

## SADE A STATISTICAL EVALUATION SYSTEM FOR UNDERGRADUATE ENGINEERING COURSES

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**Abstract** — *Based on the significant development of the new technologies associated with engineering (computing, constructive, managerial, etc), the engineers need to adapt to these technologies by reformulating concepts and attitudes. The Universities as Educational/Research Institutions have a fundamental role in the process of qualified professionals' formation. The Faculty of Engineering of the State University of Rio de Janeiro, FEN/UERJ, produced a Statistical Data Evaluation System (SADE) to improve the quality of its undergraduate engineering courses. The system comprises a graphical and interactive computer program having as input data, information collected in student opinion polls in the FEN/UERJ. These needs are especially associated to the development of new computing courses, tendencies of the labour market, research projects and postgraduate programs. This paper provides some of these answers, based on the developed evaluation methodology described previously. This paper provides a contribution to the reformulation and updating of engineering education in the Faculty of Engineering of the State University of Rio de Janeiro.*

**Index Terms** — *Engineering courses, Engineering education, Statistical analysis, Computational courses.*

### INTRODUCTION

Nowadays, based on the significant development of the new technologies associated with engineering (computing, constructive, managerial, etc), the engineers need to adapt to these technologies by reformulating concepts and attitudes. The Universities, as Educational/Research Institutions, have a fundamental role in this process.

Considering this aspects earlier mentioned, it makes necessary a constant updating of those Institutions in what concerns the actual academic needs of the undergraduate engineering courses in the most several areas.

This present investigation presents as main objective the development of a database system, (SADE: Statistical Evaluation System for Undergraduate Engineering Courses), which makes possible the development of detailed statistical data, with the objective of updating the technical and academic needs requested by the undergraduate engineering

courses of the Faculty of Engineering of State University of Rio de Janeiro, FEN/UERJ.

The Engineering Fundamental Cycle Computational Laboratory assists undergraduate engineering students of the Fundamental and Professional Cycles of the Faculty of Engineering, FEN/UERJ. The laboratory offers computational courses, aiding in the academic formation of the undergraduate engineering students, necessary for an improvement of engineering courses. Until the present moment, were formed about 1100 (one thousand and one hundred) undergraduate engineering students in this computational laboratory.

This paper briefly presents the development of the referred educational program, denominated SADE. The computational program was conceived to work as a statistical database for the reformulation of teaching methodology of the Engineering Fundamental Cycle Computational Laboratory of the Faculty of Engineering.

### THE SADE SYSTEM

The statistical evaluation system, SADE System, in his first version was developed in Access language programming, starting from a structure of data composed by menus containing all options that the program can offers to the undergraduate engineering student, based on the Windows platform. The Figure 1 presents the current version of the developed program, totally reformulated in HTML (Hypertext Markup Language) [1], being its processing done in ASP (Active Server Pages 3.0) [2]-[3], implemented based on Windows NT platform. This current version of the SADE System allows a better performance, resulting in a pleasant and dynamic environment for the program users.

The SADE System program is available in the Engineering Fundamental Cycle Computational Laboratory through a browser (Netscape Navigator or Internet Explorer). The undergraduate engineering student can consult (or supply) an extensive statistical database, searching for specific information (computational courses, research programs, etc), related to academic activities of the FEN/UERJ.

The presented statistical results are generated automatically for the program starting from the data supplied

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by student/user. These results can be visualized through a series of reports (dynamic tables and graphics).

In sequence of the paper, the development of this research work can be described by the following stages:

- Elaboration of a form related to the academic needs of the Faculty of Engineering, FEN/UERJ;
- Acquirement of the undergraduate engineering students opinions;
- Study of Access and ASP programming languages;
- Implementation of the *SADE*: Statistical Evaluation System for Undergraduate Engineering Courses;
- Insert of the data to be analysed by the referred computational program;
- Conclusion of the *SADE* System starting from the statistical analysis.

