IT Student's Placement:

Powered by Innovative Practices, Effective Assessment and Evaluation Methods for Improving Programming, Project Making and Professional Skills.

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Abstract: **A vital step for the student's pathway during their graduation is placement which is one of the imperative criteria for any institution from the accreditation point of view as well. Kasegaon Education Society's Rajarambapu Institute of Technology (RIT) was established in 1983 in an elfin village Sakharale and became autonomous in 2011-12. Most of the students admitted into the college for Undergraduate programs are from rural backgrounds which provided us an opportunity to work on improving the employability skills of the students and sharpen them in industry specific areas. We are exploring the wings of institute's autonomy in design of curriculum to introduce the industry practices into the academic curriculum through innovative practices viz; design of assessment & evaluation methods, improvement of Programming, Project making and Professional Skills. This paper discusses the assessment and evaluation methods and innovative practices being adapted in the department of IT. Initially, the current requirements of the industry were identified through "Faculty Industrial Visits" and in view of that, the courses were selected and assessment and evaluation methods were designed by incorporating the "Outcome-Based Education" (OBE) methods. The students are assessed and evaluated as per the designed assessment methods and schemes for all courses including the project work. Different methods are practiced to improve the programming skills. The professional skills are practiced by the students under the placement club, department of Information Technology.**

Keywords: Autonomy, Faculty Industry visits, Assessment methods, Evaluation schemes, Outcome-Based Education, Placement Club.

I. INTRODUCTION

Information Technology (IT) is an engineering division, which concentrates on the study of utilizing the computers and telecommunications in order to control, gather, store and circulate information with both hardware & software being a part of it [1]. The IT represents a vast category of career options that are based on processing, designing, developing, testing, managing and supporting computer and web-based technologies and devices constituting an IT Network. The modern world is entirely IT-dependent with IT applications present in nearly every aspect of life making it a field for a wide variety of career opportunities both for fresh and experienced professionals, the IT department at any college must have recorded extremely high employment opportunities for students. Though much is made for improving education across the country; the quantities: *"Less than **20%** engineers are employable for software jobs, only **18.43%** of them are employable for the Software Engineer-IT services role, **7.49%** are employable for core engineering jobs, while a dismal **3.95%** are appropriately trained to be directly deployed on projects, even though more than **90%** aspire for such jobs"* [2], proved that there is a large inequality in the aspirations of graduating engineers and their job readiness. Though there are a wide variety of career opportunities and great percentile of students who aspire for software jobs, the statistics of employability are deploring. While we, the faculties of IT department at RIT were trying to figure out the causes for: such a large inequality, the reasons & who are responsible? We realized that we must be prepared to face such bigger challenges with good preparation. The IT branch in engineering stands top (fortunately) among the least preferred ones based on student preference [1] which redefines our challenges. IT employers are in need of fresher candidates who are good at Programming, Project making and Professional behavior. With hike in global competition, the companies are on look for the graduates who are tailored from the day one with appropriate skills and at ease can step into corporate sector with minimal or no training. Honorable Jitendra Singh, Minister of State for Science & technology, while presenting the 100-day report card of his ministry said, *"Now it's must for scientists to teach at colleges, schools".* Though this takes some reasonable time to achieve, we have already started taking efforts in inculcating research based teaching and learning processes in our department.

This paper discusses the practices being adapted in the IT department. The following sections are reserved for discussing innovative practices and effective assessment and evaluation methods adapted for: Programming Skills in section II, Project Making Skills in section III and professional Skills in section IV by concluding in section V.

