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TOWARDS MODERN ENGINEERING STUDY: RESPONDING TO NECESSITIES OF THE COUNTRY IN A GLOBALISED WORLD*

Summary:

In a changing world, there is a continuing need to adapt the higher education system of our country to ensure that it remains competitive and respond effectively to challenges of globalization. The paper discusses the fundamental characteristics of studying, such as general requirements for obtaining a degree, academic regulations and procedures as well as administrative organization. This approach is based on the experience of leading US universities and although considers the entire system of higher education it is mainly focused on the engineering studies.

Key words: Engineering Study Structure, Curricula, Academic Organization and Regulations, Office of University Registrar.

Introduction

The traditional system of engineering study as well as all other academic fields has been the focus of interest of the entire world community in the last decade. Education as a confirmed and verified means for changing human habits on a long term basis has become one of the priority sectors in global planning of the development strategy in the poor as well as rich countries. Engineering studies at universities of Central and South-East Europe were based on the academic and administrative concept of the region's leading universities such as Munich, Vienna and Prague /1/.

Basic concepts of such organization are still in place. For the purpose of modernizing higher education and making closer to the contemporary needs, the European Union has initiated a process of reform of the Union universities at the end of the last century, through a series of documents and

* This paper was presented as invited paper at the International Conference ICT@FIT2008, held at the Faculty of Information Technology of the Džemal Bijedić University in Mostar, October 1-5, 2008.

activities /3/, /4/. These activities are still under way in all European countries, including ours.

This paper introduces another vision of modern higher education based on the experience of leading American and Japanese universities. Although the following discussion considers the entire system of higher education, it will be mainly focused on engineering studies.

Basic Structure of Engineering Studies

According to the above trends in the world's higher education, it is evident that contemporary need in modern engineering studies requires radical changes in our country in the conceptual as well as in administrative organization. The traditional concept of study in engineering sciences which was entirely dominated by core and particularly major courses is now changing especially undeveloped countries, towards introduction of so-called liberal studies in the curricula of engineering departments. Therefore, the current development in engineering education calls for improvement and restructuring of engineering curricula and programs in order to make them more attractive for engineering students and more connected to the communities where they live. They must be armed with sophisticated knowledge of engineering science with an understanding and appreciation of the social, cultural, economic and environmental impacts of engineering decisions. Thus, this time calls for more integrative experience for engineering students.

In the following consideration we introduce the model for implementation of such a vision of reformed engineering study based on the experience of leading American universities /3/, /4/. According to this concept the curriculum of all university departments, including engineering, consist of three groups of courses: **core courses**, **major courses** and **liberal studies**.

Liberal Studies. Area I: Mathematics, Computers (six (6) semester hours); **Area II: Natural Sciences**, Physics, Chemistry, Biology, Astronomy, Geology, Meteorology etc (seven (7) semester hours, one of the courses must be accompanied by a corresponding laboratory); **Area III: Language**, Native Language, English, Second Language, etc. (6 (six) credits hours);

Area IV: History/Social Science, History of Continents, Cultural Anthropology, and Criminology Government and Politics, Economics Geography, Sociology, Psychology, etc. (six (6) to twelve (12) semester hours); **Area V: Humanities/Fine Arts**, Literature, Ancient Civilization, Philosophy, Cinema, Theatre, Music, Religion, Archeology etc. (five (5) to eleven (11) semester hours).

The courses within the above sub area are offered and should be completed at the corresponding departments of the university.

Core courses. All graduates of the college of engineering had to master a common body of knowledge about their profession. This has been addressed by the adoption of an engineering core for all students seeking the BS in engineering. Some of these courses may be completed at a community college that offers a pre-engineering track, others are only offered within the college.

Academic Organization

The curricular design of university departments and studies presuppose different academic organization in comparison to the current one. Liberal, core and major contents designed for each department should be, according to the proposed concept, integrated at the university level. Therefore the university, rather than individual departments, appears as a partner to the students in all academic procedures like registration, credit transfer, transcript preparing, scheduling academic space, time and exams, certifying eligibility to graduate etc. Since particular courses of the curriculum designed in such a way belong to different university departments, where the liberal courses mainly have low level codes, students must complete one or more courses at different university institutions. The structural similarity of curricula at this initial liberal level of study enables the students to choose almost every department, study or major offered by the university, not immediately with registration but at the end of the sophomore year. Therefore, at about the end of the sophomore year, students formally select a major and request acceptance by the department, college or school in which the major is taught. There is no need to emphasize how this possibility contributes to the coherence and efficiency of the study in terms of longer academic experience and maturity of each applicant.