Registering at Engineering Fundamental Cycle Computational Laboratory the undergraduate engineering

student can access easily to the *SADE* System.

In sequence, using superior links the undergraduate student/user can start to fill the form, as shown in Figure 2.

Based on ASP processing, the personal data and opinions of each student/user are captured by the *SADE* System data capture mechanism and stored in the database for a subsequent analysis.

Others *SADE* System functions can be observed, as illustrated in Figure 1 and 2. The computational laboratory administration has total freedom to make any search tasks and general analysis based on the data registered in the database. The *SADE* System supplies all the topics to be analysed and the specific period, as presented in Figure 3. The program allows the choice of all periods together if necessary, Figure 3.

In the sequence, Figure 4 presents an example of the current results offered by the computational program *SADE*, related to a statistical evaluation.



FIGURE. 1  
THE STATISTICAL EVALUATION SYSTEM: THE *SADE* SYSTEM.

**SADE** Sistema de Avaliação de Dados Estatísticos

::: Principal ::: Créditos :::  
 ::: Cadastros ::: Manutenção ::: Relatórios :::

Cadastros

**Vida Acadêmica na FEN/UERJ**

\*Qual ênfase você pretende escolher? Seleccione aqui

\*Cursa outra universidade?  Sim  Não

\*Deseja no futuro fazer Pós-Graduação?  Sim  Não

\*Já desenvolveu algum trabalho de pesquisa na FEN/UERJ?  Sim  Não

\*Possui interesse em desenvolver pesquisa dentro da FEN/UERJ?  Sim  Não

Por que?  Em qual área?

\*Exerce algum tipo de atividade remunerada?  Sim  Não

Esta atividade é dentro de sua área de atuação acadêmica?  Sim  Não

Qual o tipo de atividade?  Estágio  Trabalho

FIGURE. 2  
THE SADE SYSTEM FORM.

**SADE** Sistema de Avaliação de Dados Estatísticos

::: Principal ::: Créditos :::  
 ::: Cadastros ::: Manutenção ::: Relatórios :::

Relatórios

Qual período deseja analisar?  
 Todos os períodos

Tópico a ser consultado:

- Já desenvolveram algum projeto de pesquisa.
- Já desenvolveram algum projeto de pesquisa.
- Possuem interesse em desenvolver projetos de pesquisa.
- Exercem algum tipo de atividade remunerada.
- Tipo da atividade remunerada exercida.
- Consideram importante a implantação de Empresas Júnior.
- Conhecem a Empresa Júnior HIDROS.
- Impressão com relação às disciplinas e horários referentes ao Ciclo Básico da FEN/UERJ.
- Acham importante a presença de professores em tempo integral na FEN/UERJ.
- Acham importante que os professores tenha titulação.
- Já fizeram algum curso de computação no LCB.
- Curso de computação mais procurado.

Laboratório de Computação do Ciclo Básico - LCB  
 Faculdade de Engenharia - UERJ

FIGURE. 3  
TOPICS TO THE STATISTICAL ANALYSIS.

