
Propuesta de asignaturas optativas basadas en los perfiles terminales del egresado de la carrera Ingeniería en Informática de la Universidad de Guantánamo

Proposal of optional subjects based on the profile for the graduate of the Informatics Engineering major at the University of Guantánamo

Goar Orue-Sánchez¹, Carla María Alonso-Jane², Irina Salas-Moya³

¹ Universidad de Guantánamo. Cuba

² Universidad de Guantánamo. Cuba

³ Universidad de Guantánamo. Cuba

Email address (es):

¹ goar@cug.co.cu

² carlajane@cug.co.cu

³ irina@cug.co.cu

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Abstract in Spanish: La selección de las asignaturas optativas por los estudiantes de la carrera Ingeniería en Informática muestra dispersión, por lo que se propone la creación de perfiles de salidas que agrupen las asignaturas optativas de manera tal que respondan a los intereses del territorio y dirigidos a aportarle al futuro egresado una preparación mayor en un campo o esfera de actuación de la profesión, sin llegar a convertirse en una especialidad. Además de los perfiles se propone una distribución del horario, contenido, fondo de tiempo y evaluaciones que permita implementar de manera eficiente los perfiles creados.

Keywords in Spanish: Asignaturas optativas; Currículo; Plan de estudio; Ingeniería Informática.

Abstract in English: The elective subjects chosen by the students of the Informatics Engineering major are irrefutable evidence of dispersion in the topics selected; this paper proposes profiling output grouping of the optional subjects so as to respond to the interests of the territory of a thorough preparation of the future graduates in specific fields or spheres of activity related to their profession, not necessarily a specialty. In addition to the distribution of the schedule, content, time and assessments in an efficient manner it will enable the implementation of the profiles created.

Key words: Optional subjects; curriculum; Syllabus; Informatics Engineering

INTRODUCTION

The present day program of study of the Informatics Engineering has its most direct antecedent the study of automatized Systems of Technical Economic Management created in 1976 at the Superior Polytechnical Institute José Antonio Echeverría (ISPJAE), given the country's need for professionals in the field. These specialists possessed a wide profile in training, including all that had to do with the automatization of the information systems and decision making for managing the technological processes.

The first applicable curriculum was the Study Plan A, aimed at the automatization of the processes at companies and, within it, it was included the attention to industrial processes with an integral focus, that would become the well-known Automatized Systems of Management.

The first curricula were based in the experience of the socialist countries, the Cuban reality at that moment, the influence of the faculty in which the specialty was located and the experience of the designers. (CNC. 2007)

The major, at its beginnings, had a characteristic low practical labor component, based fundamentally in the computers IRIS 10, CID 201B and, in some cases, machines of the System United of Electronic Computing Machines, for example the EC 1022; while the most used languages for analysis and design were FORTRAN, COBOL, ALGOL, LEAL, Computer Code. (Pérez M. y Telot González, J. 1980)

Applying the curricula for the Informatics Engineering major was characterized by an appreciable set of modifications caused, firstly, by the richness and variability of the object of study, which has motivated adjustments related to the university local surroundings and the relationships with productive and service entities.

The Study Program D, for the Informatics Engineering major, currently in use, has been created based on the experience acquired in the materialization of the transformations of the Cuban society, which have contributed to defining the professional model of future engineers.

In the introductory words to the Study Program D for the Informatics Engineering major is declared that the Center of Higher Education can decide which part of the study program must include as compulsory content for all of the students of the major, in order to fulfill the specific needs of the regional development; as well, an optional/ elective space so that students can make individual

decisions about the way to complete their training, which yields to legitimate interests of personal development in every student is also recommended. (Dirección de Formación de Profesionales, 2003)

The optional/elective curriculum of the Informatics Engineering major is made of 11 subjects of study, which can be selected, based on the needs of each center of higher education (CHE) to serve as complement for the integral training. In these subjects of study and hours, each CHE will be able to specify, according to its particularities for training, which subjects all students must undertake compulsorily. (CNC, 2007)

Based in the study of the subjects selected by students it was established that the selection of optional subjects is insufficient for developing a profile or thematic line, with a generalized tendency to the selection of subjects considered plain, for that reason future professionals are not well prepared for acting in the fields or spheres of their profession.

The current investigation aims at proposing a set of optional subjects of study in accordance with the needs of the Central Organisms of the State and Government (OACE in Spanish) which will be grouped in profiles or final results expectancies for the graduate of the Informatics Engineering major.

DEVELOPMENT

The optional/elective curriculum of the Informatics Engineering major is made of 11 subjects of study: 1 elective and 10 optional, as shown below:

Chart 1: Elective/optional subjects of the curriculum

Elective/optional subjects	Time allotted	1st year	2nd year	3rd year	4th year	5th year
ELECTIVE I	32		32			
OPTIONAL I	56			56		
OPTIONAL II	56				56	
OPTIONAL III	42				42	
OPTIONAL IV	42				42	
OPTIONAL V	70				70	
OPTIONAL VI	56				56	
OPTIONAL VII	56				56	
OPTIONAL VIII	56					56

OPTIONAL IX	42					42
OPTIONAL X	42					42
TOTAL	536	0	32	56	322	126

It can be appreciated that the greater amount of optional subjects of study is placed in 4th year and in the 1st semester of 5th year of the major.

