



Committee on Review of Education, and
Pedagogical Practices of the IST.
CAMEPP

Final Report

Version Of The Magazine

February 2019

The Commission's Analysis of a Model of Teaching and Pedagogical Practices of the IST.

Pedro Brogueira Department of Physics (co-ordinator)

António Pereira Gonçalves The department of Engineering and the Nuclear Sciences
If Michael Pleasures Department of Bioengineering

Isabel Marrucho Department of Chemical Engineering

José Bioucas The department of Electrical and computer Engineering

João Pimentel, Nunes, Department of Mathematics

João Ramôa Correia The department of Civil Engineering, Architecture, and

Georrecursos
Miguel Tavares da Silva The department of Mechanical

Engineering
Monica Oliveira The department of Management and Engineering

Nuno Jardim Nunes The department of Engineering and Computer science

Participated in the work of the commission on a regular basis

Nuno Guerreiro Vice-President of the student of the academic Board

Liliana Freitas, A senior fellow in the Management Science and Technology

Editorial support, and to **design**/pagination

Michael Guégués

Elisabete Calixto

Preface

The positions referred to in this report and the model of the proposed study are solely the responsibility of the members of the CAMEPP, and do not necessarily reflect the official opinion of the Instituto Superior Técnico (IST), and that of their bodies. The document is the sole and exclusive property of STI's, and is intended for internal use only and may not be distributed or reproduced for external disclosure in any manner without the express written permission of the Tech.

Thanks

The purpose of this report is the result not only of the collection of information, and reflection on, and discussion of the internal and CAMEPP, but it is also a fruitful interaction with various members of the community, the Coach and several players external. We would like to say thank you to all those who have contributed with their suggestions and comments, which were made rich by her, the work of the CAMEPP. In the first place, we would like to highlight the role of the presidents of the bodies, in the context of Teachers Arlindo de Oliveira (Board of Management), Luís Oliveira e Silva (the Council for Scientific and Raquel Aires-Barros (teaching staff), incentives for the continued comments assertive and constructive criticism during the month in which it has been developed in the work of the commission. We are also grateful to Professor Paul Martinez, the chairman of the Board of the School of the CONTEXT for the discussion of the critique, which he did in the work of the committee, and Professor Luis Caldas de Oliveira, vice-chair of the STI for entrepreneurship and business, for their assistance in the construction of the perspective of the business and the employees. Consultation with key stakeholders outside of the Coach, was also instrumental to the framing of this work, and to refine the proposal of a new model of education, and pedagogical practices of a Tech. We are grateful to the following personalities for their availability, in the us, and discuss a proposal for a new education model for the STI: Professor Albert Smith (Chairman of the Board of Directors (bod) of the A 3 ES), Eng. st Jean Carlos Silva (Member of the Executive of the board of A 3 ES), Professor António Feijó (the Vice-chancellor of the University of Lisbon, portugal), Eng.-th, Carlos Mineiro Aires (President of the association of Engineers), Eng. Carlos Leon (Vice-President of the association of Engineers), Professor Eduardo Marçal Grilo (a Member of the Board of Trustees of the A 3 ES), Professor Eduardo Pereira, Vice-Chancellor of the University of Lisbon, portugal), Prof. Miguel Tamen, Director of the Faculty of arts of the University of Lisbon (faculty host) in the Course of General Studies and Professor Manuel Heitor (ministry of Science and Higher Education). Consultation with key stakeholders and internal - which included a course coordinators, officers and *alumni* - has made it possible to gather opinions and information are particularly important for the diagnosis of the education of a Coach, and for the analysis of the measures to be implemented in a new model of education, and pedagogical practices. We are grateful to all of them, the availability and donations. The content of the first half and the pre-work of the CAMEPP was presented and discussed at many meetings with various agencies, departments, and groups of teachers in the School. Thank you to all of the responsiveness and availability of in order to collaborate in the process of self-reflection. The reviews and comments collected during the course of these meetings have been an important part of the scope of this report.

Many of the statistics in the report have been provided to us by the Study, Planning , and Quality assurance (AEPQ), and the center for Statistics and Foresight (NEP) of the instituto superior técnico. In this respect, we thank in particular Dr st Martha Long, the Dr st Elizabeth Barr, and Mr. st Martha's Grace. The CAMEPP would like to thank the Councils of Science and technology of STIS because they have started a process in participation and consultation with stakeholders internal and external to the School, as well as in the member state concerned and the parties to the Coach that actively and constructively participated in the consultation process. This active participation will not only contribute to a reflection on the School, the current model of education, as it has led to improvements in the model Técnico 2 1 2 2 , and in this report.

