

SP - An Improved Android Mobile Application for the Course System Programming – A New Way of Teaching the Course during Pandemic

Sunita M Dol

Computer Science and Engineering Department, Walchand Institute of Technology, Solapur, India
sunita_aher@yahoo.com

Abstract: SysPro is an android mobile application for System Programming course of Third Year Computer Science and Engineering. The old version of this app with name “SysPro” is available on Google Playstore with very good statistics of total downloads - 5000+ and rating - 4.6. This course is core course of Computer Science and Engineering and base for the course Compiler Construction. So during pandemic for effective teaching of this course, the SysPro app is updated by modifying the content as well as adding new contents to existing app. So this SysPro app is modified and renamed SP (System Programming) app by adding more content and made available on Google Playstore with the name “SP App for System Programming” for benefit of the students. This app is also having rating – 5.0. This app contains Notes, PPT, Question Bank – Multiple choice questions as well as subjective questions, Handouts, Programs, and Quiz. In the new version, handouts are added which can be used by students during the laboratory session for implementing the problem statement of this course.

In current study, one group post-test method is used to check the effectiveness of this tool on 72 students of Third Year Computer Science and Engineering. Statistical analysis using t-Test is performed on the marks obtained by students in Test. The t-Test shows that test result is statistical significant. Also the feedback is conducted to know the students’ perception about this new version of app using Likert’s Five Scale.

Keywords - SysPro, System Programming (SP), Android Mobile Application, Handouts, Program, Likert’s Five Scale

JEET Category – Research

I. INTRODUCTION

COVID-19 has affected all the sectors including education sector also. The teaching-learning process is shifted from traditional classroom to digital classroom. So the use of distance learning or open educational platforms is used to limit the disruption of education.

Android mobile applications are useful for engaging the students in teaching-learning process during such pandemic situation. Keeping this view in the mind, the SysPro app for the course System Programming is modified and made available for student first offline. System Programming is one of the core courses of Computer Science and Engineering. After knowing students’ perception about this modified SysPro app, the new version is uploaded on Google Play store for the benefits of the students. The course material is modified and added some new features in

the app so that students can use this mobile app for learning at their own pace.

II. LITERATURE SURVEY

Mobile apps are used in various sector such as engineering, medical, nursing education, etc.

The author Alston, P. (2012) presented the experiences where Mobile Application Development module to 3rd year undergraduate Web Systems Development (WSD) students was delivered. Also author discussed the challenges faced in developing an alternative curriculum for a module originally intended for computing students with experience using the Java programming language.

The author West, D. M. (2013) discussed how the mobile devices improve learning and engage students and teachers in teaching-learning process. Ponce, L. B. et. al. (2014) provided the importance of the mobile devices in the medical education. The results showed that there is unawareness of the mobile applications resources, in spite of that the medical students are open-minded to adopt new technologies for learning.

Evrin Baran (2014) explained the effectiveness as well as its impact of mobile learning on business English learning. Also author believed that this mobile learning improve learning effectiveness, sharing of knowledge, learners’ confidence and interest. Person, T. et. al. (2018) represented vectorialZ application for mathematics learning which is developed using VEDILS mobile application. This application is used with students to check its usefulness as well as to obtain results about the students’ learning. The article written by Emmanuel, G., et.al. (2019) provided the ICTs with a regard to Mobile Health System and field which are lacking. The author also presented the solution to the Community Health workers (CHWs).

Wang, Y., & Collins, W. B. (2021) presented the survey of mobile application related to the “Tutor”, “Recorder”, “Game Companion”, and “Cheerleader.” This article also discussed the results for mobile fitness app design to improve consumer health.

So there is no mobile app for the course System Programming which provides the study materials. So in this study, the improved app for System Programming is developed and was given to the students. This new version of app is compared with already available app SysPro on Google Playstore.

III.SYSPRO CONTENTS

The course System Programming contains the design of various system programs such as Assembler, Macro Pre-processor, Linker and Loader. This course contains algorithm for designing these system program. Students generally find these algorithms difficult to understand. So

in the new version, handouts and programs are added to help the students to implement these algorithms during laboratory sessions. The course material such as notes, PowerPoint presentation, question bank, etc. are also updated. The content of this new version is shown in the Figure 1.

