms of infrastructural facilities and resources for the all-round development of their ward. Thus a feedback covering co-curricular and extra-curricular aspects was collected.

The detailing of the stakeholders related to number of respondents and their category is mentioned in Table 1.

Table 1: Respondent details

Sr.No.	*Category of Respondents*	*DAB*	*BoS*	*AC*	*GB*	*Questionnaire/Meetings*
1	*Industry Experts*	*2*	*2*	*1*	*1*	*Questionnaire and Meetings*
2	*Experts from Academics*	*3*	*3*	*-*	*-*	*Questionnaire and Meetings*
3	*Department Faculty/Management representatives*	*12*	*13*	*5*	*4*	*Meetings*
4	*Alumni*	*1*	*1*	*-*	*-*	*Questionnaire and Meetings*
5	*Current SY students*	*-*	*-*	*-*	*-*	*Questionnaire and Meetings*
6	*Current TY students*	*-*	*-*	*-*	*-*	*Questionnaire and Meetings*
7	*Current Final Year students*	*1*	*-*	*-*	*-*	*Questionnaire and Meetings*
8	*Parents*	*-*	*-*	*-*	*-*	*Questionnaire*

A separate questionnaire was designed considering all factors for every stakeholder. All the questionnaires are tabulated below.

Table 2: Alumnae Feedback

Alumnae Feedback		
Sr.No	Question No.	Question
1	QA.1	How do you rate the relevance of the curriculum with respect to the industry needs?
2	QA.2	Are adequate and appropriate program / open electives offered in relation to the technological advancements.
3	QA.3	Do you think internships should be a mandatory part of the curriculum?
4	QA.4	If YES for QA3, what should be its duration?
5	QA.5	Which of the following abilities , do you think, final year projects provide opportunity to develop
6	QA.6	Are the present laboratory courses from the curriculum sufficient to develop the required hands-on skills by the student?
7	QA.7	How do you rate the usefulness of co-curricular and extra-curricular activities undertaken in the college for development of students' personality?
8	QA.8	How do you rate the effectiveness of the curriculum for Placement?
9	QA.9	How do you rate the effectiveness of the curriculum for Higher Studies?
10	QA.10	How do you rate the effectiveness of the curriculum for Entrepreneurship?

Table 3: Parent Feedback

Parent Feedback		
Sr.No.	Question No.	Question
1	QP.1	With the given number of courses per semester does your ward get sufficient time for self-study and other activities?

2	QP.2	How do you rate the transparency of the assessment process?
3	QP.3	Are adequate and appropriate learning resources available for your ward at the institute? (Availability of reference books, text books, e-books, reading material, etc.)?
4	QP.4	Do you think internships should be the mandatory part of the curriculum?
5	QP.5	Do you think the college provides a conducive environment for learning?
6	QP.6	How do you rate the overall personality development of your ward while studying at the college?

Table 4: Student Feedback - First and Second Year

Student Feedback - First and Second Year		
Sr.No.	Question No.	Question
1	QSFS.1	Do you think the number of allotted lectures/practical is sufficient to cover the entire syllabus of most of the courses in your curriculum?
2	QSFS.2	With the given number of courses per semester do you get sufficient time for self-study and other activities?
3	QSFS.3	How do you rate the usefulness of the curriculum content in terms of concepts building?
4	QSFS.4	How do you rate the transparency of the assessment process?
5	QSFS.5	Are adequate and appropriate learning resources available for the course? (Availability of reference books, text books, e-books, reading material, etc.)?
6	QSFS.6	Do you find laboratory sessions useful to get hands-on experience related to the course content?
7	QSFS.7	Do you think tutorials help for better understanding of the subject?

Table 5: Student Feedback - Third Year

Student Feedback - Third Year		
Sr.No.	Question No.	Question
1	QST.1	Do you think the numbers of allotted lectures/practical are sufficient to cover the entire syllabus of most of the courses in your curriculum?
2	QST.2	With the given number of courses per semester do you get sufficient time for self-study and other activities?
3	QST.3	How do you rate the usefulness of the curriculum content in terms of concepts building?
4	QST.4	How do you rate the transparency of the assessment process?
5	QST.5	Are adequate and appropriate learning resources available for the course? (Availability of reference books, text books, e-books, reading material, etc.)?
6	QST.6	Do you find laboratory sessions useful to get hands-on experience related to the course content?
7	QST.7	Do you think tutorials help for better understanding of the subject?

8	QST.8	Do you think audit courses (like self-expression..., Courses without examination) should be included in the program?
9	QST.9	Do you think that humanities courses like Principles of Economics and Finance are useful for getting exposure in the related fields?
10	QST.10	For the offered program electives, were the prerequisite courses covered in the previous semesters?
11	QST.11	Are the program electives offered in relation to the Technological advancements?
12	QST.12	Did the courses stimulate interest in the engineering field?
13	QST.13	Would you like to undergo an internship in the industry?

Table 6: Student Feedback - Final Year

Student Feedback - Final Year		
Sr.No.	Question No.	Question
1	QSF.1	Do you think the numbers of allotted lectures/practical are sufficient to cover the entire syllabus of most of the courses in your curriculum?
2	QSF.2	With the given number of courses per semester do you get sufficient time for self-study and other activities?
3	QSF.3	How do you rate the usefulness of the curriculum content in terms of concepts building?
4	QSF.4	How do you rate the transparency of the assessment process?
5	QSF.5	Are adequate and appropriate learning resources available for the course? (Availability of reference books, text books, e-books, reading material, etc.)?
6	QSF.6	Do you find laboratory sessions useful to get hands-on experience related to the course content?
7	QSF.7	Do you think tutorials help for better understanding of the subject?
8	QSF.8	Do you think audit courses (like self-expression..., Courses without examination) should be included in the program?
9	QSF.9	Do you think that humanities courses like Principles of Economics and Finance are useful for getting exposure in the related fields?
10	QSF.10	For the offered program electives, were the prerequisite courses covered in the previous semesters?
11	QSF.11	Are the program electives offered in relation to the Technological advancements?
12	QSF.12	Did the courses stimulate interest in the engineering field?
13	QSF.13	Would you like to undergo an internship in the industry?
14	QSF.14	Did you find the internship useful?
15	QSF.15	Based on your experience of internship, how much should be the duration of the internship?
16	QSF.16	Did the final year project help you to develop the following abilities

Following the above methodology, feedback from all the stakeholders was collected online by designing a google form. Thorough analysis was carried out for every stakeholder's feedback. This feedback is collected specifically for the Instrumentation and Control Department.
The next section presents the results obtained from all the feedback in terms of useful suggestions and the detailed analysis of the same.

4. Results and Discussions

Responses from the stakeholders were collected based on the detailed questionnaire shown in Table 1 to Table 5. The rigorous analysis of the responses received from all the stakeholders was carried out. The received responses from every stakeholder are presented graphically in Figure 1 to Figure 6.