II. PROGRAMMING SKILLS

This section discusses the innovative practices, assessment methods and evaluation schemes designed and adapted to improve the programming skills of the students in the department. Programming is the most important skill that IT graduates must exhibit to be able to work from day one when assigned a project to be developed. This confirms the student's ability to apply basic concepts and principles of IT to solve real world problems. Though these concepts and principles are designed as part of program curriculum, the students at the end lack with such skills. This is because of the gap in teaching

and learning pedagogy of programming courses. The courses that address the computer programming earlier were taught as courses; which are informative driven where actual learning could not happen with less laboratory hours allocated for practice: where students actually practice to apply the programming concepts. Hence to improve the programming skills of students the composition of programming courses was amended. Initially the syllabus for the programming courses is set considering the current industry needs and reviewed by the Board of Studies (BOS) members. Minimum number of theory lecture slots (3 hours per week) is allocated and auxiliary number of practical slots (4 hours per week) is allocated for students to practice the concepts "unpublished" [3]. Care is taken while setting the syllabus such that the topics will be covered in the allocated hours for respective course. This is because adding several topics into the syllabus leaves in incomplete syllabus coverage at the end of the semester or a race to finish syllabus leaves students behind with undigested concepts. Next, the assessment and evaluation schemes are carefully designed using OBE methods and RUBRICS model. The students are assessed for each experiment and evaluated with the help of Continuous Assessment Sheets (CAS).The CAS contains parameters like: Attendance & Participation, understanding, Execution report writing and uploading of programs on MOODLE server available in the department. The evaluation is carried out referring the RUBRICS designed over a scale of 1-5.The students during the practical hours are given different problem statements to avoid copying of programs which helps the faculty in evaluating the CAS effectively.

Assessment methods for programming courses are shown in figure 1. The assessment methods shown in figure 1 are more inclined towards programming exams rather than the theory exams. The question paper for all the courses is set as per the BLOOM's taxonomy and is revised by a module coordinator and auditor. Each question is mapped with Course Learning Outcomes (CLO's) and the CLO's are mapped with Program Outcomes (PO's) to check whether the PO's are achieved or not. The question paper is set to address various categories of students and is monitored with the help of charts. The figure 2 shows the result charts of JAVA course where the series 1in blue color and series 2 in brown color indicate results for the year 2013 and 2014 respectively. The range below the charts indicates the marks. The above chart in figure 2 depicts the marks distribution of JAVA online quiz for forty marks. The evaluation of programming tests is made Boolean i.e. whether the program written by the students during the exam produces the expected output or not. With no partial executions entertained, students are getting prepared appropriately. The below chart in the figure 2 shows the results of programming exam which is conducted for sixty marks. The range below the chart shows the distribution of marks of the students. These charts helps to monitor the students performance, modify the teaching strategies as required and also the question papers are revised time to time. These charts are maintained for every course which gave faculty the complete idea over what students are learning and what and how to be taught.

Apart from this, Programming and debugging contests are conducted every week in the department and the winners are rewarded. The problem statements include the questions that are asked during campus interviews. To constantly motivate students, the department rewards the "Best Programmer of the Year" award. This practice provides students with efficient practice in programming and procure experience scheme of evaluation for programming subjects.

ASSESSMENT METHODS									
Class	Subject	Theory					Practical		
		ISE (20%)			MSE (30%)	ESE (50%)	ISE (100%)		ESE
T. Y B. TECH	Java Programming	Quiz (5%)	Standalone App Development (10%)-	Presentation (5%)	Programming Exam	Programming Exam	CAS (40%)	Two Programming Tests (60%)	-
	Web Technology-I	-	-	-	-	-	CAS (30%)	Programming Test (20%)	Programming Exam (50%)
	Mobile Application Development	Mini Project (10%)	Presentation (5%)	Case study (5%)	Programming Exam	Programming Exam	-	-	-

Fig 1. ASSESSMENT METHODS FOR PROGRAMMING SUBJECTS.