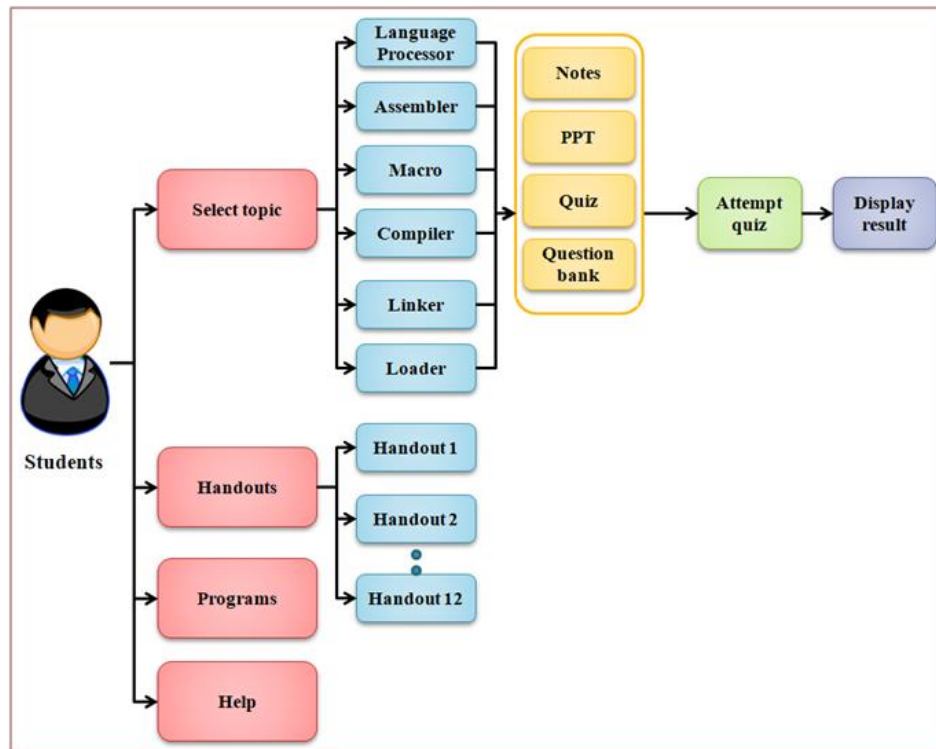
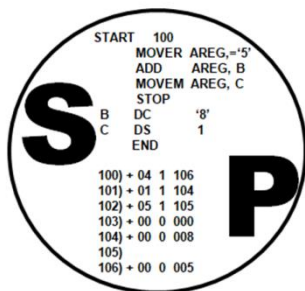


Fig. 1. SysPro Application Content

After downloading and installing this app in mobile, the following icon will be displayed in the mobile.



The screen shown in Figure 2 will be 15 seconds and after that the first screen shown in the Figure 3 will be displayed which contains the contents as

- A. PPT
- B. Notes
- C. Question Bank
- D. Handouts
- E. Programs
- F. Quiz
- G. About App

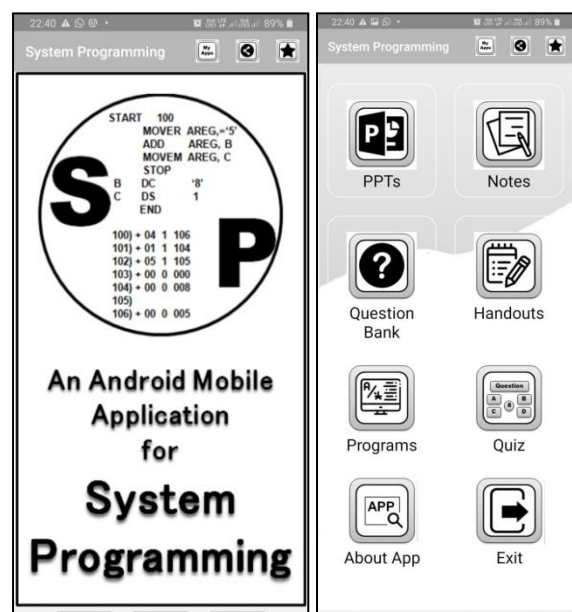


Fig. 2: Screen after clicking on mobile app Fig. 3: App contents

A. Power Point Presentations

Power point presentation is used to create visually rich content. In PPTs, flowchart along with the proper example as shown in Figure 4, is used to explain various system program algorithms. So this flowchart makes the long and lengthy algorithm easy to understand by students. Use of these PPTs enhances the teaching-learning experience to

both instructor and students. So PPTs for each unit of this course is provided in this app. Even these PPTs can be used by students to revise the content during the examination.