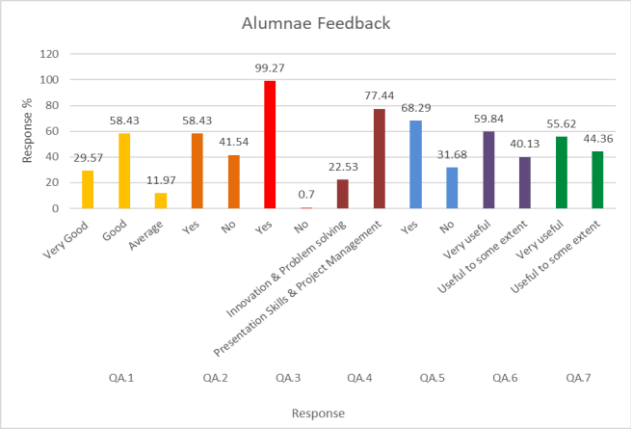

Figure 1: Alumnae Feedback

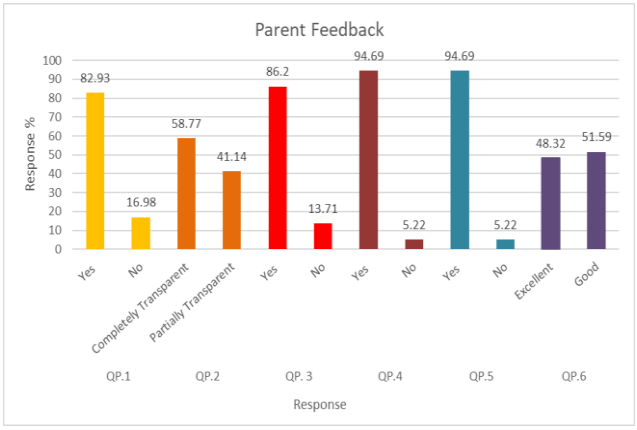

Figure 2: Parent Feedback

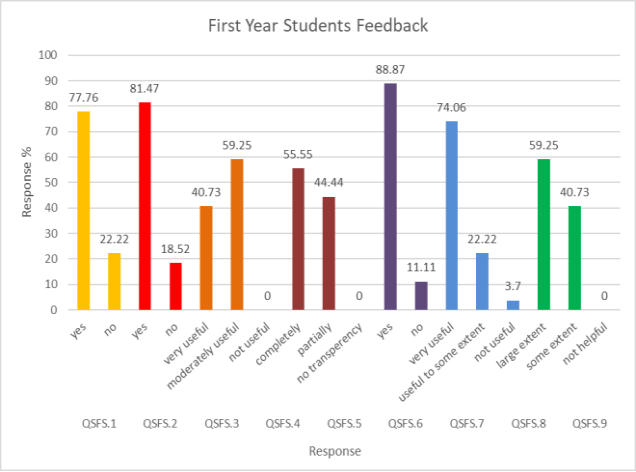

Figure 3: First Year Students Feedback

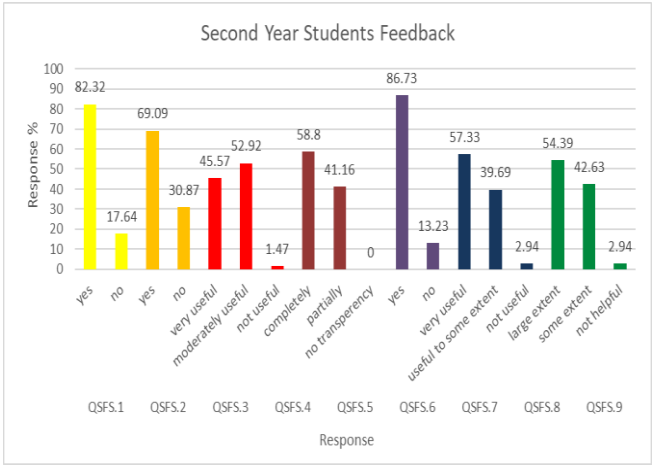

Figure 4: Second Year Students Feedback

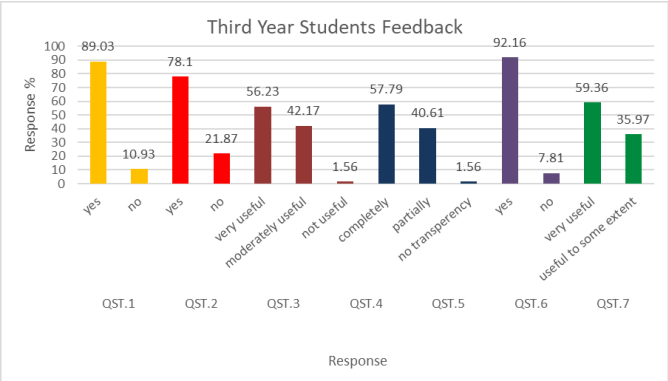

Figure 5A: Third Year Students Feedback

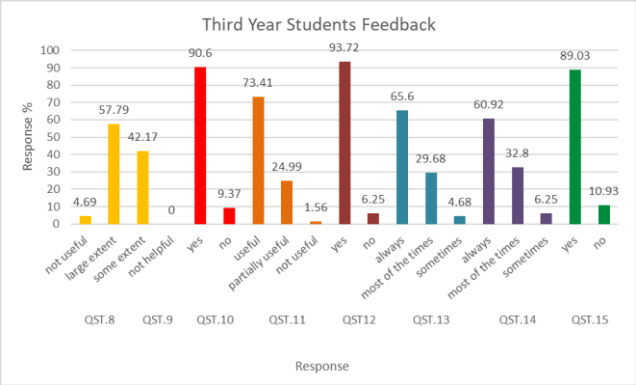

Figure 5B: Third Year Student Feedback

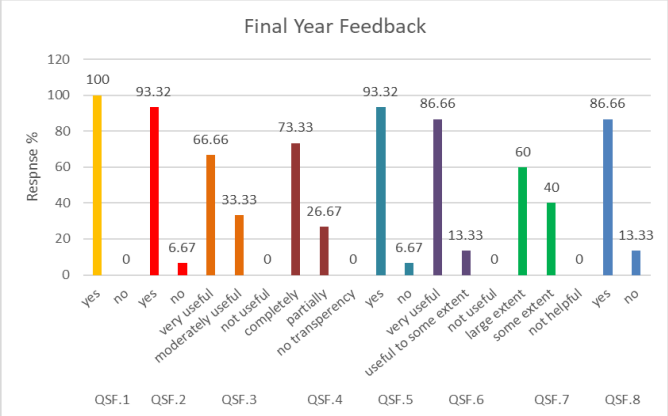

Figure 6A: Final Year Student Feedback

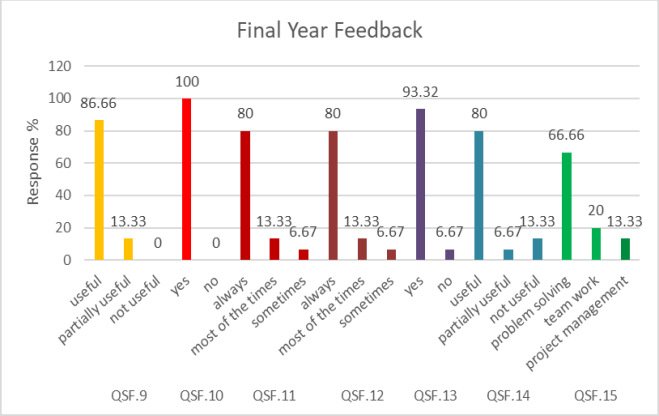

Figure 6B: Final Year Student Feedback

The survey overall reflects a good impression about the curriculum, infrastructural facilities, resources and the work culture of the department. Some useful suggestions are received from every feedback. Students suggested an increase in the number of lab and tutorial sessions. They also proposed to have more choice-based courses.