Terms of Reference

The work of the CAMEPP a result of the terms of reference as approved by the governing bodies, in the context briefly defined in the following matters:

1. How to match the current one for the Technician to prepare the graduates to anticipate, identify, intervene in, and respond to the future challenges of the society as a whole?
2. As I reflect on the teaching and the importance of developing the critical thinking, innovative thinking, and the creator of science? What is the model of the formation of the Technician both from the point of view of education **core**, both from the point of view that the answer to this vision, and the challenges of the twenty-first century?
3. How to improve the teaching and learning Coach, and how to adapt them to the context of the twenty-first century?
4. How should it be implemented, the recommendations of this committee?

The full text of the terms of reference are available on the *Appendix A* section of this report.

Contents

The Commission's Analysis of a Model of Teaching and Pedagogical Practices of the IST.....	i	preface	ii
Agradecimentos.....	iii	-	
Terms of Reference	iv		
Abbreviations	x		
Executive Summary	xii,		
Part I: Introduction	1		
Chapter 1. Context and objectives	1		
1.1. In the context of the european			
1.2. In the context of nacional.....	2		
1.3. The strategic position of the IST.....	3	1.4. The	
objectives of the CAMEPP	4	Chapter	
2. The methods and procedures are adopted for the.....	5		
Part II. the rationale for the change.....	9		
3. Challenges and trends in the education of engineering, science and technology	9		
3.1. Challenges of education in the twenty-first century	9	3.2. Training for the new ones	
3.3. The major challenges in the design of the Century. XXI.....	12	3.4. A	
background in engineering, according to the guidelines and standards of the international.....	13		
Chapter 4. The analysis of the teaching at the university for the reference.....	15		
Section 4.1. Selection of the most leading universities			
4.2. The identification of best practices in education from the university of the reference.....			
5. An analysis of the educational and Technical	22		
5.1. An analysis of the courses and indicators on education	22	5.1.1. An analysis of the courses:.....	
5.1.2. Indicators of education	30		
Abandoned escolar.....	30		
Effectiveness of training	33		
academic achievement	34		
Performance-in- 1.No ciclo.....	35		
the Performance in the 2.No cycle		3.6. Dissertação.....	
5.2. The interviews with the engineers, and students <i>alumni</i> Coach.....	39		
A summary of the interview with the students.....	39		
the Summary of an interview with the alumni	40		
the Summary of an interview with the engineers.....	41	5.3. A	
critical analysis of a model of teaching and pedagogical practice as well as the Technical	2018		
The culture of the Coach	43		
the Structures of the curriculum and the learning.....	43		
Organization for a semester of learning, and the management of stress.....	4		
Training is not a ONE	46	the Structure	
of the classroom, and instructional practice	47		
the Evaluation of the alunos.....	48		

Part III. a New model of teaching and teaching practices: a Technical	2 1 2 2	5 0
6. Overview of the new model of education, and pedagogical practices of a Tech		5 0
6.1. Frame		5 0
6.2. Guidelines		5 0
6.3. Construction		5 2
6.4. The structure of the curriculum, organization, and philosophy		5 3
6.5. in. Regarding the development of		5 5
6.6. The human and material resources, and the management of the faculty,		5 7
6.7. The proposed measures		5 8
6.8. Strategy implementação		6 2
The management of the mudança		6 2
preparatory Actions		6 6
general activities of the frame		6 6
Monitoring		6 9
7. Final thoughts		7 1
Appendix A		7 4
The terms of Reference of the CAMEPP		7 4
Appendix B		7 5
Approach And Methodology		7 5
B 1. A model of the development of		7 5
B 2. A survey of the goals and areas of operation		7 7
B 3. Contrib for the purposes of the education of a Coach		8 0
Appendix C		8 1
The adaptation of the recommendations to Bologna by Coach		8 1
C 1. The Bologna Process on the Coach		8 1
A model for the formation of mixed		8 1
The Major fields of Engineering		8 2
The learning is student-centered		8 5
C 2. An analysis of the implementation and impact of the recommendations of the Bologna on the Coach		8 6
The structure of the model to the training		8 6
the structure of The training in the broad Areas		8 7
The learning is student-centered		8 7
quality assurance		9 1
Conclusion		9 1
Appendix		9 1
D		9 2
Explanation of the proposed new model		9 2
The structure of the Curriculum, Organization, and Philosophy (ECOF)		9
Pedagogical Practices (PP)		1 1 2
Resources, and the Management of the School ATTACK)		1 2
Appendix E		1 3 3
The guidelines for the establishment of a general education course		1
1.No cycle in the Sciences and Engineering		1