If the major selected is, for example, at the college of engineering, the same procedure continues since common engineering courses are followed by required engineering courses in the major area and the technical electives. It means that the final decision about a selected engineering major must be made by the end of the junior year.

In order to set up the proposed academic system it is necessary to define **the credit system, academic regulations and procedures and the common course numbering system.**

The foundation for coordinated **credit system** is provided by *the grading system*. The basic characteristics of this system may be summarized as follows:

Definition	Grade	Quality Points Per Credit Hour
Excellent	A	4.00
	A-	3.75
Good	B+	3.25
	B	3.00
	B-	2.75
Average	C+	2.25
	C	2.00
	C-	1.75
Poor	D+	1.25
	D	1.00
	D-	0.75
Failure	F	0.00

In addition to the above mentioned grades there are some non quantified grades such as Pass, Satisfactory, Unsatisfactory, Incomplete, Withdrawn etc.

Quality points are assigned for each semester hour as listed above. In the computation of the required grade point average (GPA) for retention and conferral of a degree, the total number of quality points is divided by the total number of semester hours for which letter grades are received.

At the end of each semester/term, a report of each student's grades is sent to the address indicated by the student as the student's grade-mailing address or permanent address. This STUDENT GRADE REPORT, Figure 1, also contains cumulative GPA, cumulative quality points and GPA hours of attendant.

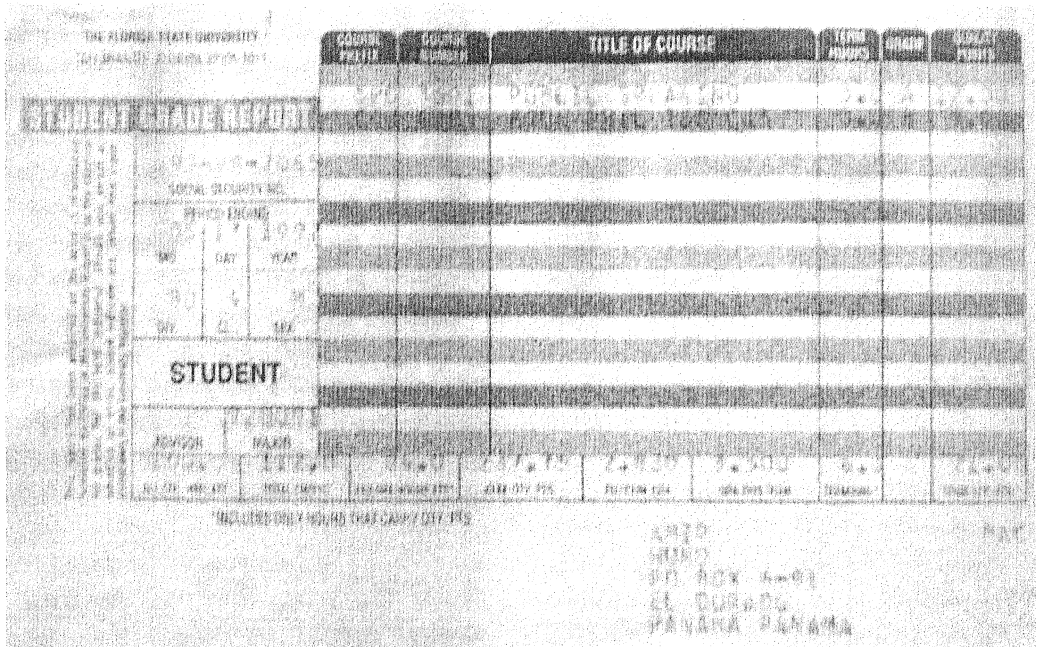


Figure 1

On the basis of semester hours earned, the students are classified as follows:

- **Freshman**, zero (0) through twenty-nine (semester-hours, classification 1;
- **Sophomore**, thirty (30) semester hours, classification 2;
- **Junior**, sixty (60) semester hours, classification 3;
- **Senior**, ninety (90) semester hours, classification 4;
- **Graduate**, any student admitted to a graduate program, classification 5.

The University considered /4/ regards fourteen (14) to fifteen (15) semester hours as normal full-time loads, and a student will not be considered full-time with fewer than twelve (12) semester hours. The student should bear in mind the requirement to take nine (9) semester hours of credit in the summer. A student who maintains a twelve (12) credit hour (low/normal) load will not graduate in four academic years unless a total of twenty-four (24) credit hours are taken during summer sessions.

