E-learning Tools for Education in Asynchronous Machines

SORIN ENACHE, AUREL CAMPEANU, MONICA-ADELA ENACHE, SERGIU IVANOV
Electromechanical Faculty
University of Craiova
107 Decebal Street, 200440 Craiova
ROMANIA
senache@em.ucv.ro http://www.em.ucv.ro

Abstract: - This paper presents a series of e-learning applications from the asynchronous machines field. The context in which they have been carried out and their structure are detailed. The way in which such of applications contribute to the increase of the educational process efficiency in the electrical engineering field is emphasized. The conclusions underline the idea that the virtual education has not only future but also present.

Key-Words: - engineering education, e-learning, software, Internet, asynchronous machines

1 Introduction

E-learning represents the interaction between the teaching-learning process and the informational technologies ICT (Information and Communication Technology). This notion covers a wide spectrum of activities, from the computer aided education (a combination between the traditional learning practices and the on-line ones) until the entirely on-line developed education.

A series of researches regarding the extent in which the information met in different contexts is memorized [13] have been carried out In order to emphasize the informational technologies role in education:

- 10 % of what we read (a virtual medium provides a rich reading material);
- 20 % of what we hear (the electronic educational materials can also include sounds);
- 30 % of what we see (such a material provides an attentive visual organization);
- 50 % of what we hear and see (the videoconferences provide the possibility of real time discussions);
- 70 % of what we discuss with other people (the virtual medium provides the possibility for participating in discussions);
- 95 % of what we teach other people (this thing involves a clear understanding and a good organization of what will be taught).

Internet has an ever greater role in the ICT context.

In an opinion poll made by CISCO Company among the Nobel Prize laureates, regarding the Internet contribution in the next twenty years, the most of the interviewed ones have accredited its positive role in the education field (fig. 1).

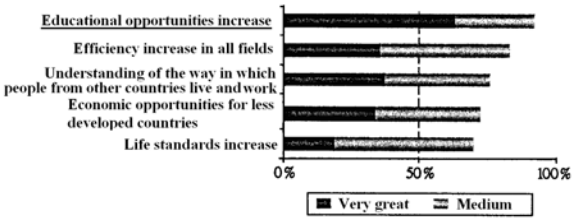

Fig. 1. Answers of the Nobel Prize laureates regarding the Internet role in the next 20 years.

2 Site e-lee.net

The association called "Association for promotion of e-Learning tools for Electrical Engineering" (e-LEE) has been founded in the year 2004 by starting from the conclusions emphasized before; this association aims to promote and estimate the multimedia didactic means for the engineering education in general and especially for the electrical engineering education.

The Electromechanical Faculty from Craiova is among the founder members.

Fig. 1. Site e-lee.net.

One of the achievements of this association is the site www.e-lee.net, which has been awarded a prize at national level, site translated in English, French, Romanian and Portuguese (fig. 1).

This site stocks a series of tutorials from four fields of the electrical engineering (fig. 2):

- electric circuits;
- power electronics;
- electrical machines;
- renewable energies.

Fig. 2. Window "Tutorials".

The Electromechanical Faculty from Craiova has been preoccupied for carrying out some applications in the electrical machines field (fig. 3) and of the asynchronous machine, respectively.

Fig. 3. Window "Electrical machines".

3 Site "Asynchronous machine"

This site (fig. 4) contains information about:

- realization and operation principles;
- general operation equations and equivalent diagrams;
- operation and mechanical characteristics;
- classical command of the drive (starting, speed adjustment and braking);
- vector control;
- Direct Torque Control – DTC.

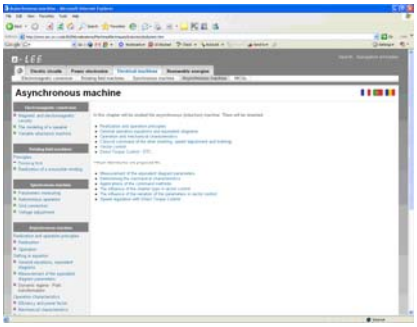

Fig. 4. Window "Electrical machines".

Virtual laboratories are proposed for:

- measurement of the equivalent diagram parameters;
- determining the mechanical characteristics;
- applications of the command methods;
- the influence of the inverter type in vector control;
- the influence of the parameters variation in vector control;
- speed adjustment with Direct Torque Control.

In the section "Realization and operation" (fig. 5) the fundamentals of the manufacturing and operation principle of the asynchronous machine are presented.

Fig. 5. Window "Realization and operation".

Concerning the manufacturing (figs. 6 and 7), the different constitutive elements are presented. The lecture is accomplished by videos and pictures taken during the technological process.

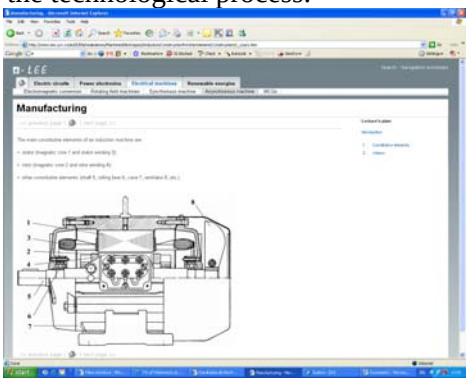

Fig. 6. Window "Manufacturing 1".