The industry experts and alumnae recommended some advanced topics, core courses and optional courses to be included in the curriculum. These recommendations were mapped on the industry needs. They also stressed on the industrial internship for a longer duration. A sense of satisfaction was observed from the parent's feedback about the resources and the practices followed in the department.

5. Conclusion

Regular feedback from stakeholders always improves the quality of imparted education. Feedback from all the stakeholders was taken using a systematic approach. The analysis of the feedback taken from students indicated that the students were satisfied with the course contents and its execution. They found the number of tutorials and hands-on sessions helpful. Considering the need of the hour, the sessions for various programming languages like Python and Java were increased in the revised curriculum. A wider basket containing more number of open elective courses and program elective courses is offered. The students were happy with the shared teaching material and Library resources. The courses like IoT (Internet of Things) and SEM (System Engineering Management) are offered as core courses based on the feedback from Alumni. The feedback from the employers related to technology advancement related courses, adequacy of theory and lab sessions, choice-based courses was found satisfactory. Revision of Automation based courses like Industrial Automation, Building Automation and Process Control is carried out in consultation with Industry experts. Feedback from the employers allowed us to add courses like Batch Automation, MIoT, Building Automation and Energy Audit, Smart Sensors, Computer Network in the revised curriculum. The increased duration of internship to 6 months and adequacy in the number of choice-based courses is appreciated. This structured feedback mechanism allows a department/ institute to identify the areas of improvement and work towards excellence.

Annexure

Code	Course title SY BTech Sem I	Code	Course title SY BTech Sem II
20 BSIN 302	Transform Calculus and Statistics	20IN 401	Fundamentals of Computer Networks
20IN 301	Sensors and Transducers	20IN 402	Control Systems
20IN 302	Industrial Instrumentation	20IN 403	Micro controller Techniques
20IN 303	Analog and Digital Electronics	20IN 404	Power Electronic and Drives
20HS301	UHV-2	20IN405	Unit Operations
20IN 305	Sensors and Transducers Lab	20IN 406	Control Systems Lab
20IN 306	Industrial Instrumentation Lab	20IN 407	Micro controller Techniques Lab
20IN 307	Analog and Digital Electronics Lab	20AC 401	Audit Course
20IN 308	Programming Practice Lab		
20AC301	Audit Course		

Code	Course title TY BTech Sem I	Code	Course title TY BTech Sem II
20IN 501	Process Loop Components	20IN 601	Process Instrumentation and Control
20IN 502	Digital Signal Processing	20IN 602	Industrial Automation
20IN 503	Internet of Things (IoT)	20IN 603	System Engineering and Management
20PEIN 501	Programme Elective-I 1. Modern Control Theory 2. Biomedical and Analytical Instrumentation 3. Advanced Micro controller Techniques	20HS 601	Management Information System (MIS)
20PEIN 502	Programme Elective-II* [NPTEL/Swayam Course]	20PEIN 601	Programme Elective-III 1. Building Automation 2. Embedded Product Design 3. MEMS
20OEHS 501	Open HS Elective –I	20OE 601	Open Elective-II 1. Bioinformatics 2. Avionics
20IN 504	Process Loop Components Lab	20IN 604	Industrial Automation Lab
20IN 505	Digital Signal Processing Lab	20IN 605	System Engineering and Management Lab
20PEIN 503	Programme Elective Lab-I	20PEIN 602	Programme Elective Lab-III
20AC 501	Self-Expression	20IN 606	Mini Project

Code	Course title Final Year BTech Sem I	Code	Course title Final Year BTech Sem II
20IN-P 701	Internship / Project	20IN 801	Process Data Analytics
20HS701	HS EPF – (Online)	20PEIN 801	Program Elective-IV 1. Process Modelling and Optimization 2. Artificial Intelligence and Machine Learning 3. Medical Device Technology
		20PEIN 802	Program Elective-V 1. Safety Instrumentation Systems 2. Computer Techniques and Operating Systems 3. Environmental Instrumentation
		20OE 801	Open Elective-III 1. Medical IoT 2. Instrumentation in Food and Agriculture 3. Digital Control
		20OE 802	Open Elective-IV 1. Smart Sensors and Systems 2. Building Automation and Energy Audit 3. Industrial Drives and Control
		20IN 802	Process Data Analytics lab
		20PEIN 803	Program Elective–IV Lab

REVISION OF CURRICULUM FOR FIRST YEAR ENGINEERING PROGRAMME FOR CCEW TO BRIDGE THE GAP BETWEEN BASIC SCIENCES AND ENGINEERING SCIENCES

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ABSTRACT

The framework of science education up to 12th Standard and next generation science standards can be considered to design a curriculum for first year of engineering programme. The main purpose of this is students learn core ideas/ fundamentals and ractices related to engineering applications as well as science. For which students will require quality curricular material to achieve these goals. The curriculum was designed as per the suggestions given by Board of subject experts as well as core department. This curriculum design includes a set of hypothesized critical components as per the engineering branch to encourage student engagement in learning, in practices as well as connecting engineering and science learnings to reach diverse students. The revised course structure of first year engineering is attached at the end of the paper for the reference as per the core department.

INTRODUCTION

The important pillars of engineering education are curriculum design, delivery and assessment. [1] [2] [3]. Among them curriculum design is one of the challenging task. Engineering education in India is undergoing a period of exceptional change. This is because engineering curriculum is influenced by different factors namely, globalization, rapid technology advances, climate change and inequality. Through the application of science and engineering, one can meet all of its basic needs: water, sanitation, food security, shelter, energy, transport. Thus, technological and scientific advances are leading exponential growth of innovation and opening a world of new possibilities and markets. Therefore, engineering curriculum needs to constantly strive to keep pace with these advances and in particular the contribution of engineering to these global opportunities and challenges. The curriculum designers need to understand the significance of technological and scientific advances as well as particular programme outcomes while framing the course for first year engineering.

Processes for designing first year courses:

After doing necessary and careful examination of the programme outcomes (PO)/ programme specific needs, interest of the students and general observation of course faculty, different courses were defined for first year level which not only are bridging the gap between basic sciences and engineering sciences but also considers technological and scientific advances in present times. Following steps were followed while revising as well as adding particular course at first year level.

