

# A Study on Challenges and Opportunities in Teaching Programming Subject to First Year Computer Science and Engineering Students : In the perspective of faculty and student

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**Abstract:** Faculty experienced in teaching first year undergraduates agree that the students' in first year face a number of challenges. First year students are not only developing academically and intellectually, they are also establishing and maintaining good relationship around them, developing an identity, deciding about career and life style and developing integrated philosophy of life. Due to the gap in their school and engineering curriculum, learning the programming subject in their first semester become more conspicuous. In this paper, an attempt has been made to study and investigate various available opportunities and challenges faced by both fresh and experienced faculty to teach the “Computer programming in c language”. A study has been conducted which comprises of a set of questions for which a collective response from the end users have been obtained. The results of this study enlighten various key areas to face the challenges and best ways to work with opportunities.

**Keywords:** Computer Programming, Engineering teaching, Challenges, opportunities

## 1. Introduction

The programming skills are treated as an art in IT industries. Learning programming is generally considered as hard part and it is observed that programming courses having high dropout rates. Being an engineering student, especially chosen the computer science stream, one should learn and become master in all the programming languages offered in the curriculum to deserve their place in the industry.

For any specialization of student, in their course of study they are having “Computer programming in C” in first semester. Almost all universities and engineering colleges in India have this course in their curriculum [Jaime Nunez et al, 2013]. This course plays a major part of engineering graduates to strongly lay their foundation on programming skills. Since this is the fundamental course to take them to learn further programming languages like C++, java, etc., this has become mandatory for them to have complete knowledge on this course. Unlike any other courses in the first semester, this course has various class room challenges to teach as well as to learn [Diana Cukiermanl, 2014].

## 2. Approach

In this section few important challenges faced by faculty while teaching this course have been put forth for a brief discussion. A survey has been conducted for 50 faculty who had taught already and teaching this

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course. This survey consist of two parts of questions among which one part to be answered on graded weight from the lowest value of 1 to highest value of 5 and another part to be answered as descriptive. The grades are considered and designed on the following basis [Mohamed Galaleldin, 2016]

Grade 5: Excellent

Grade 4: Very Good

Grade 3: Good

Grade 2: Fair

Grade 1: Poor

This survey consists of the following questionnaires [Jayne Eaden et al, 2017].

#### A. Graded Questions for faculties

1. How important is this course for engineering?
2. How much you are interested to teach this course?
3. What level of curriculum gap on students for teaching this course?
4. How important to learn this course so as to learn other programming languages?
5. How important to study this course to fit with the industry?
6. How do you rate the level of student's interest on learning this course?
7. Rate the student's cooperation with faculty in the class.
8. Rate the student's skill on solving the problems.
9. Rate the student's error free program writing skills.
10. Rate the student's skill on debugging the program.

#### B. Descriptive Questions for faculties

1. Write Reasons for student's failure in this course.
2. Did you face any difficulties in the class while teaching this course.

3. How could you handle the students who already possessing and not possessing the basic knowledge on programming?
4. Which are the best practices you adopted to teach/ demonstrate this course?
5. Which part/place/point of the course the students lose their interest on learning this course? Write the reason for this.

Like questionnaires for faculties, we have designed a set of questionnaires for evaluation of this course in student's perspective. The two parts of questionnaires as follows.

#### C. Graded Questions for students

1. How do you rate the content of this course?
2. Rate your interest on learning this course.
3. Rate your course instructor knowledge on this course.
4. Rate your course instructor's teaching skills .
5. Rate your course instructor's teaching methodologies.
6. What is the level of your programming knowledge /skills after completion of this course?
7. What is your level of debugging skills?
8. What is your level of error free programming and problem solving?
9. What is the level of support given by lab instructors in lab sessions to do the programs?
10. How friendly is the faculty with the students?

#### D. Descriptive Questions for students

1. In what way the curriculum gap has been filled to take this course.
2. In which point/place/part of the course you lose your concentration on this course. What is the reason for that?

3. What are the skills and teaching methodologies you have expected from your course instructor and whether he/she possess all those expectations?
4. Which is the best part of learning on this course?
5. What kind of changes/improvements you need on this course's content and instructor?

### 3. Results and Analysis

A survey has been conducted on 50 randomly chosen engineering faculties. Their answers for graded questions were averaged and presented in the below table 1.