B. Notes

Course material i.e. notes for each unit of this course is provided with necessary diagrams and examples in this application which is shown in Fig. 5. Whenever required for algorithms of various system programs, proper examples with colour code are provided for easy understanding.

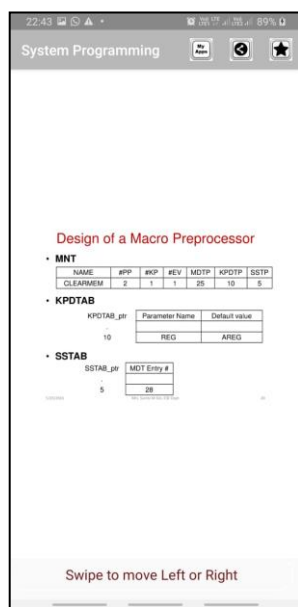


Fig. 4: PowerPoint Presentation

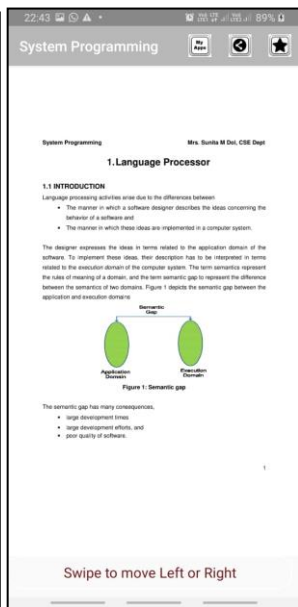


Fig. 5: Study material

C. Question Bank

Question bank helps students while preparing for examination. This application contains the subjective as well as multiple choice questions (MCQs) bank for each unit of System Programming. This MCQs and subjective question bank is shown in Fig. 6 and 7 respectively while Table I presents the number of MCQs considered for each unit.

TABLE I
NUMBER OF QUESTIONS IN EACH QUESTION BANK

Sr. No.	Name of Unit	Number of Multiple Choice Questions in each question bank
1	Language Processor	16
2	Assembler	29
3	Macro	15
4	Compiler	19
5	Linker	15
6	Loader	14

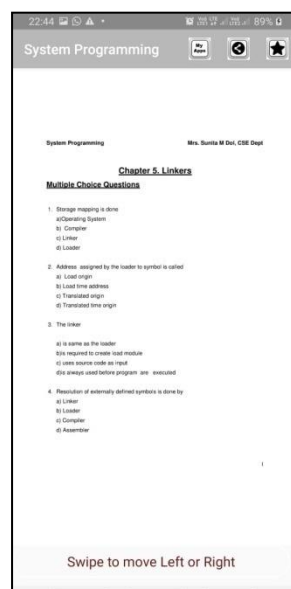


Fig. 6: MCQs bank

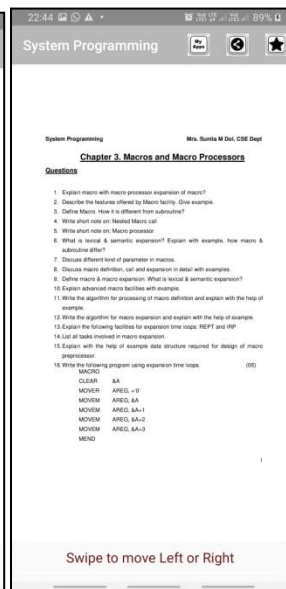


Fig. 7: Subjective question bank

D. Handouts

System Programming course consists of system program algorithm. So such course, handout is a very useful document. A handout is provided to the students during laboratory session for implementing the problem statement. It increases attention and helps students to follow the steps mentioned in the handout for development of an idea or argument. (<http://users.wmin.ac.uk/mcshand/TEACHING/handouts.htm>)

Each handout of this course consists of

- Aim,
- Theory,
- Algorithm,
- Input,
- Output and
- Conclusion.

After clicking on Handouts button of Figure 3, Figure 8 is displayed and Figure 9 shows the sample handout screen. Table II shows the Assignment number and probe statements considered for handouts in this mobile app.