List of Figures

(Figure 1). The evolution of the group, the age of the young (0 - 14 years) living in the Uk. The projections for the 2080s refer to the scenarios below, (B), and high (for The).	
4 shown in Figure 2. The process adopted for the development of a new model of teaching and practical instructional Coach.	5 shown
in Figure 3. The four pillars of education report UNESCO.	9 shown in Figure
4. CREDITS for the CU-based course (L), and MN) in the year 2017/2018	25
(Figure 5). The indicators of the generation of the G-11, after a six-year course, LB+MB, and E) for a class note for the entry.	31
Figure 6. The percentage of drop-outs, for a year of study in 2015/16, relative to the total number of drop-outs.	33
Figure 7. The evolution of the number of students enrolled in the 1.Th time, and you graduate from 2013/2014 to 2017/18.	34 (Figure
8). Effectiveness of training IST: the percentage of the number of students relative to the number of students enrolled in the 1.St time since 2013/14 to 2017/18.	34 Figure 9. The distributi
of final scores from the 1.No cycle for the generation of the G-11 and obtained by 2017	36
Figure 10. Scatter plots of the pair (a note to the entry, the final grade). To the left: 1.No loop. Right: the UC-CDI II.....	36
11. The distribution of the final grade for 2 people.No cycle for the generation of the G-11 and obtained by 2	37 Figure 12. Distribution of the notes of the essay, between 2011/12 and 2017.
39 (Figure 13). Key ideas underlying the model is the Technical 2122, built on the basis of a model of the teaching force in the Technical 2018.	52
Figure 14. The structure of the curriculum and taught courses in 1.Article 2.No cycle is a result of the measures proposed in the case of (i) the Structure of the curriculum, organization, and philosophy of the new model.	55 Figure 15. The timing of the implementation of a new model of education, and pedagogical practices of the Técnico.....
	66
(Figure 16). The areas of operation in the model of education up to the age of the goals of teaching and learning is the product of the network, the media-for).	78
Figure 17. The organisation of higher education in the Technical effect of the adoption of the Process in science in 2006. A degree in nuclear pre-Design in existence at the time the Coach had adopted the model of the integrated master's degree.	81
18. Testimonial from a student of a Technical, 2018.	90