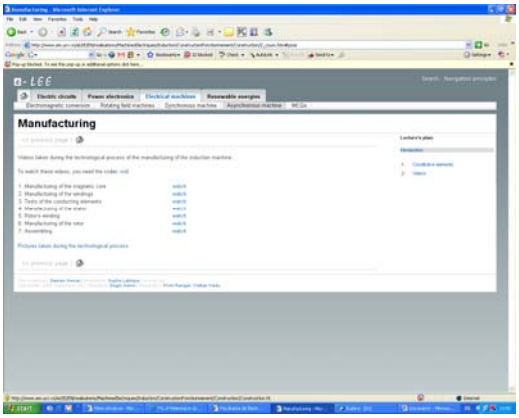

Fig. 7. Window Manufacturing 2".

The lecture concerning the operation of the asynchronous machine presents the principle, the characteristic parameters and the balance of powers (figs. 8 and 9).

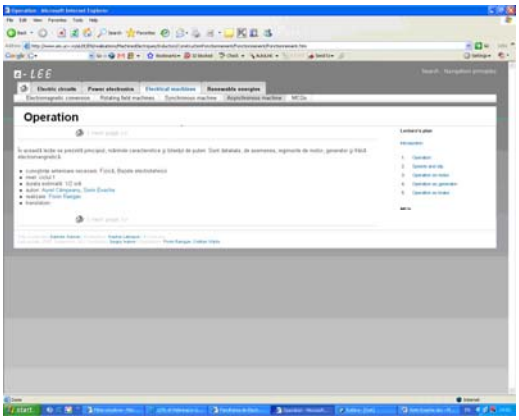

Fig. 8. Window "Operation.

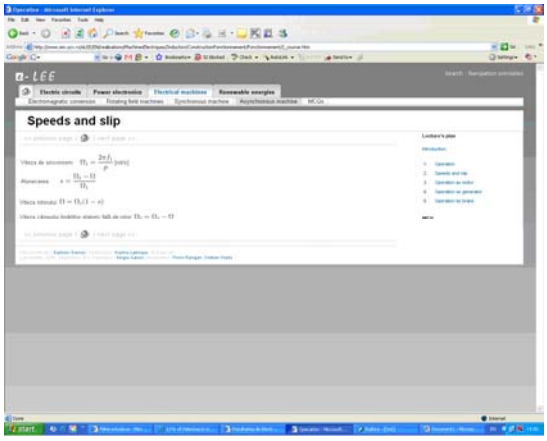

Fig. 9. Window "Speeds and slip".

The different operation regimes are also detailed: motor (fig. 10), generator (fig. 11) and electromagnetic brake (fig. 12).

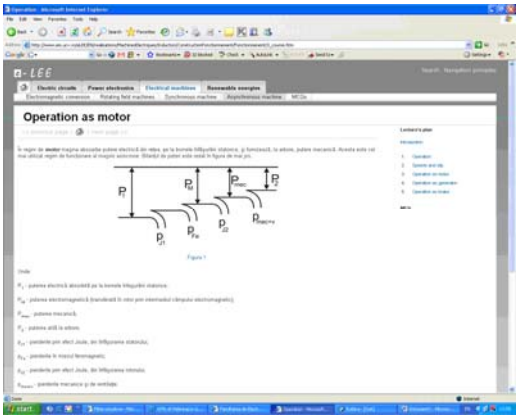

Fig. 10. Window "Operation as motor".

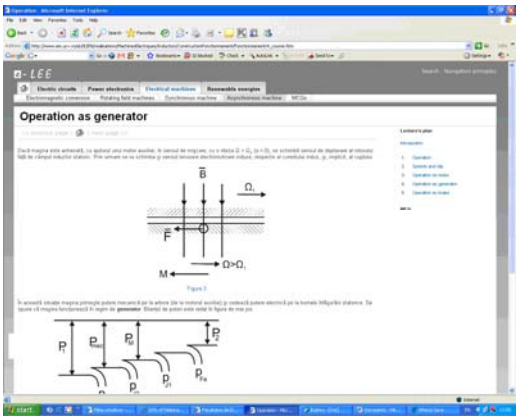

Fig. 11. Window "Operation as generator".

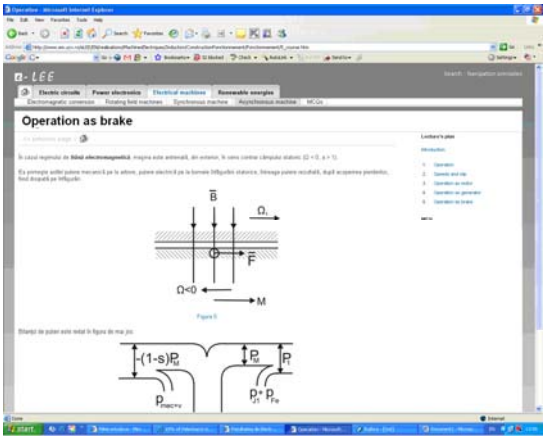

Fig. 12. Window "Operation as brake".