Step 1:

Preparing course content:

Faculty designs the course keeping in view technological and scientific advances along with inputs from particular programme. Also considering credits and marks for the course, the contents of the course is developed.

Step 2: Formation of Course

• BoS Meeting is conducted with subject experts, alumnae and industry person to know their views on prepared course content. As per their suggestion modification or changes are done in course content.

• Course objectives and course outcomes are defined for every course referring to guidlines of Bloom's revised Taxonomy.

• Standard references for learning and contact hours (lectures, tutorials, and laboratory) are identified and accordingly the first draft of syllabus semester wise is prepared by all course groups of first year programme.

Step 3: Implementation of the course.

• The first year curriculum structure is presented to Academic Council for approval.

• The approved structure by Academic council (AC) is then presented to the Governing Body (GB) of the institute for its approval and implementation.

After following above mentioned steps for First Year Engineering Programme for CCEW in the new structure from A.Y. 2020-21 , two completely new courses are added namely Sustainable Engineering and Geoinformatics, whereas some courses are modified as per the requirement of particular Programme namely, mathematics, Fundamentals of programming Language, Engineering mechanics.

Data Collection and Analysis:

Before implementation of new courses as well as modifying some courses as discussed above feedback from stakeholders is integral and very important part of the curriculum development process for first year programme. Feedback is collected through different modes like personal interview/ interaction, online / offline meetings.

Detailed information of which is tabulated below in
Table 1.

Sr. No.	Category of respondents	DAB	BoS	AC	GB	Questionnaire /meetings
1	Academician out of CCEW	1	5	4	2	
2	Department/ college Faculty and Management representatives	5	10	4	2	

RESULTS AND DISCUSSION:

The view behind the added courses as well as the modified courses for First Year Engineering Programme are discussed below.

SUSTAINABLE ENGINEERING

Sustainability improves the quality of our lives, protects our ecosystem and preserves natural resources for future generations. In the corporate world, sustainability is associated with an organization's holistic approach, taking into account everything, from manufacturing to logistics to customer service. Sustainability is a critically important goal for human activity and development.
Sustainability in the area of engineering is of great importance, as it focuses on
1) The pervasiveness of engineering activities in the societies,
2) Importance in economic development and living standards, and
3) The significant impacts that engineering processes and systems had in past and continue to have on the environment in present times.
In the course, many factors that need to be considered and appropriately addressed in moving towards engineering sustainability are included. The course include appropriate selection of resources bearing in mind sustainability criteria, the use of sustainable engineering processes, enhancement of the efficiency of engineering processes and resource use, and a holistic adoption of environmental stewardship in engineering activities. In addition, other key sustainability measures are also addressed, such as economics, equity, land use, lifestyle, socio-political factors and population in the course. Conclusions are provided related to
Both the pathways for engineering sustainability and to the broader ultimate objective of sustainability.

GEO-INFORMATICS

Geoinformatics helps to support basic scientific inquiry as well as it helps to address complex social and environmental challenges (e.g., climate change, public health, migration, transportation safety and security) through the development of new theories and methodological tools. Geoinformatics is an excellence career option for individuals from engineering and science
backgrounds. This industry is growing at an impressive pace despite being at a nascent stage. The demand for proficient Geoinformatics professionals in this field will increase in the years to come. Moreover, Geoinformatics as a discipline has been accepted by people from academia and industry. Geoinformatics is multidisciplinary by nature as it integrates methodologies from computer science, geodesy, geography, cartography, remote sensing, GIS, GPS, digital image processing, artificial intelligence, cognitive psychology, etc., in order to understand Earth features and processes and solve its problems. Using Geoinformatics, one can study about Earth's surface features, such as human settlement, road network, water body, forest, wildlife and demography, etc. Thus this course, is dependent on skills of other disciplines as well.

GEO-INFORMATICS LAB

By understanding its multidisciplinary nature, any student can get interested into Geoinformatics and learn to quickly adapt to the need based on student prior experience with the real world. It is even very essential that every Government Department and IT professional realize the power of Geoinformatics as a decision support system. In about last four decades, Geoinformatics has grown as a major tool for collecting information on almost every aspect on the Earth. In fact, with the availability of very high spatial resolution satellites in the recent years, applications of Geoinformatics have increased multifold for a range of
applications related to emergency services, public health and epidemiology, transportation and infrastructure, mineral exploration, urban planning and land use management, in-car navigation systems, environmental modelling and analysis, military, agriculture, meteorology, climate change, oceanography and coupled ocean and atmosphere modelling, business location planning, telecommunications, crime mapping, etc.

Engineering Mathematics:

Earlier courses were referred to as Engineering Mathematics I, II and III. These were very general titles and they do not imply general content of the course. These courses were renamed depending on the content as follow:

1. Linear Algebra and Univariate Calculus (LAUC) (F.Y.B.Tech)
2. Multivariate Calculus (MVC) (F.Y.B.Tech)
3. Calculus and Probability (CP) (S.Y.B.Tech: E&TC)
4. Calculus and Statistics (CS) (S.Y.B.Tech: Mech, COMP, IT)
5. Transform Calculus and Statistics (TCS) (S.Y.B.Tech: Instru)

Major Changes were made in F.Y.B.Tech Mathematics Courses. Students take interest in learning the subject when they are able to see the applications in day to day life and hence the focus was to introduce real life applications of the concepts they learn. For example, students now learn how matrices are used in encrypting and decrypting a message. They also find it interesting as to how Eigen values and Eigen vectors are used in Genetics to decide the genotypes of an offspring, how matrix method is used in finding a solution to traffic flow problems and how a nutritionist can use matrix method to make the diet chart for patients. Applications based on Linear Transformation are also introduced which are used in computer graphics. Applications based on optimization using calculus are also introduced. Courses for the second year were revised based on the programme requirements. As per the feedback and suggestions from industry experts and Board of Study members, Statistics and Probability was introduced to all second year Mathematics courses. Some fundamental concepts like Complex form of Fourier series and Discrete Fourier Transforms were added as per Board of study members' suggestions.

Fundamentals of Programming Language:

In FPL I course, 'C' language is introduced in the syllabus which is common to Computer, Information Technology, E & T/C and Instrumentation & Control. Idea behind introducing this language is to build their logic building capacity. Lab conduction also towards building their logic development skills to solve simple real life problems. Students learn and implement solutions using different data types, operators, control structures. They identify different functions for a problem to construct a modular solution. Problem statements can be framed and expanded in such a way that it explores concepts, language constructs, logic of solution and simple application. Students will be encouraged to solve open problems in different domains. Assignments are designed to challenge students through code debugging, code improvisation and code transformation**.** In FPL I course for Mechanical branch, considering the latest trends in programming are added which include Python Programming instead of C. This would help the students from the Mechanical Department to be able to plot graphs using Python libraries. So, Python Programming was newly introduced for the students of the Mechanical Engineering branch.