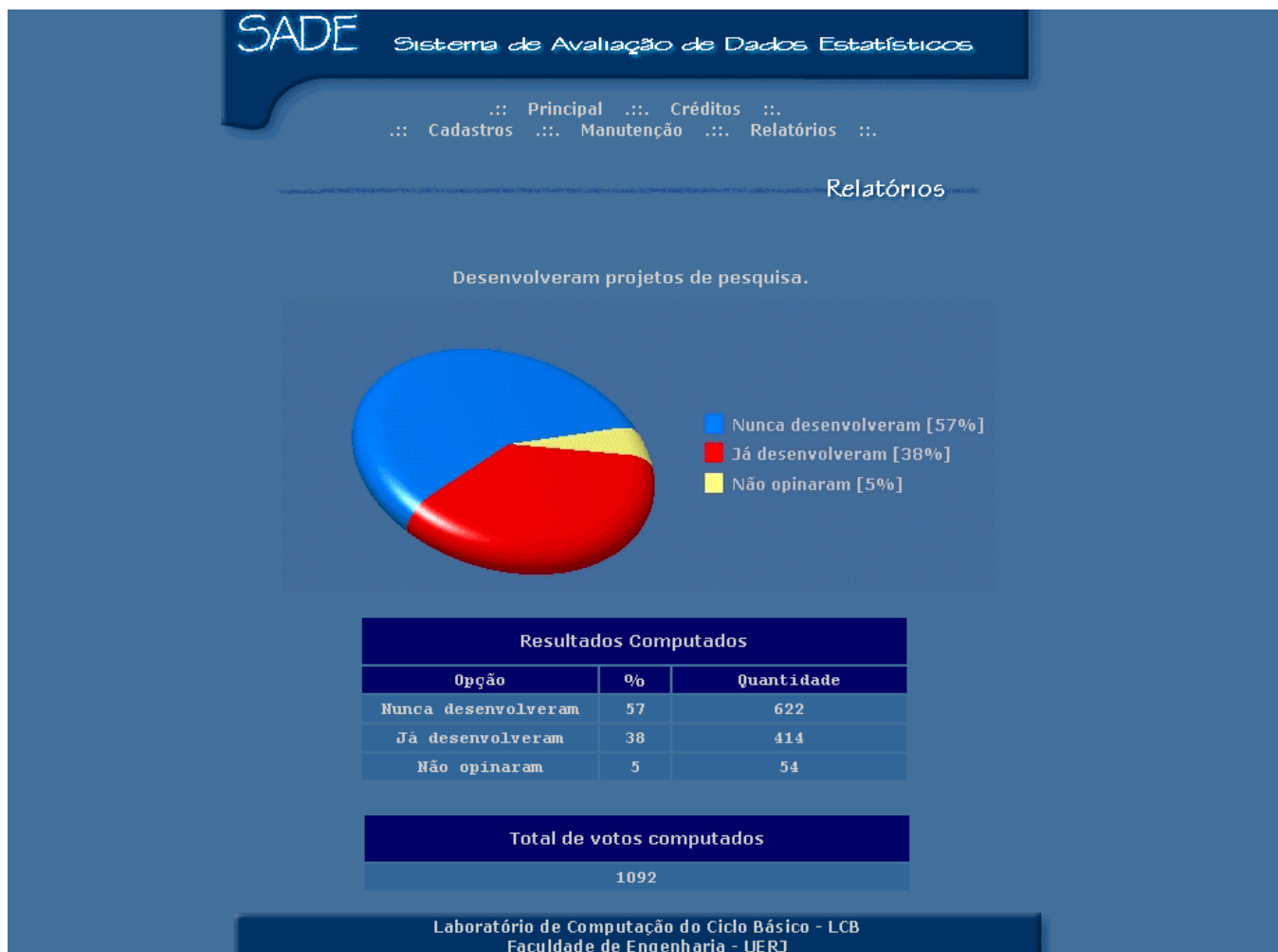


FIGURE. 4  
SERIES OF REPORTS GENERATED BY THE SADE PROGRAM.

### STATISTICAL ANALYSIS

The computational program *SADE* generates a series of reports, based on graphs and tables, containing a detailed analysis of database supplied by the undergraduate engineering student opinion polls [4]-[6].

The academic research presented in this work was developed being considered an approximate number of 1100 (one thousand and one hundred) undergraduate engineering students, properly registered in the *SADE* System. The undergraduate engineering students considered in the present analysis are studying in the Fundamental Cycle

Figure 5 presents a first graph regarding the undergraduate engineering students distribution related to the emphases offered by the Faculty of Engineering. It clearly noticed that the Electrical Engineering course has been absorbing a larger number of students reaching about 56% of the total. Nowadays, the Civil Engineering course

reaches about 19% of the total number of students and the other emphases present a number of students equal to 20%.

