Target-Oriented Training of Computer Engineer-Mathematicians in Kazan Federal University in Collaboration with JSC «Tatneft»

Kazan (Volga) Federal University
R.X. Latypov, A.M. Gusenkov, V.S.Kugurakov

The authors of this article discuss their collaboration experience between Kazan Federal University and JSC «Tatneft», one of the largest Russian petroleum enterprises, in training IT-engineers.

Key words: *programmers, curriculum, interaction with enterprises.*

R.X. Latypov

A.M. Gusenkov

V.S.Kugurakov

Introduction

From the late 1970s the intensive development and advancement of IT-equipment and software products promoted the key IT industry market development. Large-scale training of professionals in IT areas has emerged as a relevant problem today [1].

Designed updated training programs for IT-specialists should be based on international education standards, edited by such leading international professional organizations as Association for Computing Machinery (ACM) and Computer Society of the IEEE which have been involved in this area since the 1960s of the last century.

During the first decade of the 21st century a series of documents involving typical curriculum models were developed and designed, such as Computer Science 2001 (CS2001) [2,3], Information Systems 2002 (IS2002) [4], Computer Engineering 2004 (CE2004) [5], Software Engineering 2004 (SE2004) [6], Information Technology (IT2006) [7].

A second edition of above-mentioned documents was published. Third-generation State Educational Standards in «Applied Mathematics and IT» were designed on the basis of these documents and recommendations, respectively.

However, the development of future professional competencies should include those professional standards which conform to the actual requirements of Russian economy [8].

High-quality training of specialists is the top target of many Russian universities, one of which is Kazan (Volga) Federal University [9]. The authors of this article discuss their collaboration experience with JSC «Tatneft», one of the largest Russian petroleum enterprises, in training IT-engineers.

Specialist Training Program Organization

Since 2000 target-oriented training of students in Applied Mathematics and IT in collaboration with JSC «Tatneft» has been accomplished at Kazan University, Institute of Computing Mathematics & IT. More than tens of highly-skilled graduates have become leading professionals in the IT-sectors of «Tatneft».

The training program is based on a tripartite agreement (company- university-student), according to which, the

company funds tuition fees to students and even scholarships for successful students, whereas graduates have to work for this company over three years. Under the company initiative a new study system was developed including an updated curriculum and new lecture courses, which, in its turn, furthered a new profile area for specialists and integrated Bachelor and Master degree programs. Under such conditions the company's requirements are not only to exclude infringement of the fundamental skills profile in «Applied Mathematics and IT» and State Educational Standards (SES) requirements but also to introduce those integrated courses associated with the problems and issues of the company itself (JSC «Tatneft»). Besides fundamental subject modules in mathematical simulation and IT, the following courses were also introduced- mathematical models in geology & geophysics and GIS (geological \geophysical information system).

Annually, students have internship at TatASC Petroleum Production Enterprise. Problem-solving topics for term and graduate papers are elaborated by the employers of this enterprise as well as within the frame of business contracts.

Training Program Description

The majors are interrelated with information technology (IT) and are divided into two modules: theoretical module based on discrete mathematics and training module courses, involving sophisticated software engineering.

The training module courses include:

- Object-oriented analysis and engineering design (esp. UML and case-technology);
- Specific information processing language (IPL) and their automation design;
- Programming technology in Java,

- Technology of Oracle database (Java and Oracle database are proprietary standards in JSC Tatneft»);
- Operation systems (UNIX);
- Digital signal & image processing;
- Computer graphics;
- Computer architectural design;
- Data design and algorithms;
- Software engineering;
- GIS.

The training program also involves integrated modules specifically designed for JSC «Tatneft», such as courses associated with digital copyright (or security policy) and petroleum engineering, embracing applied tasks and solutions with different engineering approaches. These target-oriented modules include the following courses:

- Mathematic methods in continuum mechanics;
- Fundamental principles in geology and geophysics;
- Reservoir engineering;
- Hydrodynamic well testing (AOF testing);
- Petrophysics and fundamental principles of filter (seepage) theory;
- Mathematical reservoir simulation;
- Hydrodynamic methods in geology and geophysics;
- Numerical methods in hydrodynamic filtration theory.

Conclusion

Here the authors gave a very concise description of their collaboration experience between Kazan Federal University and JSC «Tatneft», one of the largest Russian petroleum enterprises, in training IT-engineers. Further collaboration would involve the establishment of a research-training center of data support in oil field development as well as the development of integrated programs with Institute of Geology and Petroleum Engineering of Kazan Federal University.

REFERENCES

1. IT-Personnel in Russian Economy. Employment range, current demand and forecasting in 2012 within IT industry and national economy sector- analytical research 2007 [Electronic resource]: URL: http://window.edu. ru/window catalog/ files/r6033 5/ITstaff_demant_2007.pdf, free. – Title from the screen.
2. Computing Curricula 2001. Computer Science [Electronic resource]: Final Report (Dec. 15, 2001) / IEEE Computer Soc., Assoc. for Computing Machinery. – URL: http://www.acm.org/education/curric_vols/cc2001.pdf, free. – Title from the screen.
3. Computing Curricula 2005 [Electronic resource]: The Overview Report covering undergraduate degree programs in Computer Engineering, Computer Science, Information Systems, Information Technology, Software Engineering, 30 Sept. 2005 / Assoc. for Computing Machinery (ACM) [et al.]. – (Computing Curricula Series).– URL: http://www.acm.org/education/curric_vols/CC2005-March06Final.pdf, free.– Title from the screen.
4. IS 2002. Model Curriculum and Guidelines for Undergraduate Degree Programs in Information Systems [Electronic resource] / Assoc. for Computing Machinery (ACM)[et al.]. – URL: http://www.acm.org/education/is2002.pdf, free. – Title from the screen.
5. Computer Engineering 2004. Curriculum Guidelines for Undergraduate Degree Programs in Computer Engineering [Electronic resource] : Final Curriculum Report, 2004, Dec. 12 / IEEE Computer Soc. [et al.]. – (Computing Curricula Series). – URL: http://www.eng.auburn.edu/ece/CCCE/CCCE-FinalReport-2004Dec12.pdf, free. – Title from the screen.
6. Software Engineering 2004.Curriculum Guidelines for Undergraduate Degree Programs in Software Engineering [Electronic resource] / IEEE Computer Soc. [et al.]. – (Computing Curricula Series; Aug. 23, 2004). – URL: http://sites.computer. org/ccse/SE2004Volume.pdf, free. – Title from the screen.
7. Information Technology 2008. Curriculum Guidelines for Undergraduate Degree Programs in Information Technology. Version: Posting Nov 2008 [Electronic resource] / Assoc. for Computing Machinery (ACM), IEEE Computer Soc. – (Computing Curricula Inf. Technol.). – URL: http://www.acm.org/education/curricula/ IT2008%20Curriculum.pdf, free. – Title from the screen.
8. Standards of Professional Practice in IT-technology. 2008 [Electronic resource] // ACM: Assoc. for Computing Machinery: – URL: http://www. apkit.ru/default. asp?artID=5573, free –Title from the screen.
9. R.X. Latypov (2008) Target-oriented training students in «Applied Mathematics and IT» in Kazan University / R.X. Latypov, A.M. Gusenkov, V.S.Kugurakov // Russian Conference   Teaching IT in RF» (N. Novgorod, May 12-13, 2008) N. Novgorod – pg. 31–32.