List of Tables

Table 1. Key stakeholders interviewed in the course of the development of the new MEPP's Coach..... 7 (Table 2). The major challenges for the twenty-first century, in which, the engineer plays a key role (the National Academy of Engineering).....	1 2
Table 3. Leading universities reviewed by the CAMEPP.....	1 5
Table 4. The key features and aspects that are relevant to the teaching of the UR	1 6
Table 5. The courses in the Technical and analyzed.....	2 2
Table 6. The dimensions evaluated in the analysis of the gift of the curriculum and the approach to teaching at the helm.	2 3
Table 7. General view of the structure of the courses on Tech.....	2 4
Table 8. The number of foreign students in exchange programmes in the school year 2012/13, the 2016/17	2 8
Table 9. The number of international students enrolled in the Coach, in the academic years 2012/13 to 2016/17.	2 9
Table 10. The number of international students enrolled in the programs, the mobility of the Tech in the school year 2012/2013 2016/2017.	2 9
Table 11. The percentage of the abandonment of the course, on the number of pupils, on the 2015/16.	3 2
Table 12. The average time, in years, until the completion of the course.	3 5
Table 13. The interval, in years, until the completion of the course.	3 5
Table 14. The statistics of the final standings 1.No cycle for the generation of the G-11 and obtained by 2011	
Table 15. Statistics of the ratings by the end of the 2.No cycle for the generation of the G-11 and obtained by 2017	3 7
Table 16. Abandoned, only with a thesis on the lack of, between 2007/08 and 2014/15	3 8
Table 17. The duration of the msc in between 2007/08 and 2014/15.	3 8
Table 18. The weak points of the approach to teaching at the Technical 2018.	4 2
Table 19. The distribution of the number of hours of effort, in half a year's typical in Tech 5 CU 6 ECTS credits each, in The the pressure is distributed evenly on all the CU, and B in the UC 1 are designed so that they can be completed within a period of lessons, with the evaluation of the continuous.	4 6
Table 20. A set of measures of the new model, the "Structure of the curriculum, organization, and philosophy".	5 9
Table 21. A set of measures of the new model, the "educational Practices".	5 9
Table 22. A set of measures of the new model, the "human and material Resources, and management model docente".....	6 0
Table 23. The table template, and a description of the extent to ECOF 1	6 1
Table 24. The preparatory actions to be undertaken prior to the entry into force of the new model.....	6 3
Table 25. An example of the planning of the timetable, half-yearly on the model 8 + 2	6 4
Table 26. Actions in the general framework of the new model.	6 7
Table 27. Learning objectives are used in the evaluation of the quality of teaching and learning for the award of the seal of the EUR-ACE, and is regarded as a strategic target for the new model.....	7 9
Table 28. The mapping of the potential contribution of the measures of the new model for the purposes of the EUR-ACE (daily motion, and should be read as: it is expected that the measures in this area will contribute to the objectives of the EUR-ACE).	8 0
Table 29. The major fields of engineering (GAE), and the corresponding curriculum, at the level of the training in the basic sciences, such as that proposed by the WG-Bologna (Italy). The model has been implemented in the Coach since 2006, in force, even today, with minor changes to.	8 3

Table 3.0. The distribution of CREDITS for the Training Base for the subject area in the current state of Mathematics (30) Physics (12), Math/Physics/Chemistry/Biology (12) Science (6) the CITIZENS (including the Management, and 9). (All the CREDITS of current is rounded up in such a way that each CU has a 3 or 6 credits.) 85

Table 3.1. The organization of the first half of the academic and Technical. The distribution of hours is presented that is based on a commitment to 42 h/week, up to a maximum of 25 hours of contact per week. For the calculation of ECTS credits, have admitted that it is 1 ECTS is equivalent to 28. The effort of a semester corresponds to 30 ECTS credits, i.e., up to 840 h of contact, and the study of. 86

Table 3.2. The characteristics of the model for education in the Technical and in the 2018. 89

Table 3.3. A summary of the impact of the implementation of the recommendations of the Bologna on the Desk. .. 91

Abbreviations

A 3 ES - The agency for Assessment and Accreditation of Higher Education

AE - Student council

AEPQ - The area of Study, Planning, and Quality

GA - The area of Graduate studies

CAMEPP The commission on the Review of the Education and Practices of Teaching

CC - Scientific Advisory Board

CDIO - Conceive-Design-Implement-Operate

MC - The board of Management

CLUSTER - Consortium Linking Universities of Science and Technology for Education and Research

Carnegie mellon - Carnegie Mellon University

CNA-q. - A National competition for Access to

CP - Teaching Staff

THE The Direction Of The Academic

DIRECTOR - Department of Computer science

DTU - Danmarks Tekniske Universitet (Technical University of Denmark)

DGEEC - The directorate General of Statistics, Education and Science

CREDITS The European Credit Transfer System

ECOF - The Structure Of The Curriculum Organization and Philosophy

EPFL - École Polytechnique Fédérale de Lausanne (switzerland)

s - Higher Education

EIT The European Institute of Innovation and Technology

ETH - The Eidgenössische Technische Hochschule (Federal Institute of Technology)

TSI - The equivalent of a Full-Time

THE EUR-ACE (EURopean ACcredited Engineer

FAQ - Frequently Asked Questions

GAE - Large-scale Engineering

GOP - Office of the Organization of the Pedagogical

GT Design Working group responsible for the document from the reflection, that, in 2005, was established on the recommendations to be adopted by the STI, for the implementation of the guiding principles of the Bologna

HASS - Humanities, Arts, and Social Sciences.