TABLE II
HANDOUTS FOR ASSIGNMENTS

Assignment No.	Problem statement
Assignment No. 01	Program on Files
Assignment No. 02	Scanner generator using LEX
Assignment No. 03	Parser generator using YACC
Assignment No. 04	Implementation of Macros
Assignment No. 05	Implementation of Nested macros
Assignment No. 06	Design & implementation of 1 pass assembler
Assignment No. 07	Design & implementation of 2 pass assembler
Assignment No. 08	Symbol table generation for input *.c file
Assignment No. 09	Design lexical analyser for tokens : keywords , identifiers , numbers , operators
Assignment No. 10	Implementation of Toy-code generator
Assignment No. 11	Study of Linker
Assignment No. 12	Study of Loader

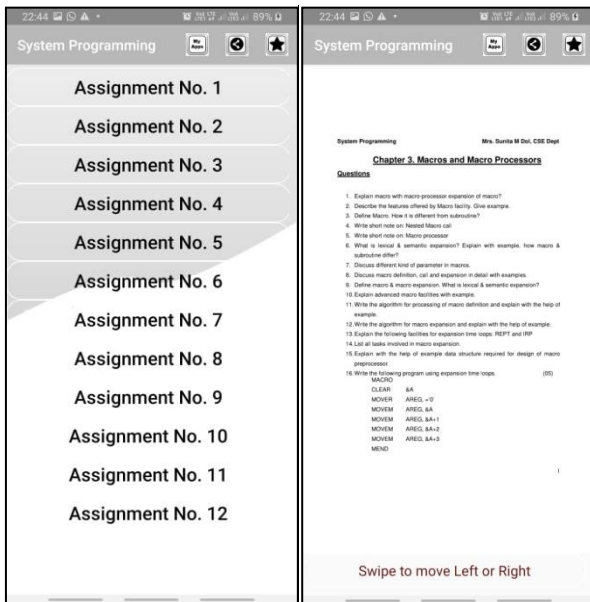


Fig. 8: Handout Screen

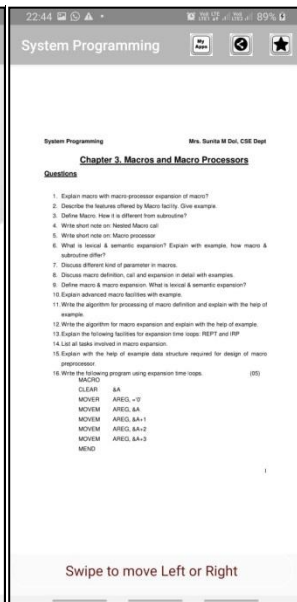


Fig.9: Sample Handouts

E. Programs

As this course contains the algorithms for designing of various system programs such as assembler, macros, linker and loader, students find it difficult to write the code for the algorithm. So the programs are given for the reference in the app. Figure 10 shows the list of programs given while Figure 11 shows the sample program. For each problem statement, program, input and output is given.

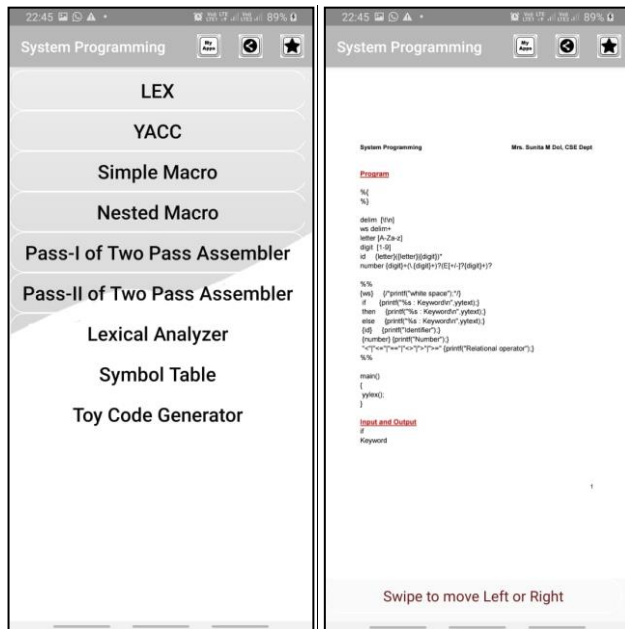


Fig. 10: Program List



Fig.11: Program Example

F. Quiz

The quiz is considered for each unit of this course. As shown in Figure 12, quiz consist of

- Question
- Options
- Check button
- Next button and
- Finish button

There are two types of question in the Quiz – single correct answer and multiple correct answers.

