Accreditation of Study Branches Pre-Gradual and Post-Gradual Studies on Mechanical Engineering Faculties of Czech Republic

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Abstract: The paper deals with main principles of accreditation and evaluations of pre-gradual and post-gradual study branches on Mechanical Engineering Faculties of Czech Republic. There is presented their important influence for increasing of total quality of education processes on technical universities. On the next part are shown facts and experiences from the evaluation of FME VŠB-TUO in years 1997, 1998 and 2000. Basic information about academic programmes on FME on the level of bachelor, master and doctoral study will be presented. Detail information about of conclusions from evaluation procedures on 1997, 1998 are presented. The paper points to signification for strategic management faculty development on the period of restructuralisation Ostrava region in 21st century.

Keywords: evaluation, education, quality, study branches

1 Introduction

Quality evaluation of the educational institution is definitely very difficult process that lasts very long. Big amount of factors influencing the educational process must be taken into account as well as their common connections and interactions. Defining the criteria used for the quality evaluation of the educational process is very complicated as well. Despite those problems it seems to be essential need to establish an objective system for quality evaluation of the educational process as a basic tool for improvement its effectiveness. Probably there exists no educational institution where all students and personnel are satisfied with the quality of educational process. Natural endeavor of all interested parties should be their increasing. Positive influence on quality of the educational process should offer following possibilities [Kurekova and Halaj 1999]:

- Economical measures of the state administration (increased budget for pedagogical activities and research).
- Legislative measures (e.g. support of sponsorship).
- Massive financial evaluation of excellent research and pedagogical workers according to objective criteria,
- Higher evaluation of the pedagogical profession within the community.
- Cooperation with students in quality evaluation of the educational process.
- Keeping in contact with graduated students (finding their opinion about obtained education, usefulness of knowledge obtained during the study, educational requirements resulting from their employment).
- Close connection to the practice in pedagogical and research activities (continuous finding of requirements present at the job market).
- Participation in international pedagogical and research projects.
- Mobility of students within the university and also at international level.
- Mobility of pedagogical personnel.
- Fast and easy access to information via Internet, proper literature, modern educational tools (e.g. multimedia).
- Scholarships for excellent students.
- Organizational measures.

In the next part we will describe Faculty of Mechanical Engineering of TU Ostrava and main conclusions about evaluation procedures in years 1997 to 2000.

2 Faculty of Mechanical Engineering of TU Ostrava - types of study programmes and degrees awarded

The Faculty provides the following study programmes and awards these degrees:

- Bachelor Study Programmes
  After state final examination: "Bakalar" (i.e. "Bachelor") abbreviated as "Bc."
- Magister Study Programmes (Master of Engineering)
  After state final examination: "Inzenyr" (i.e. "Master of Engineering") abbreviated as "Ing."
- Doctoral Study Programmes
  After state doctoral examination: „Doktor" (i.e. „Doctor") abbreviated as "Ph.D."

BACHELOR STUDY PROGRAMMES

Number code	Name of study programmes **2341 – R Mechanical Engineering**	Length of study	
		FTS	PTS
23-07-7	Mechanical Engineering Technology	3	4
23-71-7	Environmental Engineering	3	4
23-20-7	Energy Management	3	4
23-45-7	Operation and Maintenance of Hydraulic and Pneumatic Equipment	3	4
23-73-7	Robotics	3	4
23-72-7	Technical Diagnostics, Servicing and Maintenance	3	4
23-21-7	Operation, Economics and Management in Raw Material Mining	3	-
37-29-7	Economics and Operation of Transport	3	4
23-70-7	Applied Informatics and Control	3	4

MASTER STUDY PROGRAMMES

Number code	Name of study programmes **2301 – T Mechanical Engineering**	Length of study	
		FTS	PTS
23-07-8	Mechanical Engineering Technology	5	6
23-04-8	Energy Engineering	5	-
23-19-8	Production Systems with Industrial Robots and Handling Equipment	5	6
23-17-8	Design of Machines and Equipment	5	6
23-34-8	Mining Equipment	5	6
23-35-8	Transport and Materials Handling	5	6
39-05-8	Applied Mechanics	5	6
37-12-8	Operation and Maintenance of Vehicles	5	6
23-43-8	Automatic Control and Engineering Informatics	5	6