IST Instituto Superior Técnico

KIT - Karlsruhe Institute of Technology

KTH - Kungliga Tekniska Högskolan (Royal Institute of Technology)

L - Bachelor's degree

LTI Laboratory of Information Technologies

FCT The ministry of Science, Technology and Higher Education

MEPP A model of Teaching and Teaching Practices

MA The Master Of The Aligned

MB - Master Of Science

MIT The Massachusetts Institute of Technology

MI - Master's Degree

MNA The Master Of Non-Aligned

MOOCs - A Massive Open Online Course (Mooc)

DYNASTY The core of Support for the Student

NEP - Core-Statistics-and long-term

NDA - Center for Academic Development (Objectives)
UN Organization of the United Nations
PORTUGUESE-speaking african countries - African countries
 with Portuguese as its Official Language *PP* - School Practice
Polimi - Politecnico di Milano
Polito - Politecnico di Torino
THAT - The quality of the courses
RAID - The record of the Students and Graduates of Higher Education
RADIST - Assessment of the Performance of the academic staff of
 the IST *ATTACK* Resources, and the Management of the School
HR Human Resources
STEM - Science, Technology, Engineering, and Mathematics
SUTD - Singapore University of Technology and Design
TA - Teaching Assistant
ICT - Information & Communication technology
TR Terms of Reference
TT@IST - Technology Transfer
TU Delft - Technische Universiteit Delft (Delft University of Technology)
The TUE - Technische Universiteit Eindhoven (Eindhoven University of
 Technology) *CU* - Unit
UC-Chilean The Catholic university of Chile
UNESCO - The United Nations Educational, Scientific and Cultural
 Organization *UP-Catalunya* - The Polytechnic university of Catalonia
UP to Madrid - Universidad Politécnica de Madrid
UR - University-of-Reference
VUCA - Volatile, Uncertain, Complex and Ambiguous

Executive Summary

The recent technological developments and rapid social change have come to throw up new challenges to engineering education in the twenty-first century. In the UK, these challenges are exacerbated by demographic trends are favorable, by the continuing effects of the recent financial crisis and for increasing the international competitiveness of the schools with the most recognized. The report of the international since the end of the last century, showing the need for a fundamental change in the education of the engineer. The Delors report to UNESCO of the reference to the EUR-ACE, for the sustainable development goals of the united nations, the strategy of Europe in the year 2030, the Bologna Process, and the various legislative initiatives point to the need for an urgent change in the approach to teaching and practical teaching at the Instituto Superior Técnico (IST). In this context, the Coach set off a process of analysis and reflection on the model of teaching and teaching practices, with the aim to define the lines leading to a rearrangement in the formation of the School.

The aim of this report has been produced by the Commission for the Examination of the Teaching Model and Teaching Practices (CAMEPP), in the context of a mandate to the effect that the board of management of the School to reconsider the model of the ordering educational Tech to help make engineers better able to anticipate, identify, intervene in, and respond to the challenges of the future. In this challenge, you must, of course, from the recognition of the strengths of the School: it's an age-old tradition in the selection of the best, which is provided with a scientific and technical basis, and accurate, at the expense of a high-stress job, which selects and shapes the more able students. In the model, it should still be in line with the ambitions set in the strategic plan for the team, you want to place the School in the internationalmente as a reference at the european level. In this overview you must create the right conditions for the Tech to be competitive in attracting talent to the international level by bringing together the human condition, and materials so that you can continue to develop a culture of merit in the promotion of education and research in the fields of science, technology and innovation in a global context.

In this study, which focused on the provision of training for 1st and 2nd grade, the CAMEPP, followed by a socio-technical approach that is focused on the values and goals of the school of engineering, science, and technology in the twenty-first century. Starting from built-in diagnostics, and in one year prospective comparison with other countries, the CAMEPP has reviewed the 16 schools in the reference, and the 26 courses at the Tech. They were identified as good practices are prevalent in the various school are: (i) the formation of a solid foundation in the sciences and engineering; (ii) the methods of teaching for active learning; and (iii) flexibility in their academic courses; and (iv) formation of inspiration for humanistic; and (v) the cross-cutting skills part of the course units; (vi) the project of integrated multi-disciplinary; (e) the organisation of teaching, with a focus on the continuous work; or (b) internationalization, (ix) training in entrepreneurship, innovation; (x) the conditions are very attractive for the education and the experience of academic, (xi) the diversity of qualifications; (xii) the provision of general education in the sciences and engineering. International trends have been contrasted with the situation of the education of a Coach, and are discussed in interviews with many leading figures within the School, and of great influence, and experience in higher education and in the regulation of the professional.