- For single correct answer, if the students click on correct answer then the message is displayed 'Answer is wrong'. If selected option is not correct then displays two messages – 'Wrong Answer' and 'Correct Answer' and it automatically goes to the next question
- For multiple correct answers answer, if students select the correct options then click on 'CHECK' button to get the correct answer otherwise it displays two messages – 'Wrong Answer' and 'Correct Answer'. Click on 'NEXT' button to go to the next question.

In both types of questions, students can select the answers only once. After clicking on 'FINISH' button, the result is displayed which contains

- Total number of questions in the particular unit
- Total number of questions attempted
- Total correct question attempted by student and
- Total score obtained by student

Table III shows the number of questions in each quiz of this app.

TABLE III
NUMBER OF QUESTIONS IN EACH QUIZ

Sr. No.	Name of Unit	Number of Multiple Choice Questions in each Quiz
1	Language Processor	66
2	Assembler	50
3	Macro	21
4	Compiler	38
5	Linker	20
6	Loader	29

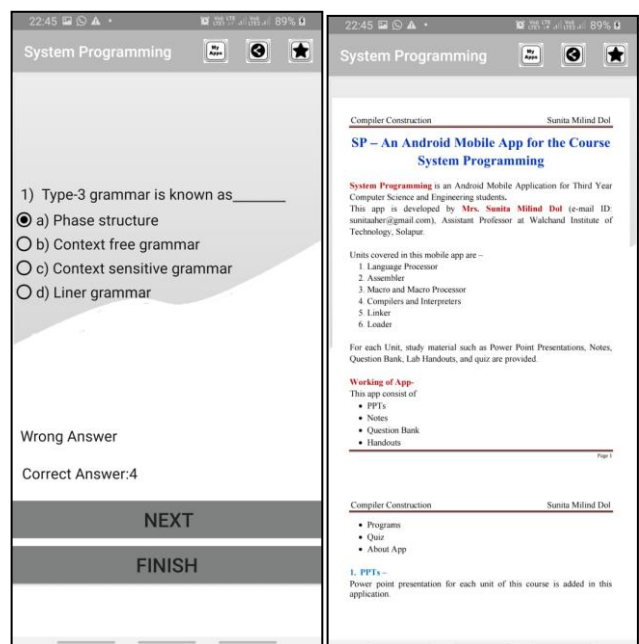


Fig. 12: Quiz Fig.

13: About app

G. About App

Help option is given for students to know about the app contents, syllabus covered, references, etc. The help page is shown in Figure 13.

From the feedback as given in Table V, it is observed that 100% students like this app.

TABLE V
FEEDBACK FORM

Sr. No.		Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	Whether SysPro covers all units of the course System Programming?	45%	55%	-	-	-
2	Whether course material given for each unit in this app helped you to clear the concepts of this course?	70%	30%	-	-	-
3	Whether power point presentations given in the app are interactive and engaged you in teaching learning process?	69%	31%	-	-	-
4	Whether the algorithms explained with the help of flowchart along with example clearly demonstrate the working of these algorithms?	72%	26%	2%	-	-
5	Whether quiz provided in the app is useful during the examination?	65%	35%	-	-	-
6	Whether games such as word scramble, word match and crossword provided in the app are engaged you in the teaching-learning process?	64%	36%	-	-	-
7	Whether the sample question bank given for each unit in the app is useful?	32%	68%	-	-	-
8	Whether the lab handouts which are used during laboratory sessions are useful?	40%	50%	-	-	-
9	Whether handouts helped you while implementing the assignments during the laboratory session?	30%	67%	3%	-	-
10	Whether program provided in this app is useful while implementing the program?	45%	54%	1%	-	-
11	Whether this app clarifies the concepts of System Programming?	48%	52%	-	-	-
12	Did you like this mobile app?	Yes= 99%				

V.METHODOLOGY

The research design details are shown in Table VI. Students were asked to download the app from Google Playstore and installed it in the mobile. After installing the app in the mobile, students went through the app contents – PPT, Notes, Question Bank, Handouts, Programs, and Quiz. Students attempted test related to this course and result analysis was done to check the use of this app to the students.