Engineering Mechanics:

Engineering Mechanics course was for all branches/ programmes in previous first year programme but in new/ revised design it is kept for only Mechani9cal programme as it deals with analysis of forces that act on bodies and the resulting motions caused by those forces. Engineering Mechanics provides the basis for theory of machines, stress analysis, design engineering and machine dynamics.

- It aims at finding solutions through the integrated application of mathematical, scientific, and engineering principles.
- The course is designed with the aim to make the students understand and apply the principles of statics including the concepts of force analysis, equilibrium, friction, beam loads, centroid and moment of inertia.
- The dynamics part includes the application of principles of rectilinear motion, curvilinear motion and projectile motion. The course also covers the topics of D'Alembert's principle, work-energy principle and impact-momentum principle.
- The emphasis is on solving the problems based on real life engineering applications and to make students ready to take further courses like Analysis and Synthesis of Mechanisms, Strength of Materials, Machine Design and Dynamics of Machines.

CONCLUSIONS

This communication advocates the benefits of addition of new courses and some modified courses in First Year Engineering Programme for CCEW in the new structure from A.Y. 2020-21, these courses will ensure

1] Correlation of sciences and engineering sciences.
2] Advances in technology and sciences in present times.
3] Programme specific needs.
4] Students interest.

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ANNEXURE -I

F.Y. B. Tech. First Semester	
Course Code	Course Title
20BS01	Linear Algebra and Univariate Calculus
20BS02	Chemistry
20ES01	Basic Electrical and Electronics Engg.
20ES02	Fundamentals of Programming Language - I
20ES03	Sustainable Engineering
20BS02L	Chemistry Lab
20ES01L	Basic Electrical and Electronics Engg. Lab
20ES02L	Fundamentals of Programming Language – I Lab
20ES02L	Technical Skill Development Lab
F.Y. B. Tech. Second Semester	
Course Code	Course Title
20BS03	Multivariate Calculus
20BS04	Physics
20ES04	Engineering Graphics
20ES05	Fundamentals of Programming Language - II
20ES06	Geo Informatics
20BS04L	Physics Lab

20ES04L	Engineering Graphics Lab
20ES05L	Fundamentals of Programming Language – II Lab
20ES06L	Geo Informatics Lab

COURSE OUTCOME BASED COOPERATIVE TEACHING FOR ENGINEERING STUDENTS

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ABSTRACT
Cooperative teaching is a pedagogy that implements teaching one subject collaboratively with two teachers having expertise in the same subject but with different perspectives. This short communication explores co-teaching padagogy implemented for the subject Deep Learning in the Department of Computer Engineering, Cummins College of Engineering for Women, Pune. Different types of co-teaching are also listed in this paper.

INTRODUCTION

Cooperative teaching (or co-teaching) involves two professionals teaching together in the same classroom to benefit students with additional contents. It is important that co-teachers teach together heterogeneously. Co-teachers do not perform their roles as primary and secondary teachers. Rather, when two professionals educate students in co-teaching, two demanding skill sets can be combined for effective classroom functioning. In the 1990s, the term "Cooperative teaching" was shortened to 'co-teaching'. Teachers work together to manage time in the classroom and provide co-teaching strategies. (https://k12teacherstaffdevelopment.com/tlb/what-is-co-operative-teaching-or-co-teaching/; Abdul Rahim Hamdan et al. 2016).

RELATED WORK

There are 6 Models of co-teaching. Short description of these models is given here. In **Team Teaching**, two teachers share the same instructions for a single group of students in a different way to teach multiple approaches or perspectives to solve the same problem. In **Parallel Teaching**, students are divided into two groups and the same topic is taught to two different groups. In **Station Teaching** one teacher leads a station and the other teacher monitors behavior and supports station transitions. In the **Alternate Teaching** model, one teacher contributes instruction to the group and the other handles a smaller group to provide pre-teaching/ re-teaching. This model benefits students to understand missed contents or complete learning in specified time. **One Teach- One Collect Data** model is used to prepare for special education paperwork where data collection is needed. In the **One Teach- One Assist** model, teachers blend their work. Their area of focus is different. This method is useful for teachers to learn expertise from each other.

The implementation of co-teaching requires the approval of the administrator in terms of the number of teachers involved, the planning and implementation of programmes, and financial support. (Joanna Brendle, 2017) The success of a co-teaching partnership is based on the co-teachers' understanding and expertise in implementing research-based co-teaching models. (Anna Rytivaara, 2021)

METHODOLOGY

Co-teaching was implemented in the Department of Computer Engineering, Cummins College of Engineering for Women, Pune to teach Program Elective subject Deep Learning (DL) to Final year B. Tech. students for the first time for the batch AY 2019-20 in semester II. For this outcome based co-teaching padagogy, a plan was decided and was finalized by co-teachers. An approval was taken from the Head of the Department and the Principal of the institution.
The subject DL comes under the umbrella of Machine Learning (ML) and Artificial Intelligence (AI). Amongst six units in the subject, first two units focus on basics of ML and of Neural Network (NN) and third unit covers multilayer feed forward NN. Units four and five cover various DL architectures, algorithms and applications whereas the sixth unit covers introduction to advanced DL models and their applications.
The subject was taught by two teachers. First co-teacher was from an academic background and the other was a research scientist having experience in real time DL applications. The objective of this co-teaching was to teach students both theory and its implementation for real time applications. First three units included base preparation for the subjects and theoretical information about simple models. These units were taught by a first co-teacher from college. Next three units included theory of complex models and applications for the subject. Amongst these three units, fourth and fifth units and a few topics from 3rd Unit were taught by the second

co-teacher. Second co-teacher also explained various application areas of the subject. These applications were live projects developed under the guidance of a second co-teacher. Thus, students could map the outcome of the theory that they have learned with its already existing real time applications. Thus, this co-teaching is named as Outcome Based Co-teaching. This is a type of modified team teaching where one subject was taught by two professionals with their own skillset.
A feedback form was designed for outcome based co-teaching to find their understanding of topics taught by the second co-teacher. In this feedback students were asked to give a rating of their understanding about the topic and also write comments if they wish.

RESULTS AND DISCUSSION

There were 21 students enrolled for this program elective subject. Twelve students gave feedback. Students were told to give their feedback in the form of numbers between 1 to 4, where 1 being worst and 4 being best. They were also told to write some comments if they wish. 75% students selected option 4, 16% selected option 1 and 8% students selected option 3. No student selected option 2. Students also gave feedback that conducting such lectures is beneficial.
To observe their understanding, students were encouraged to select one topic in a group from the sixth unit and give a small presentation online. Students presented topics in groups and also shared their notes in one single common online document. This experiment was performed to find success in co-teaching. It was observed that students successfully presented an introduction to advanced DL topics from the sixth unit and could apply knowledge that they have learned.

CONCLUSIONS

Co-teaching was needed for this subject as there was a need to give input to students that require understanding of theory and implementation of that theory in industry or research for live applications. Outcome based co-teaching was implemented using a modified team teaching method. 75% of students found this type of teaching very useful. Students not only learned theory along with real time applications in this outcome based co-teaching, but also demonstrated their understanding by giving a small presentation about the introduction to advanced DL topics. Now there is a need to experiment with various co-teaching pedagogies and compare the feedback and analyze students' academic results.