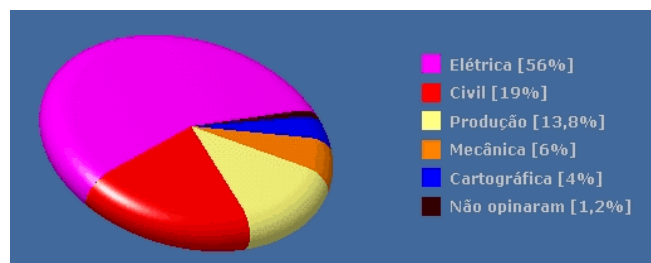


FIGURE. 5  
UNDERGRADUATE ENGINEERING STUDENTS DISTRIBUTION.

Another topic focused in this paper verifies the interest of the undergraduate engineering students of FEN/UERJ in continuing their academic studies in graduate programs. The Figure 6 shows clearly that the majority of students would like to course graduate programs.

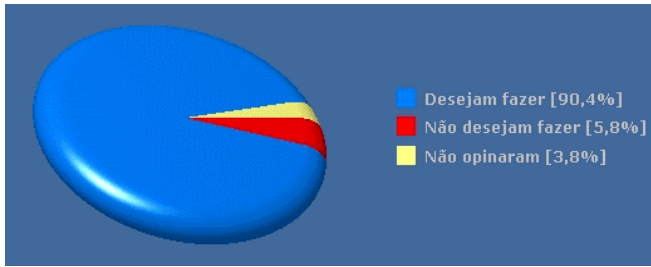


FIGURE. 6  
INTEREST IN CONTINUING THE ACADEMIC CAREER.

The analysis proceeds with a quite relevant subject, associated to the interest of the undergraduate engineering students in the development of research projects.

It can be observed that a quite reasonable number of students has been involved in research projects, about 40%, as shown in Figure 7. Such fact is quite important, because it denotes that the undergraduate engineering students of the FEN/UERJ have very interest to participate and develop research projects. This information can be an incentive for the Faculty of Engineering to including the undergraduate engineering students in research projects.



FIGURE. 7  
PARTICIPATION IN RESEARCH PROJECTS.

In the sequence, it is verified that a large number of the undergraduate engineering students, about 70%, of the Faculty of Engineering present a significant interest in developing research projects in any areas of the engineering, as illustrated in Figure 8.



FIGURE. 8  
INTEREST IN THE DEVELOPMENT OF RESEARCH PROJECTS.

It can be observed in Figure 9 that the undergraduate engineering students consider very important the full time

lectures. The number of undergraduate students with this opinion was quite reasonable, reaching about 74%. This number shows clearly that the students would like to interact permanently with the Professors.

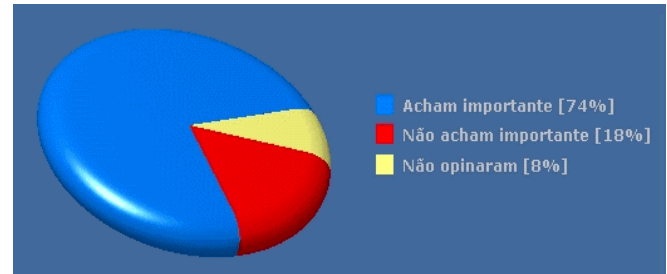


FIGURE. 9  
STUDENTS OPINION ABOUT FULL-TIME LECTURES.

It can be visualised in Figure 10 that the undergraduate engineering students consider very important the qualification of the full time lectures. The number of undergraduate students with this opinion was very large, reaching about 80%.



FIGURE. 10  
QUALIFICATION OF THE FULL-TIME LECTURES.

The physical facilities and computer resources offered by the Engineering Fundamental Cycle Computational Laboratory to the undergraduate engineering students of FEN/UERJ were considered in this analysis. It can be verified that 70% of the student's opinion about the earlier mentioned computational laboratory consider that their needs are completely satisfied, as presented in Figure 11.