The analysis of the quantitative indicators for the education of a Coach has been supplemented by interviews of the students, ex-students, and the course co-ordinators out of School. The respondents were generally favourable to the proposed measures, which come from the prospective study of the leading universities. Today's students will show their support for the implementation of a 1st year of the common, of the reduction in the number of course units (CU) at the same time, and the increase of active learning, and the flexibility of the curriculum, it is not beneficial to the compulsory education in the English language on 1st year. The co-ordinators are also positive, with the introduction of the methods of active learning, as well as to the organization's half-yearly periods, corresponding to one half of

1

The formation of a 3-cycle, which has been the subject of a change in the law in recent years (DL 65/2018), it is the object of reflection is parallel to a Committee was appointed to the civil code.

half a year, provided that you backed-up the availability of teaching staff for the investigation. Express reservations regarding the requirement of the project/dissertation, in collaboration with the business, and the award of qualifications in different ways. Finally, the ex-students to express the great satisfaction of the strength and extent of training received, upon improvements to the need for the development of transversal skills and training and the computer tacional. They expressed misgivings as to the increase of the flexibility and compulsory education in the English language. The majority of students, ex-students, faculty, and employers to recognise that the culture of the Tech assen-one set of principles, which as a whole are called the "meritocracy of difficulty" - the idea that the difficulty of an Engineering education is the warrant of a future career and success to a life of material it is comfortable. It is not surprising that the difficulty of the competition on the course of education, and the associated effort and talent necessary to overcome it, it is one of the core values that best define the experience of those who have come out by the Coach, and that is one of the most identified at the institutional level ("in the Coach, the students are satisfied to work") and are recognized by the employers, "and from that, the team, and the vin- to"). An important implication of the "meritocracy of difficulty," he is the image of the superiority of the students from the Technical (and some teachers) are you the same when you compare it with other students from other schools and teams. However, the character of the overly-hard, and is mandatory for the majority of the resumes, it seems to emerge as an anachronism that is incompatible with a time of globalization, and the work is collaborative and inter - and intra-specific cialidades, with the proliferation of information technology and computing, and the rapid pace of change which is the new norm. This is the rigidity of the curriculum is also reflected in the contents of CU, and the way in which they are taught, and, most importantly, it is in the way in which students learn, study and apply it. In most of the cases, the students of the centre are designed to solve problems of the kind, and to respond to questions that the standard of a high level of complexity. This feature was identified in 2001 by Professor Michael Athans when you compare it to the students at MIT, and the team, while remaining the unchangeable past seventeen years ago...***"MIT students to excel in an independent-thinking, and problem-solving, while the IST students are spoon-fed".***

The School is faced with the need to develop a model, which is internalized and ran it with great success, but it prevents the full development of the strategy of internationalization, the more am biciosa. Thus, it addresses in a sustainable way, some of the main critics of the model, the current Coach is: (i) the culture and values of the School; (ii) the structures of the curriculum and the teaching / learning process, and (iii) the organization's semiannual management and the efforts of the academic; and (iv) the non-STEM; and (v) the structure of the lessons and practices of teaching; and, finally, (vi) the assessment of the students. This new model is not only a challenge in adapting the curriculum to a more socially relevant, and in turn to wide, and above all, a pragmatic view of the implementation of the process of change at the scale of the Technical and in the respect of the tradition, and the accuracy of the various engineering disciplines that characterize the school. The new curriculum emphasizes the choice of the students in the multi-disciplinary nature of knowledge, the impact of social experience across the out-of-school and in the areas of nuclear and skill. In this report, the brand, above all, the recognition that the service Technician has embraced this challenge, which is internationally recognized in the school of engineering, and who it involves the courage, and the ability to implement these changes at the scale of the Coach, with the well-known limitations of the features.

