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Enhancing Performance in Co-curricular Activities Through Structured Approach in Minor Projects

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Abstract: This paper discusses the process of enhancing the student's performance through minor project. Minor projects are typically carried out in third year of four year engineering graduation. In this paper the rubrics based evaluation is defined to enhance the minor project experiences. Minor projects are one of the platform to showcase integrated learning experience. The defined rubrics are based on engineering design process. The experiment is done on 2012-2016 batch of 6th semester students. Performances of the students are show- cased through co-curricular activities and by participating in various competitions held across the country. With this practice achievement in co-curricular activity participation is increased from 15% to 65% for previous year batch.

Key words: minor project, co-curricular activities, ABET criteria.

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1. Introduction

This paper addresses a process to enhance the performance of student's in minor projects. Projects are the integral part of any engineering program where in students realize the innovative idea into working model or provide the solutions to the engineering problems, by applying the knowlede or skills aquired during previous semister. Minor projects are one of the tool to showcase the integrated learning environment[1-4]. The credits for minor project is 6 for the 2012-2016 batch. Theme is defined for the students to select the problem statement under different application areas. Engineering design and Project life cycle is followed during implementation of the project. In engineering design process the basic sciences, mathematics and engineering sciences are applied to convert an idea into a process or a product. The project is carried out under four stages. They are initiation, planning, execution and closure.

Evauation of the project is done through well defined rubrics. The rubrics for minor projects are designed as per engineering design process. Rubrics helped project guides in assessing the knowledge and skills aquired by the students. Projects are reviewed by the respective guide, and department expert review commitee formed by the Head of Department. Evaluation of the projects are carried out under 4 reviews. Projects are reviewed by respective guide, once in a week and a department commitee will review once in month. Students are encouraged to participate in co- curricular activities. Performance of

the students are showcased through co-curricular activities. This paper describes the excecution of minor projects for the third year students in electronics and communication engineering curriculum[5-11].

The organization of the paper is as follows. Section 2 describes the various stages in the implementation of minor projects. Sections 3 describes the evaluation scheme. Section 4 discusses the outcomes and finally the conclusions.

2. Minor Projects

The students are given with theme to select the problem statement. The theme given in third year is "Sense, control, Act: Measure the universe, Transform the world…" The objective of the project is to sense the data, process it and take decision based on the chosen application. The application areas are defined as:

I. Automotive - This area is chosen as it is an emerging field for the years ahead.

II. Assistive Technology - To aid the people with disabilities.

III. Medical - To design a cost effective solution for health related problems.

IV. Very Large Scale Integrated circuit (VLSI) - To design analog circuits.

In the category 1, 2 and 3 the students are using the sensor from the mobile phone and developing the application on android platform.

In order to carry out the project in android the students need to have knowledge of courses like engineering physics, mathematics, analog electronics, Microcontroller, signals and systems, HDL, communication and programming concepts of HDL, C/C++.

2.1 Guide lines for selection of a project

The following guidelines are set for the selection of problem statements

i. The project needs to encompass the concepts learnt in subject/s studied in the previous semesters, so that the student will learn to integrate the acquired knowledge to provide a solution to the defined problem statement for the mini-projects.

ii. Student can select a project which leads to a product or model or prototype. The selected project should cater to the blocks mentioned in the Figure 1.

iii. Time plan: Effort to do the project should be between 120-150 Hrs per team, which includes self study of an individual member (80-100 Hrs) and team work (40-50hrs).

iv. Learning overhead should be 20-25% of total project development time.

Figure 1: Block diagram of project problem statement

2.2 The project life cycle

Figure 2 shows the project life cycle. This includes,

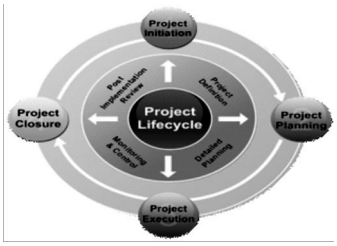

Figure 2 : The minor project life cycle [7]

Project initiation-This is the critical phase within the project life-cycle. It is also called the project pre-planning phase of the selected problem statement and work with multiple solutions. Here the project scope is defined and the appropriate methods for completing the project are determined.