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USE OF 'JEOPARDY-STYLE CLASSROOM QUIZ' TO REVISE CONCEPTS RELATED TO 'BIG DATA AND ANALYTICS' COURSE

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ABSTRACT

Game element in online education plays an important role. These gamification tools help instructors to increase engagement of students in classroom activity. Gamification is a creative way to revise concepts related to any academic topic. This paper explains the use of Gaming as an active learning method during conduction of online teaching classes for Big data and Analytics course.

INTRODUCTION

In the education sector, a pandemic situation has given opportunity to " Blended learning " in which students are using electronic media to learn new things. Students are getting practical and conventional learning experience. Active learning is one of the key points of blended learning which involves active participation of students in the classroom. Game based learning is part of active learning that promotes student engagement.

Jeopardy is a quiz based game. It can be played by any age group. Instructor can design a Jeopardy game to play in the classroom. This game can be played by individuals or in the team. Students will get benefited if it is played in the team as they can explore teamwork.

Instructors can use this game format to assess the students' knowledge during the unit test, end of the module test or cumulative / end semester tests. Instructors can take the help of these tools while reviewing the concepts or topics.

RELATED WORK

Gamification and game based learning are key points of teaching learning for the new generation of the learners and instructors. Jorge F. Figueroa-Flores[5] had given an overview of the use of gamification and game based learning to motivate and engage students in an effective way.

Ching-Hsuh Cheng Chung-House[2] has proposed a game-based learning system that will help to improve self-efficacy for student's learning. In this paper the author has suggested to map course contents with the games to carry out game based learning on more topics . This will get more attention from the learners in the e-learning scenario.

Game based learning experience in the daily teaching and will create a gamification environment in the course. Antonio Santos[4] has proposed the method for the teachers which describes an iterative approach for designing and using board games for daily teaching. Case study of this method shows that a student group who uses a gamification approach really motivated and performed well .

Ika Febriana Wati , Yuniawatika[6] overviewed the Covid-19 situation and its impact on elementary school learning. In this paper they have also suggested some of the tools and techniques to be used to implement game-based learning.

METHODOLOGY

Designing the game in the proper direction is an important task. Instructors have to take into the various aspects while designing the game. Instructors need to identify the topic , course contents for designing the game. To engage more students, instructors can decide the number of students . Rules and regulations to play the game also to be framed. On board game should be attractive. Background, font , colour scheme to be decided based on course contents.

Instructors need to take care that the game should be played in an interesting and fun manner. There should be time management while playing the game.

IMPLEMENTATION

Fractile is a Jeopardy-style classroom quiz. Five streams as per the subtopics of the unit of subject are selected. There are five levels in each stream. Every level carries varying marks. Higher cognitive questions are designed for the higher points.

There are five teams of students who are playing this game. There are four students in one team. Each team is allowed to select the stream for the question. Marks are given to the team, which gives the right answer. As the game succeeds, difficult and higher cognitive level questions can be fired by the faculty.

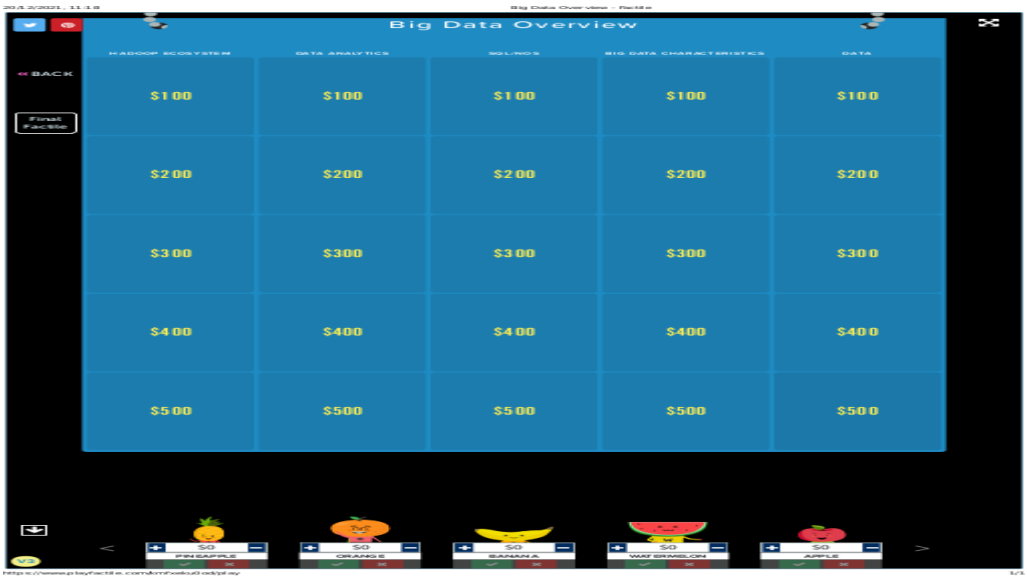

Figure 1: Game board grid of Fractile.

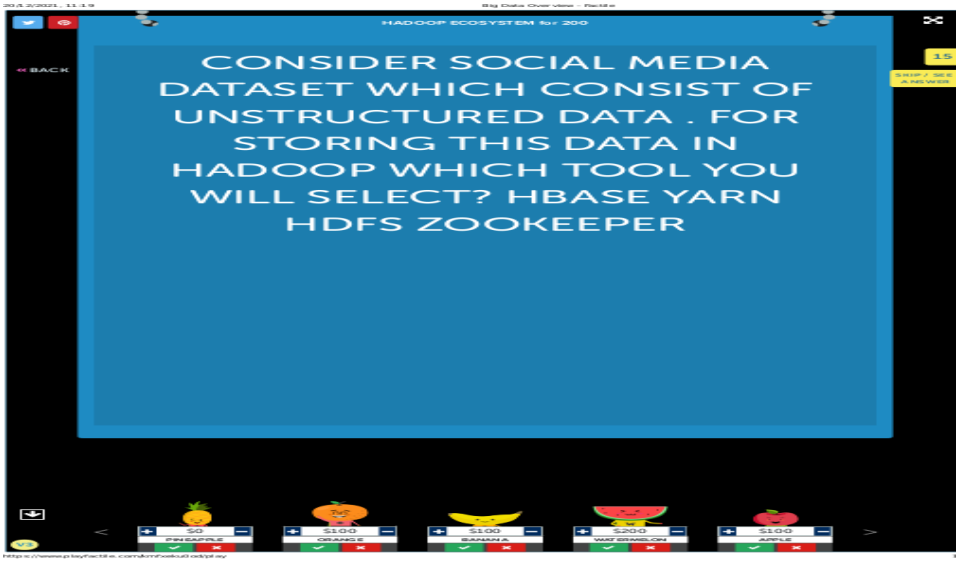

Figure 2: Sample question of higher cognitive level

INSTRUMENT: SURVEY QUESTIONNAIRE

Students feedback is conducted to understand their views on this activity. Figure 3 to 5 describes the feedback questionnaire and students' responses.