Accordingly, the curriculum of optional subjects of study represents a 10.27 % of the total hours, accomplishing rules establishing that optional/elective subjects of study must extend throughout 10 % of the total curriculum, at least. (Dirección de Formación de Profesionales, 2003)

Chart 2: Relationship among the schedules for the different types of curricula

Total hours of the curriculum	Hours of the basic curriculum	% hours in the basic curriculum	Hours of the particular curriculum	% particular curriculum	Hours OPTATIVE curriculum	% OPTATIVE curriculum
5216	4020	77,07	660	12,65	536	10,27

The students' choice of optional subjects of study must be made a semester in advance; hence the list must be previously communicated by the teaching department following the recommendations of the study program, despite the fact that optional subjects do not have a normative character.

In the complementary instructions of the curriculum D it is established the possibility of creating profiles or terminal exits for the major, designed in the basis of the contents of the particular and optional/elective subjects of the major, intending to contribute to the future training of the graduate in any field or sphere of acting related to their profession, but these optional or elective subjects do not constitute specialties. This will help the future worker to be more efficient in labor, once placed in an institution, and to contribute as well to postgraduate training.

All the profiles designed for a major are based in common aspirations (host curriculum) which cannot be modified. The National Commission of the major (CNC in Spanish) can modify these aspects that illustrate to the homologous centers of higher education the possible terminal profiles, taking into account the requests and the social assignment of the country in each territory.

(Dirección de Formación de Profesionales, 2005)

The needs of each territory are determined in meetings with the organizations for the state administration (OACE, in Spanish) aimed at training engineers with abilities in network management, engineering and software management, web programming and data bases management. Each profile will provide solutions for the particular needs of each territory. Each profile will group a set of optional related subjects of study and the student will choose a profile instead of independent subjects of study. In this way planning is carried out for organizing and guiding the education of the students in the diverse profiles of knowledge.

Proposal of profiles

This paper proposes the creation of four profiles that group a set of optional subjects of study. In order to select the optional subjects of study it was discussed which disciplines would have more impact in the students' training and it was established the following list for the selection:

Computer Networks:

- Introduction to GNU Linux
- Server administration
- Management and configuration of thin clients

Engineering and Software Management

- Management of software quality
- Expeditious methodologies
- Employers

Web Programming

- CSS3
- JavaScript
- Framework Ext Js

Data Bases

- SQL
 - Postgres / MySQL
 - Advanced DB

Cuban Universities embrace a diversity of profiles; that is why the creation of the profiles for professionals is intended for students who choose to receive subjects of study not only related to a

specific topic, but of all profiles. However, the subject of study chosen will receive more hours. In order to accomplish such plans, the number of optional hours is strictly monitored each semester.

First semester 4th year:

OPTIONAL II	56 hours
OPTIONAL III	42 hours
OPTIONAL IV	42 hours

Second semester 4th year:

OPTIONAL V	70 hours
OPTIONAL VI	56 hours
OPTIONAL VII	56 hours

First semester 5th year:

OPTIONAL VIII	56 hours
OPTIONAL IX	42 hours
OPTIONAL X	42 hours

As can be appreciated, each semester plan includes an optional subject of study that has more hours. All students will receive in one semester the optional subjects of study planned for the semester, but in the optional subjects a bigger quantity of hours will be received in the profile chosen.

According to the precedence between the subjects of study and taking into account the subjects of the basic curriculum taught in 4th year the profiles by semester were designed as follows:

Chart 3: Optional subjects and profiles for the 4th year- first semester

Subjects	Hours	Computer		
		Networks	Web Programming	Data Bases
OPTIONAL II	56	Introduction to Linux	CSS3	SQL
OPTIONAL III	42	SQL	Introduction to Linux	CSS3
OPTIONAL IV	42	CSS3	SQL	Introduction toLinux

The students that select the profile Computer Networks will receive the optional subject of study II, of 56 hours, and Introduction to Linux and other subjects from other profiles. The students who choose Web Programming will receive in the Optional II, CSS3 and in the optional 42 hours the rest of the matters. Finally, the ones that selected Data Bases will receive optional 56 hours with SQL and CSS3 and Introduction to Linux in the other two optional 42 hours.