Project planning-This is a part of project management which relates to the use of schedules to plan and subsequently report progress within the project environment.

Project execution-This involves systematic execution of project plan.

Project closure-This phase deals with the releasing of final deliverables, handing over the project documentation, writing technical papers is carried out.

Table 1: Mapping of a-k and evaluation rubrics for CIE marks

Review	Sl. No	Description	Marks	Inadequate Upto 25%	Average Upto 50%	Admirable Upto 75%	Outstanding Upto 100%
Review 1	1.	Need Analysis **ECOE(e)-1A**	3	Not done	Not well defined	Framed but not clear	Need analysis done .
	2.	Identify the Problem **ECOE(e)-1D**	2	Objectives are not clear.	Objectives and scope are not well defined.	Objectives clearly framed. Scope not well defined.	Objectives are correctly stated.
	3.	Understanding of professional ethics , Copy right, plagiarism **ECOE(f)-2A,2B**	2	Not read	Read but not understood	Read and understood	Read, understood
	4.	Problem definition and Application in societal contest **ECOE(e)-1D,1A**	3	Problem definition is not stated correctly.	Aware about the problem but objectives and scope not well defined.	Overall sound understanding of the problem and constraints.	Problem and scope are well defined to the proposed work.
	5.	Literature survey **ECOE(e)-1C**	5	Not reviewed any related material relevant to the proposed work.	Literature review/field survey done, but not consolidated properly.	Literature review is done and consolidated properly.	Literature review is done thoroughly highlighting the importance and the limitations of the previous works.
	6.	Identifying multiple solutions **ECOE(e)-3A**	5	Not developed alternate solution.	Developed few (min 3) alternate solutions.	Developed alternate solutions but no evaluation.	Developed alternate solutions and selection of optimal solution.
	7	Selecting the best suited solution with justifications **ECOE(d)-1B**	5	Not developed alternate solution.	Developed few (min 3) alternate solutions but selection is based on arbitrary criteria	Developed alternate solutions but evaluation does not consider all the factors.	Developed alternate solutions and selection of optimal solution considering all the factors.
Review 2	1	Distribution of work among team members by leader & team work **ECOE(d)-1A**	5	Work distribution is not done.	Leader identified, but work is not started	Leader identified, but work is not distributed properly.	Leader identified, but work has been distributed properly.
	2	Specification and identification of input & output **ECOE(e)-2A**	5	Input and output are not identified.	Input and output are identified.	Input and output are identified but not according to specs.	Inputs, outputs arr identified and are according to specs.
	3	Functional block diagram relating input & output **ECOE(e)-2B**	5	Incomplete functional block diagram	Functional block diagram is done but inputs and outputs are not stated.	Functional block diagram is done but inputs and outputs are not clearly mentioned.	Functional block diagram is done with proper inputs and outputs are not clearly mentioned.
	4	Design on paper with listing of the required components **ECOE(e)-2C**	5	Design is incomplete in terms of specifications and sub-blocks.	Design of sub blocks is satisfactory.	Design is completed in line with the specifications required.	Design is complete, with all functional blocks in working condition.
	5	Simulation of the design using any open source **ECOE(c-2D)**	5	No results and no analysis	Partial results but no analysis.	Inadequate analysis	Desired results are obtained and analyzed.
Review 3	1	Detailed block diagram with all specifications/ algorithms **ECOE(e)-5A**	10	Incomplete block diagram	Functional block diagram is done but improper interconnections of block.	Functional block diagram is done with proper interconnections of block but not according to specs.	Functional block diagram is done with proper interconnections of blocks according to specs.