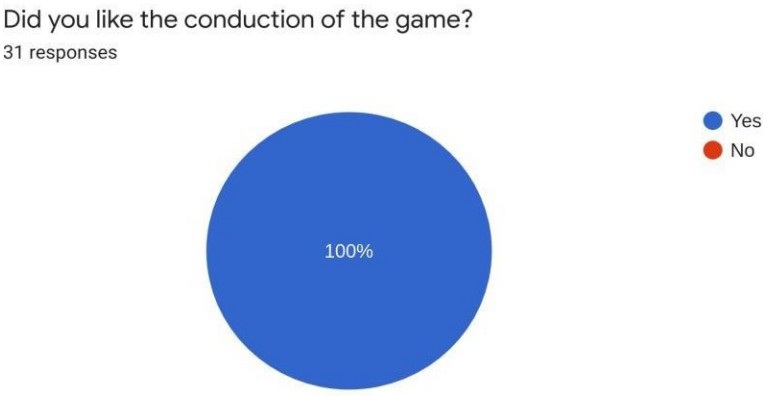

Figure 3: Question and student response about game conduction

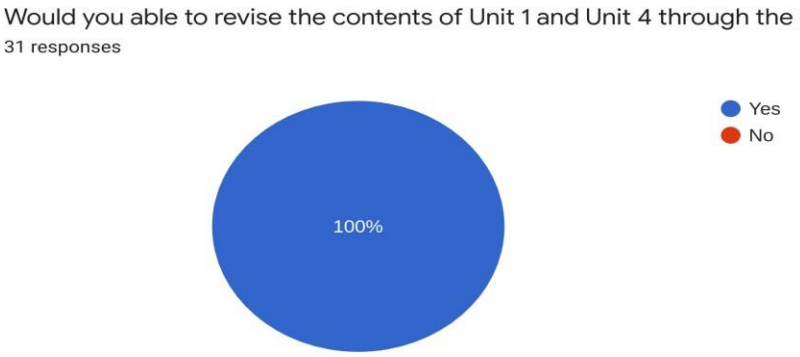

Figure 4 : Question and student response about revising concept

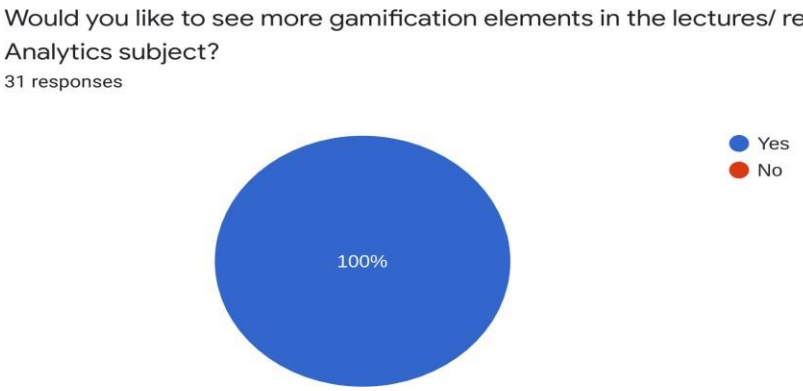

Figure 5: Question and student response about repeating game activity for other topi

RESULTS ANALYSIS AND DISCUSSION

This game helped students to improve their team building, leadership qualities along with technical knowledge. Eachteam tried to be competent with each other. Learners liked this new way of revising the concepts. They found this technique interesting and very helpful for better understanding the fundamental concept and its application.

CONCLUSIONS

Game based learning always helps the students to improve their technical as well as interpersonal skills. Students get more engaged during the classroom session. Instructors are also able to note that students found it difficult to answer some of the topics. Revision sessions for these topics can be arranged.

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Report on FDP on New Pedagogies arranged by College Pedagogy Cell

Four weeks 'On-line FDP on New Pedagogies' for all CCEW faculties was arranged from 29th November to 3rd December 2021

- On the background of the need to apply active learning strategies to engage students in online as well as offline classes CCEW Pedagogy Cell had organized an online one Week FDP on "New Pedagogies". Following expected outcomes were defined;

Expected Outcomes of this FDP are:
Ø *Possible change in PBL implementation process*
Ø *Use of guidelines for Student Centric MOOC development*
Ø *New pedagogy for individual course content delivery and evaluation*
Ø *Redefining outcomes w.r.to Employability for our students*

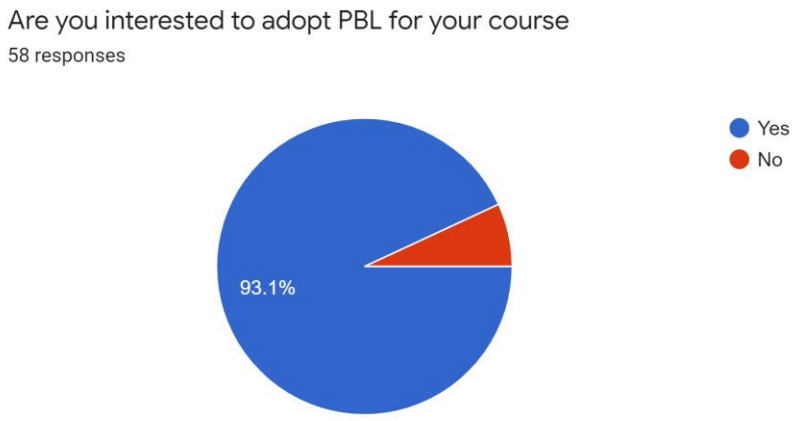
- **Identified speakers :**
  - **Dr. Vikas Shinde** [Professor in the Mechanical Engineering Department at Vishwaniketan iMEET, Khalapur, Mumbai],
  - **Dr. Sameer Sahasrabuddhe** [Director, Educational Multimedia Research Center (EMMRC), Pune, India],
  - **Dr. Vinay Kulkarni** [Head, Dept. of Mechanical Engineering, DYPCOE, Akurdi, Pune] and our own
  - **Dr. Sharada Ohatkar** and **Dr. Ashwini Deshpande** [Professor, EnTC Department, CCEW, Pune].