DOCTORAL STUDY PROGRAMMES

Number code	Name of study programmes **2301 – V Mechanical Engineering**	Length of study	
		FTS	PTS
23-07-9	Mechanical Engineering Technology	3	5
23-04-9	Energy Engineering	3	5
23-16-9	Hydraulics and Pneumatics	3	5
37-01-9	Transport Technics and Technology	3	5
23-03-9	Construction of Production Machines and Equipment	3	5
23-35-9	Transport and Materials Handling	3	5
39-05-9	Applied Mechanics	3	5
39-12-9	Automation of Technological Processes	3	5
23-01-9	Parts and Mechanisms of Machines	3	5
16-07-9	Environmental Engineering	3	5

3 Basic information about academic programmes on FME

There are two graduate Programmes of Study in Mechanical Engineering - Master of Science and Bachelor - and a Post-graduate doctoral programme. A student of the Master of Science Programme can change to the Bachelor Programme without any restriction. Those taking a Bachelors degree have an opportunity to transfer to a Masters degree at a later stage, after they have completed their Bachelor Programme, including the State Examination, and, upon transfer, they are required to complete an additional compensatory year. This Faculty has implemented a credit system of education compatible with the EC pilot scheme ECTS.

The Bachelor study was introduced in 1992 and it is a compact programme of university study that lasts three or four years with full-time or part-time attendance, respectively. The first and a part of the second year of study are concentrated on theoretical foundations of mechanical engineering with the same syllabus for all fields of specialization. The instruction concentrates on practical problems and applications that a technician may find in the day-to-day running of a manufacturing facility. Upon completion of the State Examination, the title Bachelor, abbr. Bc, is awarded to successful students at the end of the study. A successful student of Bachelor Programme, willing to change to the Master of Science Programme, can do so only after he/she has completed his /her Bachelor Programme, including the State Examination, and a compensatory addition to a year.

The Master of Engineering Programme consists of a five-year, two-part programme of study. The first part lasts two and half years and represents a standard basis of mechanical engineering. It is completed by the Overall Examination. The second part, lasting two and half years, is subject-oriented and is completed by the Final State Examination and an oral defence of the thesis. The whole programme leads to the Degree of ***Engineer*** (**ING.)**. The degree is considered equivalent to the degree of Master of Science in Engineering (MEng) or it is an equivalent to the German title ***Diplom-Ingenieur (Dipl.-Ing.***).

The Doctor of Engineering Programme does not include formal instruction, but is only based on a structured individual study programme and research. The qualification for admission to the programme, which may last from three to a maximum of seven years, is the Degree of Excellence in Mechanical Engineering (Ph. D.). The Doctor of Engineering Programme is intended for talented, young scientific workers and should provide students with knowledge and understanding of the "state-of-the-art" in one or more of the many areas of Mechanical Engineering, in which the Faculty has acknowledged expertise. The full-time programme is, in particular, intended for fresh graduates from the Faculty and they are beneficiaries of Faculty financial support. The part-time programme is intended for experts from industry and they do not receive any financial support from the funds of the Faculty.