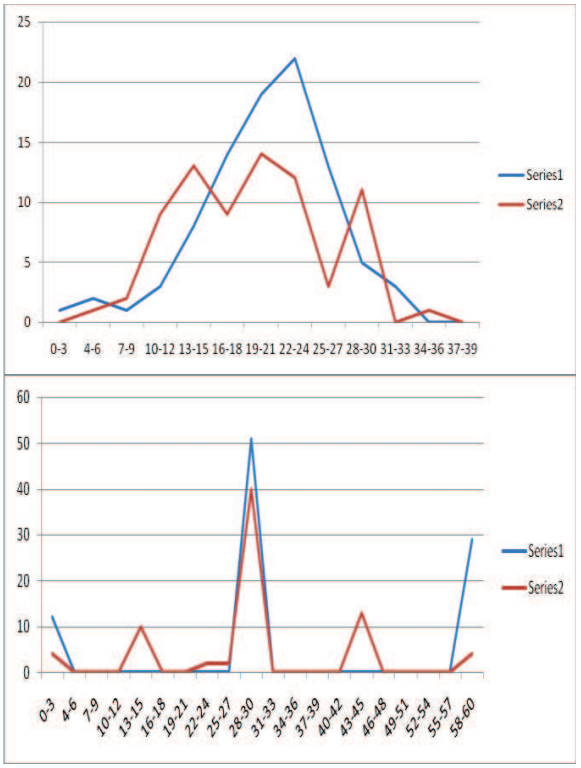

Fig 2. JAVA COURSE RESULT ANALYSIS CHART.

III. PROJECT MAKING SKILLS

Employers are now expecting even fresher's to be productive right away. It is expected that the graduates must work on some project either on-going or a new from the day they are put into work. The fresher's are capable for this only when they take their academic projects seriously and go through the phases of project development life cycle under proper guidance. In view of this, faculties at our department visit industries to gain awareness about the industry work culture and know the industrial practices that help reduce the gap between industry and Graduate students. This experience certainly helped the faculties train their students to be Industry oriented immediately after graduation which the corporate world is currently demanding through project guidance. IT official says during Industry Interaction "*From the previous experiences with the students, most of them are not serious about their project work. Very important in industry is you work, you show the results and you grow. You need to get them out of this thought process of getting A or B grade,* "unpublished" [5]". To address this problem of student understanding about project work and development, we at the department conduct a one day workshop on "Redefining Final Year Projects" at the start of the first semester. During this workshop, the students are informed about all the phases of project development; from the selection of Problem, submission of Proposals, Project Proposal finalization, Synopsis approval, design, development and deployment phases, finally technical report writing[6] and most importantly incorporation of "Quality Circle" problem solving methodologies.

Initially the students are asked to report with a list of problems that are identified after brain storming session among the students. The problems are identified based on feasibility along with the project guide. The finalized problem must be submitted to the guide by applying the "Quality Circle" problem solving methodologies. The students must prepare "Pareto diagrams", "Cause & Effect Analysis" or WHY-WHY analysis and Activity chart. The students are assessed through Synopsis Approval Presentation, 1st Review and 2nd Review. The evaluations of these assessments are made by selecting the relevant RUBRICS over a scale of 1-5. The department of IT has designed a well defined assessment and evaluation schemes using the RUBRICS model. The assessment method for project work for the year 2014-15 is shown in the Table 2. This assessment methods and RUBRICS scheme of evaluation is explained to the students during the workshop. Each phase of assessment is time bound and the activities are carried out by the teams as per the activity chart designed by the team members and respective guide. Special achievements seem to be a point of attraction where a good credit of marks is allocated for sponsorships, internships, project competitions, paper publications and paper presentations. Participation in special achievements provided the students a very good exposure. It is also observed that the number of special achievements in the year 2010 increased in 2014. The Figure 3 shows three charts where chart1 shows the distribution of Project marks for the year 2012-13 and 2013-14, where the distribution of marks ranges between 75-95 only, chart 2 shows the distribution of Project marks for the year 2014-15 with effective distribution of marks between 40-95, and chart 3 shows then number of special achievements from 2010 to 2014. The range below the charts 1 and 2 describes the distribution of hundred marks of students.