- The detailed schedule is as follows,

S. N	Topics	Identified Speaker	Dates
1.	**PBL with the context of NEP**	**Dr. Vikas Shinde**	**29th Nov. 2021**
2.	**Learner centric MOOC development**	**Dr. Sameer Sahsatrabuddhe**	**30th Nov. 2021**
3.	**New Pedagogy for Teaching & Evaluation**	**Dr. Vinay Kulkarni**	**1st Dec. 2021**
4.	**Pedagogy for OBE [w.r.to Employability]**	**Dr. Vinay Kulkarni**	**2nd Dec. 2021**
5.	**Individual faculty Website development**	**Dr. Sharda Ohatkar & Dr. Ashwini Deshpande**	**3rd Dec. 2021**

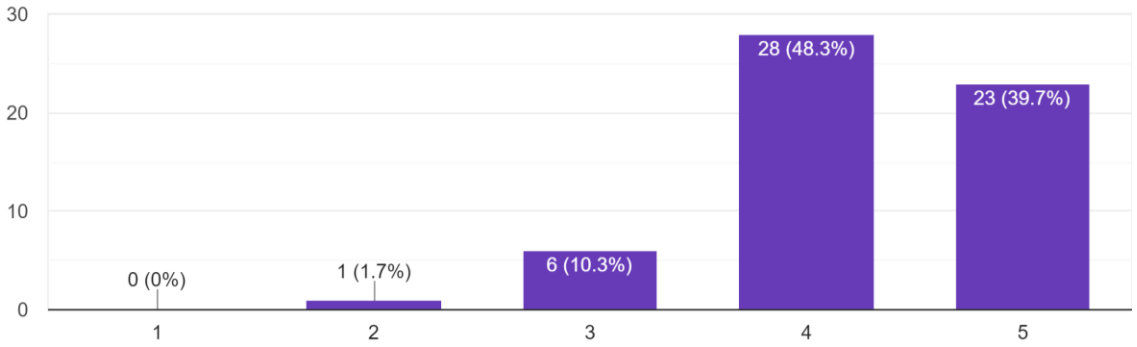
- It is observed that, all CCEW, Pune faculty members had participated and after every session during weeks' time, faculty completed the given assignments.

- Following are the responses collected through feedback form submitted by CCEW faculty members.



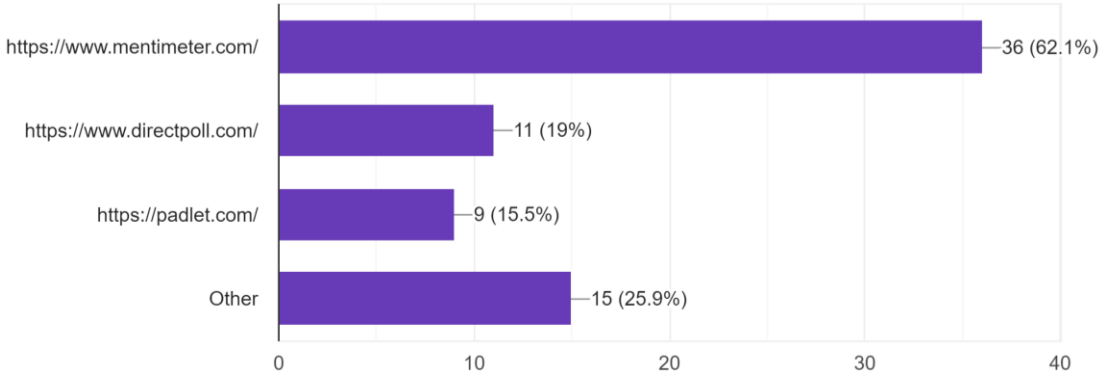
At what extent you feel that NEP can be implemented by adopting PBL [as explained by Dr. Shinde]

58 responses



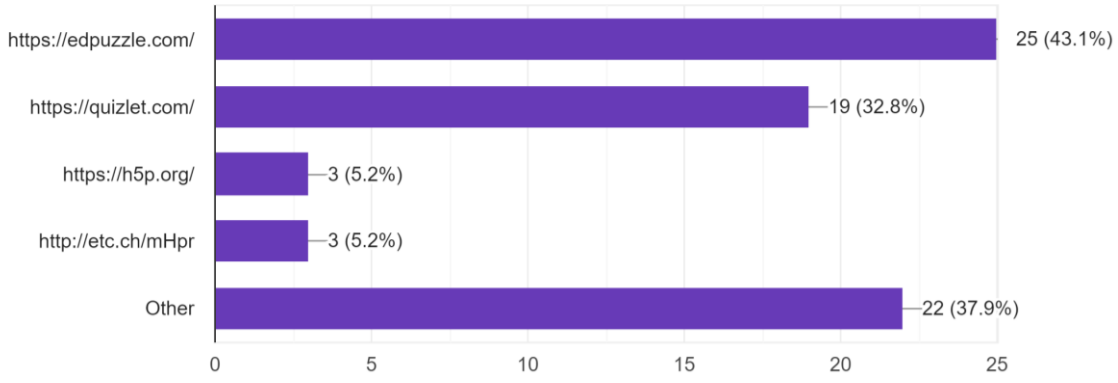
Which of the following you have explored on your own For conducting polls online

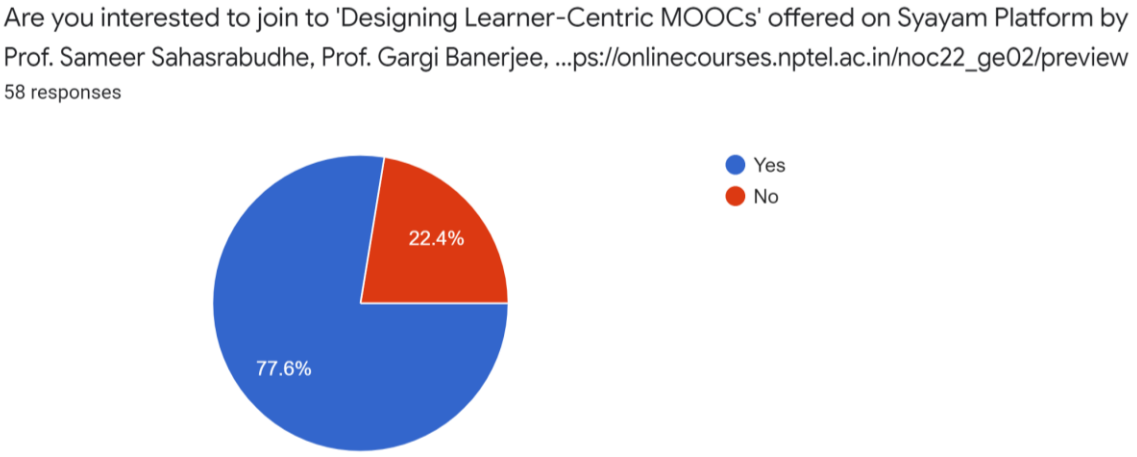
58 responses



Which of the following you have explored on your own For creating Puzzle and / or Quizzes

58 responses





- After successful completion/fulfilling certificate criteria, faculties had received certificates. One such example is shown here.. -→

CERTIFICATE

This is to certify that Mr. / Ms. / Dr. Chhaya S. Gosavi of Computer Department, Employee ID 182 has successfully completed Online Faculty Development Program on "New Pedagogies" conducted from on 29th November 2021 to 3rd December 2021 organized by Pedagogy Cell of Cummins College of Engineering for Women, Pune.

Dr. Anand Bewoor
Dean Academics &
Pedagogy Cell Coordinator

Dr. Madhuri Khambete
Principal,
CCEW, Pune

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