A SURVEY OF SOFTWARE ENGINEERING COURSES

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Together with the recent, rapid growth in numbers of technical papers, survey articles, symposia, conferences, and books, there is also a corresponding increase in software engineering education activities. In order to obtain some insight into the number and nature of course offerings, Peter Freeman of the University of California, Irvine, published a survey form in early 1977 in both the ACM Software Engineering Notes and the IEEE TC/SE Newsletter. Figure 1 replicates this survey form. Most responses were received by April, 1977. Recently, Peter Freeman forwarded these responses to A.A.J. Hoffman of Texas Christian University for analysis and reporting.

There were a total of 28 responses from 26 traditional educational institutions, offering regular and special courses, industrial organizations, and professional development companies. Table 1 is a list of the organizations represented by survey respondents. While most responses came from the United States, others originated in France, Canada, and the United Kingdom. The majority of the respondents simple returned the completed survey form, while others submitted course outlines and brochures. Software Engineering was the most popular course title (used by ten different organizations). There were two each with titles of Introduction to Software Engineering, Software Design, and Advanced Software System Design. The complete list of course titles is as shown in Table 2.

Items 3 and 4 on the survey requested course level (beginning, intermediate or advanced) and type (undergraduate, graduate, professional development, manufacturer). The tabulation of responses to items 3 and 4 are shown in Table 3. Most courses are shown to be intermediate to advanced graduate, although the bulk of the undergraduate offerings are listed as intermediate. The latter result appears to be inconsistent.

All the respondents (28) offer courses in lecture form with eight indicating concurrent laboratory. Eight titles are offered as seminars both in conjunction with a lecture series and by themselves. No respondents indicated offering a speaker series.

The rapid growth in courses is shown by responses to the "date first offered" item. No courses were listed as beginning prior to 1972. In that year only two were offered. Table 4 shows the rapid growth in course starts from 1972, with 2, to 1977, with 8 starts. Most responses indicated that offerings were repeated 1 to 12 times. The institutions of higher education offer courses each semester while professional development groups offer courses more frequently. It appears that all courses are offered repeatedly and regularly once initiated. Furthermore, they are well attended. Some classes average 90 students, while others average as low as 5. The most prevalent size average is in the range of 20 to 25 students. The length of the offerings ranged from one four hour session to a 15-week one semester university class, meeting one hour, three times each week plus laboratory. Most fall into the latter category. The shorter courses (3 to 10 weeks) tend to be most intense with some scheduling 6 or 7 hours of class per day.

It is of interest to note that in almost every case the persons listed as instructors also are course developers. The course materials listed include textbooks, lecture notes, and reprints of technical articles. Reprints are the most prevalent course material used, with a range of one to 30 reprints per class. The average number of reprints used was four. A few instructors indicated use of visual aids and audio cassettes. Some outside speakers were also indicated.

The required work for semester courses typically included a series of readings, four or five programs, and a term paper. One class offered by D.J. Reifer of UCLA includes a discussion topic each session during which controversial issues are debated. Anita Jones

of Carnegie-Mellon University uses different teams of three students each to create, test and modify each other team's work.

Although most respondents reported that courses were still in early stages of development, all are pleased with their courses and the response of the students. One problem encountered by several instructors was that of introducing real world problems and applications into the course. One instructor suggested separating real and applied methodologies into two courses. Many respondents like to spend as much time as possible in testing.

CONCLUSIONS

The rapid growth of software engineering precludes any formal status report based on data over one year old. Furthermore, it is not clear to what extent this survey reached or was returned by any reasonable percentage of the potential respondents. Nevertheless, the survey shows that a wide range of software engineering courses are available, that most respondents offer only one course, no one offerer has a "complete" set, and that no formal degree programs entitled "software engineering" are listed.

RECOMMENDATIONS

There is a real and urgent need to deceminate detailed information about software engineering education to textbook authors, curriculum developers, etc. Using the results of this survey as a basis, a new survey should be prepared and distributed to a widely diverse constituancy of potential respondents. Also, the results of the survey should be made available more quickly than this survey.

SOFTWARE ENGINEERING EDUCATION SURVEY

USE ONE SHEET PER COURSE — PLEASE RETURN BY 1 FEBRUARY 1977

1. Course Title _____

2. Where offered (organization and department) _____

3. Course level (beg., inter., adv.) 4. Type (undergrad, grad, prof. devel., mfr.)

5. Form of course - circle all applicable (lecture, lab, seminar, speaker series)

6. Average nbr of students: _____ 7. Number of times offered: _____

8. Date first offered: _____ 9. Length (elapsed time): _____

10. Intensity (hrs/week or day) _____

11. Course developer: _____ 12. Most recent instructor : _____

13. Book(s) used: _____

14. Reprints used (nbr of): _____

15. Exercises: (nbr/size/type): _____

16. Films and other visual material: _____

17. Number of outside speakers used: _____

18. Other materials: _____

19. Please provide a one-paragraph, catalog-type, description of the course:

20. Comments

21. Person to contact for additional information (include phone):

22. Respondent (if different from #21):

23. PLEASE ATTACH A SYLLABUS OR OUTLINE IF AVAILABLE

RETURN TO PROF. PETER FREEMAN, DEPARTMENT OF INFORMATION AND COMPUTER SCIENCE, University of California, IRVINE CA 92717

TABLE 1
List of the Organizations Represented by Survey Respondents:

Bucknell University
Carnegie - Mellon University
College of William & Mary
Digital Systems Laboratory, Ratheon
EDF-CEA-IRIA (France)
Fairleigh Dickinson University
IBM Systems Research Institute
Massachusetts Institute of Technology
Meridian Mutual Insurance Company
North Carolina State University
Northeastern University
Polytechnic Institute of New York
RCA - Government Systems Division
Southern Illinois University at Carbondale
Southern Methodist University
Stevens Institute of Technology
Syracuse University
Systemhouse, Ltd.
Taylor University
UCLA, Extension
University of California, Irvine
University of California, Irvine, Extension
University of Houston
University of Liverpool
University of Saskatchewan
University of Texas at Dallas

TABLE 2
Course Titles

Advanced Programming
Advanced Software System Design
Computer Systems Engineering Management
Design of Large-Scale Software Systems
Fundamental Structures of Computer Science
Information Systems Analysis
Introduction to Software Engineering
Management Information Systems
Principles of Advanced Programming
Program Analysis and Testing
Program Certification
Programming Style
Software Design
Software Design Techniques
Software Development Projects
Software Engineering for Technical Management
Software Engineering Methods
Software Reliability
Special Topics in Software Engineering
Structured Programming
Topics in Software Reliability

TABLE 3
Level and Type of Courses

	Beginning	Intermediate	Advanced
Undergraduate	2	8	2
Graduate	1	5	8
Professional Dev.	3	3	1
Manufacturing	0	0	2

TABLE 4
Number of New Course Starts

Year	Number of First Offerings
1972	2
1973	2
1974	5
1975	4
1976	6
1977	8