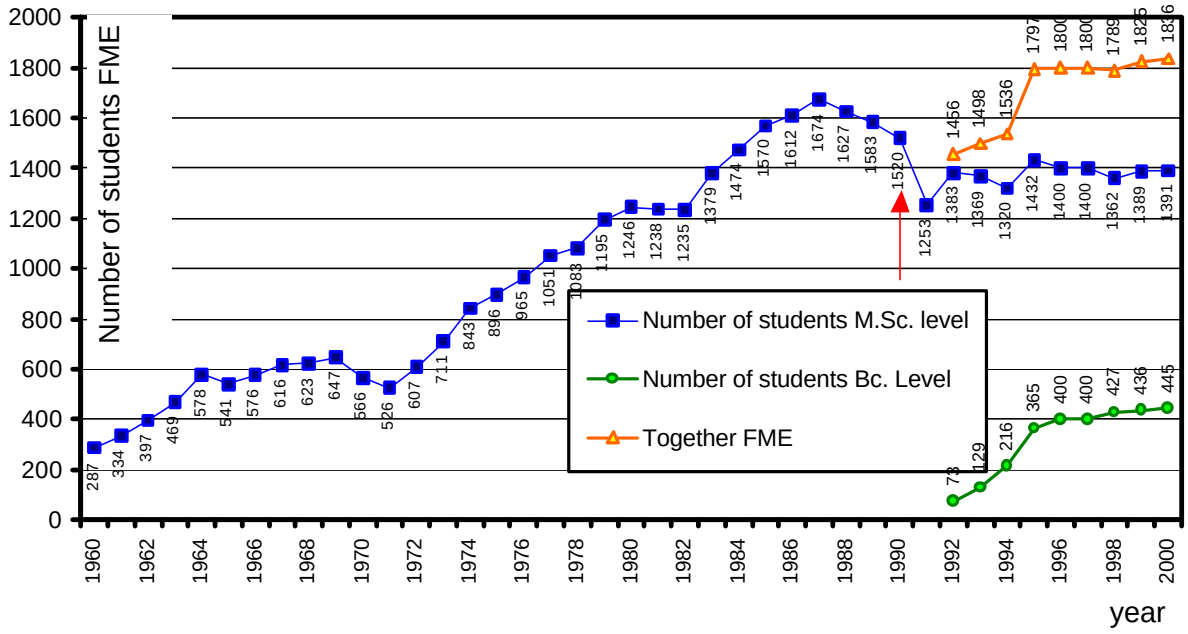

Fig. 1 Number of students of Mechanical Engineering Faculty TU of Ostrava at 1960 to 2000

4 Independent External Evaluation Process of the FME

Faculty of Mechanical Engineering is the faculty with a long tradition (this year it will celebrate 50th anniversary) and it won very good position between the other faculties of both VSB-Technical University Ostrava and faculties of Mechanical Engineering in Czech Republic. The evidence of that is also contained in the conclusions of External Evaluation Report of Teaching and Learning of the FME (together with Faculty of Electrotechnic Engineering and Informatics), which was drawn up in the end of year 1998 at the occasion of the independent evaluation process done by the group of European experts within the Phare Multi-Country Programme in Higher Education ZZ-95.20 Quality Assurance in Higher Education. As a chair of the group was nominated Dr. Stephen Gergely, Fellow of the Institute of Electrical Engineering, Coventry University, UK, and project manager was Mrs. Anne-Kathrine Mandrup, Centre for Quality Assurance and Evaluation of Higher Education, Denmark.

The Report was written on the basis of many planned meetings between the external group and representatives of all participants of teaching and learning process of FEEI, further on the basis of many visits in offices, laboratories and other important rooms used for teaching and learning. As a good starting point for the evaluation served a self assessment document prepared by a team consisting of some of the leaders of the faculty [CHMELIK, K. AND BRIS, R. 1999]. Main findings and recommendations described in the Report are as follows [Sousedik, B. et all. 1998]:

Both faculties (FME, FEEI) provide a good, traditional, master level education in a large number of specialized streams and they have very good contacts with industry.

Strengths:

- A lot of well qualified teachers (FME - number of professors and asocc. prof. is the best on the whole TU).
- Well equipped lecture halls and buildings.
- Students have a very wide range of choice (branches, subjects).
- Good co-operation with industry which helps in equipping some of the laboratories.
- Good computer and instruments facilities (bearing in mind the inevitable financial constraints).

Weakness:

- The existing structures do not promote the implementation of necessary changes.
- Closer cooperation among departments seems necessary.
- The existing entrance criteria and teaching leads to a very high failure rate in the first year.
- There should have better feedback from students about all aspects of their education.
- International relations for both staff and students are at a low level. They are based mostly on personal relations.

The Faculty FME now faces the challenge of change on many fronts. Many of these faces engineer educators all over the world, so they are not specific only for Ostrava. Some of these are:

- The change of technology, particularly in the disciplines taught by the Faculty.
- The change of industrial structures, in the Czech Republic as well as world wide.
- The change in the numbers and types of students. (The introduction of the bachelor level is expected to lead to an increase in the numbers of students and inevitably to a change to a more effective system of education).
- The changes in the law for Czech Universities will lead to structural and other changes in Ostrava.
- The trends in Western Europe are for more formal and more formally documented methods of quality assurance. This University may decide to implement some of these.

Points to consider of measures capable of implementation by the FME:

- Reconsider the entrance procedures and criteria, which seem to be inappropriate and are one of the causes of high wastage.
- Better introduction of students into the study skills and providing a better match between School and University at the start of the course.
- Move from lecture oriented learning to reduce teaching time and manage self-study.

- Examine ways of increasing the numbers of students who are able to study their first choice of specialization.
- Introduce a system for collecting and analyzing examination statistics as a valuable performance indicator and management tool.
- The commitment for further development of the system of quality assurance and management.