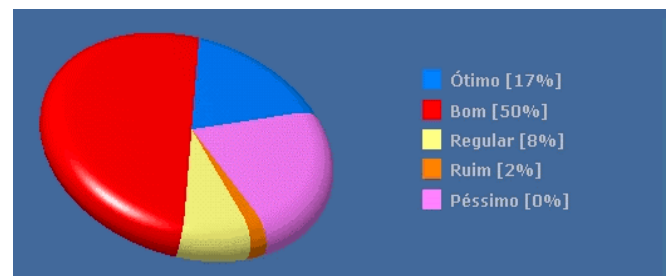


FIGURE. 11  
STUDENT'S OPINION ABOUT THE COMPUTER RESOURCES.

The computational courses taught by Engineering Fundamental Cycle Computational Laboratory staff were a key issue of this investigation. Figure 12 presents a significant contribution of the laboratory related to the teaching of the computational courses. It is clearly noticed that a significant number of the undergraduate engineering students, about 70%, have participated of the courses.

This number tends to increase significantly in agreement to the analysed data stored in the SADE System. The quality of the courses is a constant concern of the laboratory staff. The mentioned courses, Figure 12, have been improved constantly to better attend the undergraduate engineering students.

Nowadays, the computational courses taught are: ANSYS Program, 3D Studio Max, AutoCad, Maintenance of Microcomputers, HTML, Microsoft Windows, Microsoft Word, Microsoft Access, Microsoft Excel and Network Technology, as shown in Figure 12.

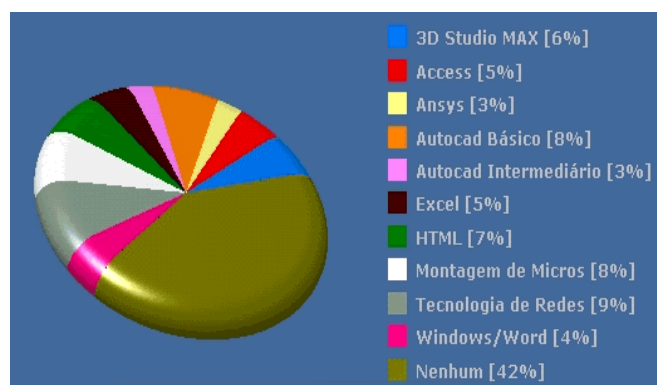


FIGURE. 12  
COMPUTATIONAL COURSES.

As result of an initial work presented in this paper, promising results are being demonstrated associated to a significant increasing in the quality of the developing research projects and undergraduate engineering courses in the Faculty of Engineering of the State University of Rio de Janeiro, FEN/UERJ.

### FINAL REMARKS

This paper described the results obtained with the use of a Statistical Evaluation System (SADE System) developed by the Engineering Fundamental Cycle Computational Laboratory of the Faculty of Engineering of the State University of Rio de Janeiro, FEN/UERJ. The evaluation mainly focused on undergraduate students academic needs, computational courses, improvement of the teaching quality, engineering education, etc. The Statistical Evaluation System (SADE System) produced a series of reports including dynamic tables and graphical information about a detailed analysis of database supplied by the undergraduate engineering student opinion polls.

The referred computational laboratory has been contributing decisively to the improvement of the engineering courses teaching quality in the FEN/UERJ. Nowadays, the laboratory offers academic computational courses and assists in the development of research projects of the undergraduate engineering students.

In the development of the present study, the SADE System has registered 1100 (one thousand and one hundred) undergraduate students. It is intended to continue registering a larger number of undergraduate engineering students. The present investigation will continue and all the conclusions reached be put in practice. With this, it is expected to contribute for the modernization and updating of some academic procedures related to the engineering courses in the FEN/UERJ.

This investigation proved to be an useful tool to identify undergraduate engineering students academic needs that are constantly out of the standard usually accepted in academic area.

A refined investigation of these academic needs could then be performance to confirm the results offered by the use of the statistical evaluation system. The present investigation is now focusing in discovering efficient ways to correct misjudgments or to improve the SADE System's performance.

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