Chart 4: Optional Subjects and profiles for the 4th year- second semester

Subjects	Hours	Computer Networks	Web programming	Data Bases
OPTIONAL V	70	JavaScript	Postgres /MySQL	Patterns
OPTIONAL VI	56	Patterns	JavaScript	Postgres /MySQL
OPTIONALVII	56	Postgres /MySQL	Patterns	JavaScript

Chart 5: Optional Subjects and profiles for the 5th year- first semester

Subjects	Hours	Computer Networks	Web programming	Data Bases
OPTIONALVIII	56	Framework	Advanced DB	Expedite Methodologies
OPTIONAL IX	42	Expedite Methodologies	Framework	Advanced DB
OPTIONAL X	42	Advanced DB	Expedite Methodologies	Framework

Plan for the optional subjects adjusted to the profiles.

In order to accomplish the distribution of the optional subjects of study for the professional profiles, it becomes mandatory to adjust the schedules so that students receive all the corresponding hours of the selected profile. As an example we will analyze the first semester of 4th year, which has 14 school weeks to accomplish these adjustments:

All students will receive all the optional subjects of study, at least 42 hours, and 56 hours for the subject that tributes to their specific profile. Taking into analysis a 14 weeks semester all the optional subjects are taught in two weekly encounters, hence, in week 10 every student should have received 40 hours. The first frequencies of week 11 would complete the 42 hours of the optional subject. From that point on, in the schedule, instead of 3 planned subjects, two especial weekly

encounters (a total 4 hours) are planned to complete the 56 hours in just one optional subject. That optional subject will be received only by the student with that specific profile, that is, in week 11 all students will receive three optional subjects, and from then on, the optional subject that belongs to their profile only.

Chart 5: Fragments of the 1st semester of 4th year adjusted to the specific profiles

SEM	1						2					
hours	L	M	M	J	V	S	L	M	M	J	V	S
1	1	2	2	3	1		1	2	2	3	1	
2	4	3	4	5	1		4	3	4	5	2	
3	5						5					

The distribution of the first 2 weeks is repeated up to week 10

Chart 6: Weeks 11 and 12 of the 4th year adjusted to the specific profiles

SEM	11						12					
hours	L	M	M	J	V	S	L	M	M	J	V	S
morning	1	1	<u>2</u>	2	P	1	1	2	2	P	1	
	2	<u>4</u>	<u>3</u>	P		1	P				1	
	3											

	Subjects	Hrs.	Curriculum
1	Operating Research	70	base
2	Software Engineering II	70	base
3	Optional II	56	optional
4	Optional III	42	optional
5	Optional IV	42	optional

In week 11 the underlined hours are the last common hours for each class, from there, the letter P signals the selected profile in the study schedule. The plan continues then unchanged after week 12. Each optional subject of the profile can also be planned apart from class time.

Distribution of the content, time allotted and evaluations

Las evaluaciones de las asignaturas optativas se realizan través de trabajos de curso por lo que se sugiere que los estudiantes que seleccionaron el perfil al que pertenece la misma tengan un trabajo de curso con mayor complejidad.

Each optional program should have an especial theme that only the students of that specific profile will receive. The theme should encourage research on that profile, and it will have to be taught in 16 hours.

For being assessed about the optional subjects of study, students will write a research paper, so we recommend that the profile chosen be relevant for the professional profile of the students.

CONCLUSIONS

- A study of the optional curriculum was accomplished in the Informatics Engineering major and it was established how students choose the optional subjects of study.
- The complementary indications to the D study plan establish the possibility of creating profiles or terminal exits designed from the contents of optional/elective subjects that are intended to contribute to the preparation of the future professionals, but do not constitute specialties of the plan. The following conclusion was established:
- The greater number of optional subjects of study is planned in the 4th year and in 1st semester of 5th year.
- The curriculum of the optional subjects of study is a 10.27 % of the total hours, 10 % of the total hours of the curriculum.
- This paper recommends designing four profiles that will group a set of optional subjects of study.
- For the selection of the optional subjects of study, it was discussed which disciplines would have more impact in the students' training. That way, if the student chooses a profile he will not only receive the subjects of study of that profile, but also contents of all the profiles. Nevertheless, the subject of study that belongs to the profile chosen will receive a greater amount of hours.
- The distribution plan will be structured as follows: optional subjects of study (at least 42 hours) and the profile optional, 56 hours.

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- Considering a 14 weeks semester, all the optional subjects are taught in two weekly encounters up to week 11. From that point on, to complete the scheduled 56 hours students will receive just one optional subject: only the one that belongs to their profile.
 - For being assessed about the optional subject of study, students will write a research paper.

REFERENCES

- CNC. (2007). *Plan de estudio D Ingeniería Informática Presencial*. MES
- Dirección de Formación de Profesionales. (2003). *Documento base del plan de estudio D*. MES
- Dirección de formación de profesionales. (2005). *Indicaciones complementarias al documento base para la elaboración de los planes de estudio «D» dirigidas a los presidentes de las comisiones nacionales de carrera de los CES del MES*. MES.
- Pérez Monteagudo, F. y Telot González, J. (1980). *Introducción a la computación*. La Habana: Pueblo y Educación.