Academic Regulations and Procedures are fully consistent with the academic organization described. The academic process is carried out in full cooperation of university with its chancellor and corresponding colleges, schools and departments. At the beginning of each academic year the university publishes **UNIVERSITY CALENDAR**, with opening and closing data, admission/readmission data and legal holidays. Before each semester/term, the university offers a list of courses which will be taught in the appropriate semester/term. Students with the assistance of the designate undergraduate adviser select the course plan finally approved by the appropriate academic unit. At the end of each semester students take final exams, who grade being averaged through partial exams at the courses. Thus formed, the grade should be deposited at Office of the University Registrar (OUR) within 3 to 5 days. When reports about grades and certification of attendance are made to the OUR the corresponding semester is practically completed. At the end of each semester/term the Office of the University Registrar send a report of each student's grades to the address indicated by the student. The report includes GPA for the current semester, as well as the cumulative GPA. Under the *forgiveness policy* an undergraduate student may improve his GPA by repeating a course in which a grade of "D" or "F" was received and requesting that the repeat grade be the only one counted in the calculation. Only two such requests are available to any student during the student's undergraduate career.

The graduation policy in American universities allows limited credit transfer possibility from other universities, colleges or national (states) tests. For example, some universities request minimal number of credits which must be earned at the university of graduation, while other require that the fixed number of last credit hours must be earned at the appropriate institution. In addition, since the university offers courses in a given academic period according to student interest and teaching staff availability many students, especially from classification IV and V, while waiting for their major courses to be available, may take other courses in order to complete a minor(s) and/or second major. In this way, flexibility of higher education is significantly improved, offering better chances to young graduates for employment.

The major purpose of **The Common Course Numbering System** is to facilitate the transfer of courses between participating institutions.

Each participating institution controls the title, credit and content of its own courses and assigns the first digit of the course number to indicate the level at which students normally take the course. The course prefix and the last three digits of the course number are assigned by members of faculty discipline committees appointed for that purpose by the corresponding department. Thus, each *course identifier* consists of the course prefix (three

capital letters) and four digits. In science and other areas a “r” after the course number is known as a lab indicator. The following table shows an example of *Course Identifier*.

Prefix	Level Code (first digit)	Century Digit (second digit)	Decade Digit (third digit)	Unit Digit (fourth digit)	Lab Code
SYG	1	0	1	0	
Sociology General	Freshman level at this institution	Entry level general sociology	Survey course	Social problems	No lab com- pon- ent in this course

Equivalent courses at different institutions are identified by the same prefix and the last three digits of the course number. They are generally transferable between different departments of the university, as well as accredited universities in a state and the entire country.

The course prefix is a three-letter designator for major division of an academic discipline, subject matter area or subcategory of knowledge. The prefix is not intended to identify the department in which the course is offered. Rather, the content of a course determines the assigned prefix used to identify the course.

Office of the University Registrar

The office of the University Registrar is the official custodian of permanent academic records of all past and current students enrolled at the university. It is responsible for registering students and for maintaining student and departmental records for the term in progress, readmitting students, preparing transcript, scheduling academic space, maintaining and updating curricula, certifying attendance for loan purposes, implementing and monitoring academic regulations, certifying eligibility for graduation, and providing services for students, faculty and administration. Reports and certification of attendance and grade point average are made to governmental institutions and agencies with the student's permission.

A student should address to the OUR questions concerning registration, location and meeting times of courses, errors in registrations

records, dropping and adding courses, cancellation of registration and grade problems.

Conclusion

In accordance with the current transformation of higher education in our country, this paper analyses the academic and administrative organization of American universities for the purpose of applying some ideas of this highly sophisticated educative system in our reform.

Starting from the historical concept of the formation of our universities, the present paper points to the need for an integrated university, as the central partner of the relevant social structures in the forthcoming reform of higher education in order for the university to be adequately prepared for these challenges. The paper proposes both indispensable global measures to be taken in its academic and administrative structure and organization and some concrete solution enabled by the global measures. Although the proposals relate to the university as a whole, the study of engineering is the focus of the paper.

Sažetak:

U svijetu punom promjena, postoji stalna potreba prilagodavanja sistema visokog obrazovanja u našoj državi, da bi se osigurala njegova konkurentnost i sposobnost za efikasno odgovaranje na izazove globalizacije. Ovaj rad govori o temeljnim osobinama studiranja, poput općih zahtjeva za stjecanjem diplome, akademskih pravila i procedura kao i administrativne organizacije. Ovaj pristup bazira se na iskustvu vodećih američkih univerziteta i premda razmatra cjelokupni sistem visokog obrazovanja, uglavnom se fokusira na tehničke studije.

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