Starting from the manufacturing and operation principle of the asynchronous machine, the general operation equations are determined and, on this basis, the equivalent "T" - "π" diagrams (fig. 13) and vectorial diagram (fig. 14).

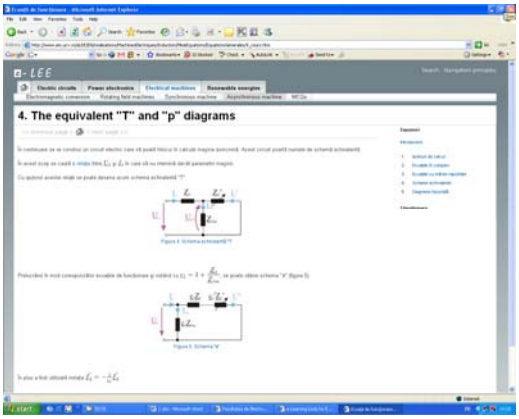

Fig. 13. Window "The equivalent T and π diagrams".

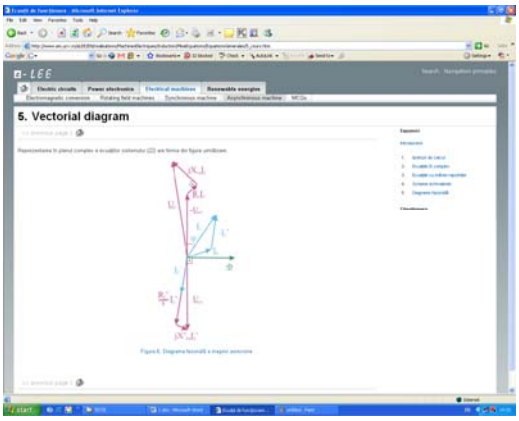

Fig. 14. Window "Vectorial diagram".

4 Conclusion

The applications from the asynchronous machines field, installed on the site www.e-lee.net, are of real help for understanding the operation principle, the construction and the equations of this machine.

In the future this site will be developed by collaboration between the University of Craiova (Romania), Université Catholique de Louvain (Belgium), Haute Etude d'Ingénieur Lille (France) and Universidad Tecnica de Lisbon (Portugal).

References:

[1] U. Blomqvist, L. Handberg, A. Naeve, New Methods for Focusing on Students Learning Process and Reflection in Higher Education, *Proceedings of the 28th IUT Conference*, Vaxjo, Suede, 2003.

[2] M. Brut, *Instrumente pentru e-learning*, Ed. Polirom, 2006.

[3] D. Brundage, R. Keane, R. Mackneson, Application of learning theory to the instruction of adults, Thelma Barer-Stein and James A. Draper, *The Craft of Teaching adults*, Culture concept, Toronto, 1993, pp. 131-144.

[4] A. Campeanu, A. Ionescu, I. Vlad, S. Enache, Modelling and Simulation of Magnetic Saturation in Induction Motors, *International Electric Machines and Drives Conference IEMDC'07*, Volume 1, May 2007, pp. 688–693.

[5] A. Campeanu, M. Radulescu, I. Vlad, S. Enache, Influence of Cross-Saturation for Modeling and Simulation of the Dynamic Processes in the Induction Motors, *IEEE Region 8, EUROCON2007 - The International Conference on "Computer as a Tool"*, Warsaw, Poland, 9-12 septembrie 2007, ISBN:1-4244-0813-X, pp. 1830 – 1833.

[6] R.Colin Penfield, *Accelerated Learning*, Dell, New York, 1989.

[7] S. Enache., I. Vlad, M.A. Enache, Aspects Regarding Dynamic Regimes of Induction Motors Control by the Stator Flux, *Power Engineering, Energy and Drives, 2007, POWERENG 2007*, Setubal, Portugal, 12-14 April 2007, pp. 152-155.

[8] S. Enache, R. Prejbeanu, A. Campeanu, I. Vlad, Aspects Regarding Simulation of the Saturated Induction Motors Control by the Voltage Inverter Commanded in Current, *IEEE Region 8, EUROCON2007 - The International Conference on "Computer as a Tool"*, Warsaw, Poland, 9-12 september 2007, pp. 1826 - 1829.

[9] S. Enache, A. Campeanu, I. Vlad, M. Enache, A New Method for Induction Motor Stability Analysis when Supplying at Variable Frequency, *Proceedings of ISTASC'07*, Athens, 2007, ISSN: 1790-5115, pp. 117-120.

[10] M.A. Enache, S. Enache, M. Dobriceanu, Considerations Regarding Determination of the Induction Motors Parameters, *International Electric Machines and Drives Conference IEMDC '07*, Volume 1, 3-5 May 2007, pp. 662–667.

[11] W. Horton, *Designing Web-Based Training*, Wiley Publishing House, 2000.

[12] R. McGreal, M. Elliot, *Learning on the Web*, TeleEducation NB, Canada, 2002.

[13] G. William, *Control theory in the classroom*, New York, 2004.

[14] www.e-lee.net.