	2	Integrating the functional blocks, debugging details and Partial demonstration of results **ECOE(c-2B,C,D,E)**	10	Functional blocks are not identified. No results	Functional blocks are implemented but improperly integrated Code/Simulation results are not proper.	Functional blocks are implemented with proper integration. Code/Simulation results are proper but unable to demonstrate.	Proper integration of functional blocks and debugging details are provided. Able to demonstrate the required result.
	3	Draft of the work **ECOE(g)-2C**	5	Not done	partial	Incomplete	Done
Review 4	1	Hardware/product implementation, **ECOE(e)-5C**	10	No results	Hardware implementation results are not proper.	Hardware implementation results are proper but unable to demonstrate.	Implementation done and demonstration of desired results.
	2	Analysis & demonstration of results of results **ECOE(e)-5B**	5	Design is incomplete in terms of specifications and sub-blocks.No results and no analysis	Design of sub blocks is satisfactory, partial results but no analysis.	Design is completed in line with the specifications required. Inadequate analysis.	Design is complete, with all functional blocks in working condition. Desired results are obtained and analyzed.
	3	Report submission in Latex (as given in the format) **ECOE(g)-1A,B**	5	Not followed the recommended format	Followed the format but the contents are not properly organized	Format and contents are satisfactory	The report is properly organized as per the recommended format.
	4	Paper presentations, awards. **ECOE(g)-2B,C**	5	Nil	Paper not applied for the conference ,not selected	Paper applied for the conference and selected	Paper applied for the conference and awarded.

Table 2: Evaluation rubrics of SEE

	Rubrics	**Marks**	Inadequate Upto 25%	Average Upto 50%	Admirable Upto 75%	Outstanding Upto 100%
Write up (15-Marks)	Problem definition	2	Objectives are not clear.	Objectives and scope are not well defined.	Objectives clearly framed. Scope not well defined.	Objectives are correctly Stated.
	Block diagram	3	Not given	Partial block diagram	Block diagram but incomplete i/p and o/p	Complete block diagram with proper i/p and o/p.
	Individual contribution to project	3	Work distribution is not done.	Leader identified, but work is not started	Leader identified, but work is not distributed properly.	Leader identified, but work has been distributed properly.
	Budget for the project	2	Marketing Survey not done	Marketing survey is done but budgeting not done.	Marketing survey and budgeting are done.	Proper allocation of budgeting done
	Application of project in societal context	5	Not aware of the social context	Application of the project not defined	Application of the project defined but not in social context	Application of the project defined with reference to social context
Oral	PPT preparation	5	Not prepared	Incomplete Preparation	Prepared but flow not maintained	Prepared with proper flow
	PPT Presentation	5	Not prepared	Incomplete Preparation	Presented but flow is not maintained	Presented with effective communication
Report (10 Marks)	Written presentation	10	Not followed the recommended format	Followed the format but the contents are not properly organized	Format and contents are satisfactory	The report is properly organized as per the recommended format.
Demonstrations &	Overall Explanation	5	Not prepared	Prepared but not well explained	Explained but not effectively.	Explained with effective communication
	Demonstration of results	5	Design is incomplete in terms of specifications and sub-blocks.	Design of sub blocks is satisfactory,	Design is completed in line with the specifications required.	Design is complete, with all functional blocks in working condition.
	Analysis of results	5	No results and no analysis	Partial results but no analysis.	Inadequate analysis.	Desired results are obtained and analyzed.

2.1 Criteria for team formation

The following criteria's are defined for the student's group formation

i. 2 to 4 students in a team.

ii. Role of a teammates: Project manager Software manager and Hardware manager

iii. Teams will be formed by the faculty and Head of the department.

2.4 Role of a Guide

The primary responsibility of the guide is to help students to understand the meaning and need of various stages in the implementation of the project. At every stage of the project development, guide should help towards its successful completion as per the predefined standards.