TABLE I. ASSESSMENT METHODS FOR FINAL YEAR PROJECTS

Assessment	ISE			ESE	TOTAL
	Synopsis	Review – I	Review – II		
Phase- I Marks	25	10	15	**50**	100
Phase- I Marks	25	10	15	**50**	100

The IT curriculum is also integrated with mini projects for third year students. Here students must identify the local entrepreneurs and collect their requirements. Students are encouraged to develop software as per the customer requirements and deploy the software. During the process of mini projects, students learn how to identify real world problems, requirements and design solutions. The department plans to apply the assessment methods and evaluation schemes of final year projects to evaluate mini projects. This will help the faculty to evaluate the mini projects more effectively.

TABLE II. SPECIAL ACHIEVEMENTS IN FINAL YEAR PROJECTS

Year	Sponsored Projects	Paper Presentations	Publications	Project Competitions	Paper/ Project Prizes	Total Special Achievements
2013-14	6	1	1	8	7	**23**
2012-13	4	3	0	2	5	**14**
2011-12	3	1	0	2	3	**9**
2010-11	3	3	0	2	5	**13**

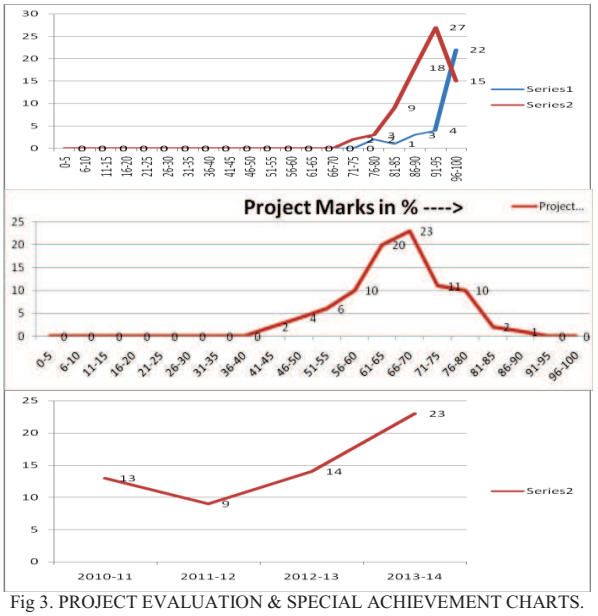

Fig 3. PROJECT EVALUATION & SPECIAL ACHIEVEMENT CHARTS.

Figure 4 shows the student's individual evaluation sheet used for evaluating final year project phase-I. The evaluation sheet contains relevant metrics whose RUBRICS are already defined "unpublished" [4]. The evaluation sheet contains three assessments: Synopsis Approval, Review –I and Review – II and its weightage as shown in the table 1. The evaluation is performed by a team of faculty consisting Department Program Committee (DPC) member and faculty guide. The metrics helps faculty to evaluate the project work effectively. The first and second charts in figure 3 show the difference in evaluating student project work without using RUBRICS and with RUBRICS model. The RUBRICS evaluation has shown a great difference over the existing University project evaluation scheme. The existing project evaluation follows group evaluation which is not effective to make a difference among the individual or student group. The students are also asked to have a self project evaluation for each assessment and compare with the faculty's evaluation. This helps students to introspect their level of knowledge and understanding. The marks sheet is made available to all the faculty guides and students using Google docs. The project coordinator monitors the evaluation process. Any queries related to evaluation are addressed by the project coordinator and Head of the Department which makes the evaluation system transparent. Project competitions are organized at the end of the year at institute level which gives opportunity for students to participate and selected project teams are rewarded.

IV. PROFESSIONAL SKILLS

In the present scenario the corporate are gleaning for street smart engineering graduates. We at RIT provide excellent learning opportunities by providing conducive environment for training. To impart the education which is relevant to the practical work environment we have designed a curriculum to train the students in their professional skills so that they are able to adapt better in the industry. The course covers aspects such as communicative concepts, body language, corporate etiquettes, leadership, presentation skills etc. The institute has a dedicated and experienced team of faculties to train the students in this area to develop their professional skills.