5. New criteria for evaluation of faculties

Ministry of Education of Czech Republic prepared a new criteria for evaluation of faculties, which will be applied on the next evaluation on the end of year 2000. Review of this three types of criteria is on the next table:

Table 1: New criteria for evaluation of faculties

Binary criteria		
1	Education minimally one (magister program - M.Sc.) at foreign language	Y, N
2	Education of foreign students on Ph.D. study level	Y, N
3	Organization scientific and research competitions for pre and postgraduate students on faculty	Y, N
4	Evaluation of faculty on foreign level	Y, N
5	Evaluation of teachers by students – (participate min. 20% of students, evaluation min. 90% of all teachers)	Y, N
6	Existence of inner information system, with open to public data about students, about research and development and faculty economy	Y, N
7	Minimally 95% of students must finished their study in nominal or shorter time interval	Y, N
8	Minimally 10% of students after study stay on foreign university make there minimally one an subject examine	Y, N
9	Faculty has accreditation min. one Ph.D level study programm	Y, N
Metric criteria		Value
10	Financial funds acquired on open competitions	
11	Government contribution for education activity	
12	Number of nominal teacher (adjusted on full time)	
13	Number of nominal professors	
14	Number of nominal teachers with scientific status (title CSc., DrSc., Dr., Ph.D. or R&D attestation)	
15	Number of associated professors younger 40 years with pedagogic rate min 70%	
16	Number of professors younger 50 years with pedagogic rate min 70%	
17	Number of Ph.D level students	
18	Number of Ph.D level graduates	
19	Number of all form study students	
20	Number of foreign students	
21	Number of all elaborated opinions at professor nominations, habilitation nominations and Ph.D dissertation thesis for other faculties	
22	Number of all graduates	
Metric criteria (calculated)		Value
23	Rate of financial funds obtained in open competitions to one nominal adjusted teacher	
24	Rate of financial funds obtained in open competitions to government education contribution	
25	Rate of associated professors younger 40 years with pedagogic rate min 70% from the number of all nominal teachers	
26	Rate of full professors younger 50 years with pedagogic rate min 70% from the number of all nominal teachers	

7. Conclusions

The Faculty of Mechanical Engineering is a faculty with 50 years tradition and it confirmed its viability and recorded a remarkable and dynamic development in difficult times. This was proved especially by the fast increase of students number on 90-years. It was applying for this kind of study and by total permanent interest in offered fields of study, although the interest was unbalanced, which - taking into account the generally low interest of the young generation in Czech Republic in studies of technical subjects - is a great merit of the Faculty.

Evaluation procedures at 1997, 1998 and 2000 year shown that Faculty of Mechanical Engineering is very good prepared for difficult education and research tasks on the edge of 21th century.

8. References

[1] CHMELIK, K. AND BRIS, R. 1999. Role of Faculty of Electrical Engineering an Informatics at the Process of University Education. In *International Conference on Engineering Education ICEE' 99* [CD-ROM]. Ostrava: VŠB-TU Ostrava, August 1999, 8 pp., ISSN 1562-3580. <URL: http://www.fs.vsb.cz/ akce/1999/ICEE99/Proceedings/papers/>

[2] KUREKOVA, E and HALAJ, M. 1999 Evaluation of the Education Process Quality at the University Level. In *International Conference on Engineering Education ICEE' 99* [CD-ROM]. Ostrava: VŠB-TU Ostrava, August 1999, 4 pp., ISSN 1562-3580. <URL: http://www.fs.vsb.cz/ akce/1999/ICEE99/Proceedings/papers/>

[3] Sousedik, B. et all. 1998. Self-evaluation Report in the Framework of PHARE Multi-Country Programme in Higher Education. Ostrava: VSB-TUO, 1998. 15 pp. + 8 pp. attachment. ZZ-95.20 "Quality Assurance in Higher Education coordinated by Quality Support Centre, The Open University London.

[4] SMUTNY, L. & FARANA, R. 1998. Information Technologies for Engineering Education in the Web Environment of Internet. In *Proceedings International Conference on Engineering Education 1998.* Rio de Janeiro (Brazil): PUC, August 1998, Paper 133, 4 pp.

[5] SMUTNY, L. AND VITECEK, A. 1999. Innovation of Study Programme for Engineer Level on the Faculty of Mechanical Engineering TU Ostrava. In *International Conference on Engineering Education ICEE' 99* [CD-ROM]. Ostrava: VŠB-TU Ostrava, August 1999, 7 pp., ISSN 1562-3580. <URL: http://www.fs.vsb.cz/akce/1999/ICEE99/Proceedings/papers/>.

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