**Table 1. Results of Survey taken from the 50 faculties who handled computer programming subject**

| S.No | Question                                                                 | Grade | % of faculty opted this grade |
|------|--------------------------------------------------------------------------|-------|-------------------------------|
| 1    | How important is this course for engineering?                            | 5     | 100                           |
| 2    | How much you are interested to teach this course?                        | 4     | 90                            |
| 3    | What level of curriculum gap on students for teaching this course?       | 3     | 72                            |
| 4    | How important to learn this course to learn other programming languages? | 4     | 86                            |
| 5    | How important to study this course to fit with the industry?             | 2     | 46                            |
| 6    | How do you rate the level of student's interest on learning this course? | 4     | 66                            |
| 7    | Rate the student's cooperation with faculty in the class.                | 2     | 76                            |
| 8    | Rate the student's skill on solving the problems.                        | 2     | 94                            |
| 9    | Rate the student's error free program writing skills.                    | 2     | 80                            |
| 10   | Rate the student's skill on debugging the program                        | 2     | 58                            |

The summary of different answers given by the faculty for descriptive questions is as follows.

Major percentage of faculty has pointed that student's lack of interest leads to their failure in this

course. The faculty struggled to handle the class when the class comprises of both science stream and computer science stream, students with and without possessing some basic knowledge on computer and basic programming, students from urban and rural background. The faculty answered that it is a great challenge to teach the course in the class since the class consists of students in diversified streams such as who possess knowledge does not have any basic knowledge in computer programming of the same class.

The course instructor's usually adopt only common and usual pedagogy methods of teaching. From the teacher's answers it is observed that the student's lose their interest and concentration on this subject when they does not get a clear view on a particular topic and as well there might not be continuity in the course if they were absent for consecutive classes.

Later, a survey has been conducted on 100 randomly chosen second year engineering students. Their answers for graded questions were averaged and presented in the below table 2.

**Table 2. Results of Survey taken from the 100 Students who studies Computer Programming subject**

| S.No | Question                                                                                 | Grade | % of students opted this grade |
|------|------------------------------------------------------------------------------------------|-------|--------------------------------|
| 1    | How you rate the content of this course?                                                 | 4     | 67                             |
| 2    | Rate your interest on learning this course.                                              | 5     | 79                             |
| 3    | Rate your course instructor knowledge on this course                                     | 3     | 59                             |
| 4    | Rate your course instructor's teaching skills                                            | 3     | 58                             |
| 5    | Rate your course instructor's teaching methodologies                                     | 3     | 61                             |
| 6    | What is the level of your programming knowledge /skills after completion of this course? | 3     | 74                             |
| 7    | What is your level of debugging skills?                                                  | 4     | 47                             |
| 8    | What is your level of error free programming and problem solving?                        | 3     | 39                             |
| 9    | What is the level of support given by lab instructors in lab sessions to do the programs | 2     | 44                             |
| 10   | How friendly the faculty with the students?                                              | 2     | 51                             |

The synopsis of different answers given by the students for descriptive questions has been given below:

- Students have undergone bridge course for few days so as to get the basic knowledge on the basics of computer science only but not on programming language basics.
- They lose their interest when they are unable to understand the topic.
- This generation expect the faculty to be very friendly with them and must interact with them.
- Various innovative teaching methods could be implemented instead of chalk and talk.
- In few situations, the faculty were not able to clear their doubts.

#### 4. Challenges and Opportunities

From Table I, II and answers for descriptive questions, we observed that there are few challenges that the faculty who teach the course “Computer Programming in C”. They are listed below:

1. They have to face the problem of filling the curriculum gap for science stream students, in order to make them to complete the course successfully.
2. While teaching, they have to relate the course content to industry relevance by giving real time examples.
3. A Faculty has to adopt the best teaching learning methods to engage the students with full concentration throughout the course.
4. They have to make the students to be a problem solver.
5. The bridge course has to be conducted effectively for programming part alone.
6. Faculty must possess rich knowledge in computer programming concepts and problem solving.
7. Their contribution must be extremely extended in the lab session to associate with the students to solve the problems.

8. A friendly relationship must be maintained towards the student to get their full cooperation towards the class.

Even the challenges are serious matters for the faculty, they also have sensible opportunities with this course. From the study it has been observed that the students are fresh minds and novice to programming languages, faculty can get the following opportunities,

1. Once a faculty teaches this course to a set of students, then it will be easy or comfortable for him/her to teach further programming courses like C++, java, etc, in further semesters as per the curriculum design for the same set of students
2. The knowledgeable teacher can become hero for their students.
3. Since, they are fresh minds, they can be educated in a right way with burst of knowledge.
4. The faculty can turn the students to be a more attentive in the course.
5. Maintaining the student's discipline will be easy.

#### 5. Conclusion

Few attributes like stream of students, learning skills etc have been considered for the survey. It has been observed that the survey has enlighten few attributes that an engineering faculty could follow to teach the programming language. It is also understood that the primary job of the faculty is to make the students to excel with programming skills. Based on the observations of the survey, various challenges for faculty on which they have to strengthen their skills have been discussed in the above sections.

In addition, number of opportunities has also been stated through which they can enjoy and utilize those to their growth. The main outcome of the survey shows that the engineering faculty who ever teach this course must have rich knowledge and adopt new innovation methodologies to make the students to learn the course effectively and efficiently.

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