Efforts are made for the students to continuously interact and at the same time learn. We conduct "one day Placement Training" on e-mail writing, Mock interviews, Technical Interviews and Group Discussion for final year B.Tech students. These trainings are tailor made suiting to industrial needs. The students are continuously evaluated by conducting mock drives where the student's performance is video recorded and individual suggestions are provided by the experts. The professional skills are practiced by the students on their own under Placement club without any faculty's supervision which enhances the self learning amongst the students by creating a friendly environment to make mistakes and learn from the mistakes. Aptitude being the first round for any campus drive, it is important that every student should have strong aptitude skills. To enhance these skills the institute has taken an initiative to introduce aptitude in to the curriculum.

Department of Information Technology

INDIVIDUAL WORK ASSESSMENT (IWA) SHEET, PROJECT PHASE- I

Name of Student : _____ Roll No : _____
Class & Semester : _____ Team No : _____
Name of Guide : _____ Academic Year: _____

Sr. No:	Each metric 5 Marks: 1or 2-Poor, 3-Average, 4- Good, 5- Excellent			Marks
DATE: 21/08/2014	**Synopsis Approval Presentation (Maximum Marks: 25M)**			
1.	Introduces self, eye contact, Organization of content, Knowledge of topic demonstrated during ppt			
2.	Quality of answers given to the panel questions			
3.	Regularity in meeting the guide for discussion & adding appropriate input to the diary			
4.	Problem identification			
5.	Literature survey / Gather information from multiple sources			
6.	Analyze and evaluate information			
7.	Formulate solution/ Defend position/ Problem Description			
8.	System Requirement Specifications for the modules			
9.	Innovative & Usefulness, Activity Chart			
10.	Organization of content and readability in the report on his/her module			
Guide Sign:	Examiner Sign:	Student Sign:	(e.g. 50/2=25) **TOTAL (25) A=**	
DATE: 19/09/2014	**1st Review (Maximum Marks: 10M)**			
1.	Introduces self, eye contact, Organization of content, Knowledge of topic demonstrated during ppt			
2.	Quality of answers given to the panel questions			
3.	Regularity in meeting the guide for discussion & adding appropriate input to the diary			
4.	Review of System Requirement Specifications for all the modules			
5.	Design: Data Flow Diagrams & Flow Charts			
6.	Design: Usecase, class & Object Diagrams			
7.	Design: Sequence & Collaboration Diagrams			
8.	Design: Activity, Component & Deployment Diagrams			
9.	Use of appropriate tools and techniques for project design			
10.	Organization of content and readability in the report on his/her module			
Guide Sign:	Examiner Sign:	Student Sign:	(e.g. 50/5=10) **TOTAL (10) B=**	
DATE: 27/09/2014	**2nd Review (Maximum Marks: 15M)**			
1.	Introduces self, eye contact, Organization of content, Knowledge of topic demonstrated during ppt			
2.	Quality of answers given to the panel questions			
3.	Regularity in meeting the guide for discussion & adding appropriate input to the diary			
4.	Review of Design of the project is effective & professional (DFD, Flow Charts & UML diagrams)			
5.	Coding of the project/ Implementation (50%)			
6.	Use of Coding conventions			
7.	Understanding and Contribution in Coding the modules			
8.	Appropriate tools/technologies are used for coding the modules			
9.	Testing of the project and use of appropriate tools/techniques			
10.	Able to deploy developed modules effectively			
11.	Quality of results			
12.	Organization of content and readability in the report on his/her module			
Guide Sign:	Examiner Sign:	Student Sign:	(e.g. 60/4=15) **TOTAL (15) C=**	
			IWA TOTAL (50) : (A+B+C) =	

Fig 4. PROEJCT PHASE – I INDIVIDUAL EVALAUTION SHEET

V. CONCLUSION

This paper discusses the Innovative Practices, Effective Assessment and Evaluation Methods for Improving Programming, Project Making and Professional Skills practiced in the IT department at RIT which became possible with the advent of autonomy in designing the curriculum. The inferences indicate significant improvement in assessment and evaluation tools and student's performance which impacts their placement in to the IT industries. The initiatives are continuously appraised as per industrial needs. In future we also plan to design Placement evaluation scheme.

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