TABLE VI
RESEARCH DESIGN DETAILS

Technique used	SP Mobile App
Sample	70 students of Third Year Computer Science and Engineering
Method used	One Group post-test method
Instruments used	<ul style="list-style-type: none"> Post-test Survey Questionnaire
Bloom's Taxonomy	Cognitive Level – Recall, Understand and Apply
Statistical Analysis	t-Test performed online

VI. RESULT ANALYSIS

Figure 16 shows the graph for the marks obtained by students in test. It is found from this figure that Maximum students received the marks above 50.

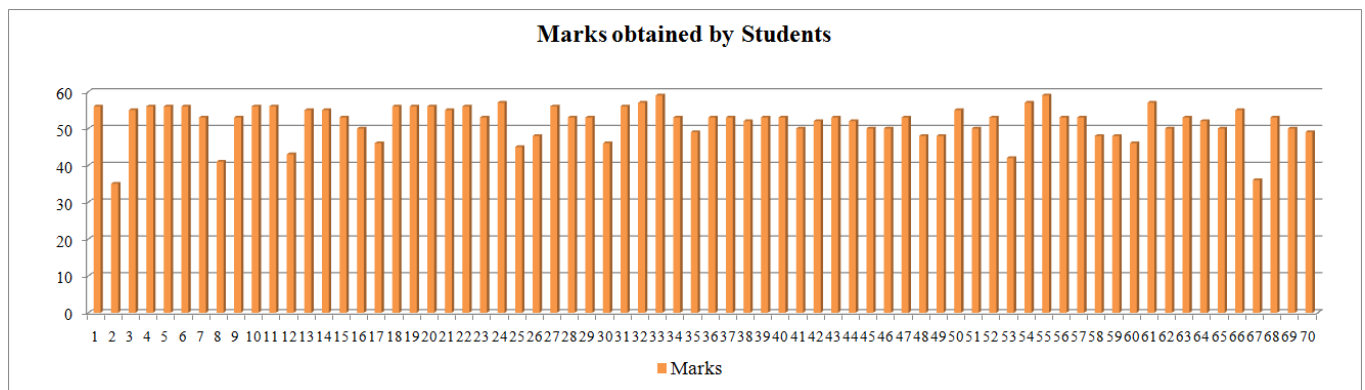


Fig. 16: Result analysis

Test applied on the marks obtained in the test. The p-value is 0.001093 which is <0.05 and shows that the result are statistically significant as shown in Table VII.

TABLE VII
STATISTICAL ANALYSIS USING T-TEST

	Population Mean	t-value	p-value
Final Test (Out of 70)	50	3.183091	0.001093

To check whether results are statistically significant, t-Test is used to analyse the result and this t-Test is performed online

[<https://www.socscistatistics.com/tests/tsinglesample/defaultt2.aspx>]. Table VII presents the statistical analysis using t-

VII. CONCLUSION AND FUTURE WORK

In this paper, the updated version of the mobile App SysPro is considered. Also comparison of new version with old version is also given. In the new version of this app, laboratory handouts which contain the step by step process to implement the problem statement are added. These handouts will be helpful for the students while implementing the problem statement in the laboratory sessions. Also the feedback showed that 100% students like this version of SysPro mobile app. In future, more subjective or multiple choice questions can be added. Also self-created videos on various topics of this course can be added for better understanding of this course.

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- Online t-Test on the link <https://www.socscistatistics.com/tests/tsinglesample/default2.aspx>



Sunita M. Dol (Aher) received the B.E. degree in Computer Science & Engineering from Amravati University, Amravati, and the M.E. degree in Computer Science and Engineering from Solapur University, Solapur. She is currently pursuing PhD in Computer Science and Engineering from Sant Gadge Baba Amravati University, Amravati, Maharashtra, India. She is presently working as an Assistant Professor, in Department of Computer Science and Engineering, Walchand Institute of Technology, Solapur, Maharashtra. She is thrice recipient of awards from Infosys DC Pune, under Inspire-Campus Connect Faculty Excellence Award. She also received SAP Award of Excellence during Four Week AICTE approved FDP by IIT Bombay on 'Use of ICT in Education for Online and Blended Learning'. She also received awards from Computer Society of India and the Institution of Engineers India. She has more than 60 research articles in International/National Journal and Conference. Her research interest includes data mining and education technology.