2.5 Steps for the students to carry out a project:

i. Define the problem

ii. Specify the requirements

iii. Specify the design in the understandable form (Block Diagram, Flowchart, Algorithm, etc)

iv. Analyze the design

v. Select appropriate simulation tool and development board for the design.

vi. Implement the design

vii. Result representation and analysis

viii. Prepare a document and presentation according to the format given

3. Evaluation Scheme

Evaluation is done based on the rubrics given in Table 1 and 2. This is under two phases. They are continuous evaluation scheme (CIE) and semester end evaluation scheme (SEE). The Table 1 and 2 shows the rubrics and marks distribution for the CIE and SEE. These rubrics are based on the engineering design process.

3.1 Continuous internal evaluation (CIE) and semester end evaluation (SEE)

i. Project shall be reviewed and evaluated by the concerned Guide once in a week for 50% of the marks.

ii. Project shall be evaluated by the review committee, once in a month for 50% of the marks

The comparisons of the credits distribution for the year 2014-1015 is as shown in Table 3. This is the major change in curriculum and led to the promotion of co-curricular activities.

Table 3: comparison of the credits distribution

Year	Credits distribution
2014	3
2015	6

4. Outcomes

The course project outcome is measured w.r.to the rubrics designed as shown in Table 1. The tremendous increase in the participation of co-curricular activities is achieved. Table 4 shows the comparison of participation in co-curricular activities for the year 2015- 2014. The data shows the increase in state level and national level participation.

Table 4. Comparison of participation in co-curricular activities for the year 2015- 2014.

Year	Number of batches	Number of awards won	Percentage	State level	National level
2011-15	40	6	15%	5	1
2012-16	40	26	65 %	7	7

In automotive sector out of 22 batches, 15 of them won the prize in various categories as listed below.

i. Paper presentation at Gauhati university and Pleiades 2015

ii. 8 papers selected at Sristi-15, Bangalore

iii. 1st prize in VERVE held by ISSATE, Bangalore

iv. Four of the projects at KPIT SPARKLE

A. Medical – (2 project batches out of 4)

i. SRISHTI-15 project exhibition

B. Assistive - (5 project batches out of 8)

i. IEECE conference, Kochi, paper presentation and Pleiades-15

ii. Avishkar conducted by SRISHTI-15, 2nd place

iii. Idea impact in SRISHTI-15, 3rd place

iv. Paper at BITS, won 3rd prize

C. VLSI – (4 project batches out of 6)

i. Two papers at SRISHTI-15, Bangalore

ii. A project at International conference, Don Bosco, Bangalore, won 3rd prize

iii. Paper presentation at NSMT-2015, Suratkal

Figure 3 shows the mapping of outcome elements with the rubrics. The evaluation scheme is designed as shown in Table 1. The focus is on outcome c,e,f and g. In review 1 the highest score is 8.1 for need analysis and alternate solutions. and the least score is 6.9 for literature survey. In review 2 the highest score is for functional block diagram and the least is for distribution of work among team members. In review 3 the highest score is for detailed block diagram and the least is for draft of the work. In review 4 highest is for Analysis of results and the least is for paper Presentations and awards.

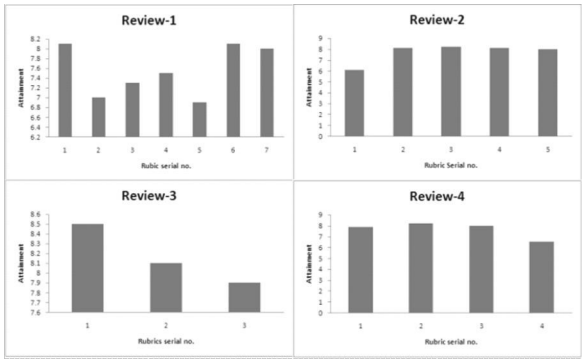

Figure 3: Outcome measurement for review 1,2,3 and 4

5. Conclusion

Theme based Minor projects course with 6 credits introduced in the pre final year students of 2011-15 batch. Students have followed engineering design process in implementation of the projects. The rubrics are redesigned to asses the student's projects. Students are encouraged to participate in various competations held across the country. With this practice, we achieved 65% participation in co-curricular activity.

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