A critical review of current Technical trends in international schools and referral support to the proposal of a new model of education, and pedagogical practices of the Technical *Technical 2122*). They are presented for the lines on the road, and the ideas for which it was built, and after that, the main measures (the rational and the underlying-hundred), which are required to be implemented: (i) to provide training in fundamental academic rigor, fluent in digital, and high-quality, in keeping with the tradition of the School; (ii) the implementation of a model of active learning, with a strong coresponsabilização the students, including on-going assessment, and based on the models

pedagogical assets; and (iii) to foster a learning and collaborative, cross-disciplinary and cross-cultural, encouraging communication, and critical thinking and structured; and (iv) to adapt to the learning of a world that is constantly changing (VUCA) which is dominated by the context of uncertainty, the uncertainty and the vagueness of the goals; and (v) encourage creativity, innovation and entrepreneurship; (vi) to provide you with a strong exposure to the thought of the societal, and the goal is to create value; and (vii) ensure the suitability of the model for education and human resources, infrastructure, and the workload of students and faculty; (b) to create an ecosystem to study the dif-the individual, the society, such as the core of a better learning, and positive an experience as possible for the pass-through of the students, by Coach; and, finally, (viii) position in the Tech, as one of the global leaders in the education of engineering, and to enhance the attraction of international students, researchers, and faculty.

These guidelines and learning objectives for the service Technician has led to the proposal of a model

Technical 2 1 2 2 model for this, which has benefited from a collaborative process, and the discussion in the School. Model

Technical 2 1 2 2 it includes a number of measures have been grouped into three areas: (i) the Structure of the curriculum, organization and philosophy; (ii) the Practice of teaching; and (iii) human and material Resources, and the management model of the teacher.

In the first part - *The structure of the curriculum, organization, and philosophy* - are proposed: (i) the adoption of the model 3 a+ 2, a); (ii) the modification of CU, for 6 -and 3 -ECTS throughout the School year; and (iii) the introduction of a cal periods, for the first half of the 8 th to+ 2 weeks; and (iv) an increase in the articulation of the basic training in the specialty, any change in body weight; and (v) the overall increase in the flexibility of the curriculum (3 0 CREDITS at 1.No cycle) and 3 for the majority of the 2.No loops, with the possibility of having the options to free and *minors*); (vi) the establishment of a *min* in the level 2.No cycle; (iv) the recognition of levels and extra-curricular activities; (b) the introduction of the UC integrated "to Develop, Plan, Innovate, 1 2 CREDITS for a follow-up study at 1.No cycle; (vii) the extension of the scope of the project by the end of the 2.No cycle; (x) the establishment of a general education course 1.No cycle in the Sciences a taught in English and Portuguese; (xi) the introduction of the project/UC, in conjunction with the business units of the investigation; (xii) to the establishment of the week of "Design" in the spirit of the program "*Projeter Ensemble*"the EPFL, the inte value is between 1 in.No semester 2.Th semester; (xiii) the strengthening of the autonomy and the coresponsabilização of the student and, finally, (viii) a change in the model, the application of the 2.No loop.

In the second-tier - *Regarding the development of* - are proposed: (i) a change of paradigm in the teaching of classes in theory and practice; and (ii) the enhancement/overhaul of the training is experiential, and (iii) the enhancement of education in the *soft skills* in the scope of the UC's already in place; and (iv) the increase in the medical fields, in computer science and programming; and the introduction of training in the social sciences, the humanities, and the arts; (iv) the restructuring of the model, with a weight average of 5 0 % of the assessment for the examination. Finally, in

the third part of the - *The human and material resources, and the management model of the teacher* - it is proposed that: (i) t increase of the human resources involved in the activities of the teaching (including the monitors, and agents); and(ii) the formation of innovation in education, engineering, and technology; and (iii) the renewal of premises and equipment-bands, (iv) the strengthening of international recruitment in three rounds by the significant improvement in the action of the *marketing* and communication technologies; and (v) the establishment of homes and living spaces, and recreational activities in the articu- lation with the University of Lisboa (portugal); (iv) to update and align the system to the assessment and management of human resources. The measures have been designed and considered as a whole, and come with an eu- strategy for its implementation, which sets up a structural model of education, and pedagogical practices of the technology, which substantially changes the "*business as usual*" all of the courses in 1.Article 2.No loop. However, the changes proposed relate to the tradition of the School, while preserving some of the essential features without disruption. For example, the training of the base, keeps the weight of about 4 0 percent, reducing the load to below the

For 20 hours, without a reduction of the load of teaching in total, the education is free, limited to 10% of the training in the sciences, social and human around 4% of the total credits of the training, the overall 5 years of age. The implementation of the model in a time frame of two years and is, therefore, a major challenge that requires the mobilization of resources and resources are very important, and with a high level of commitment on the part of the School. The new model took effect in 2021/2022, it is essential to: (i) the adoption of a strategy for the management of change in the direction of the School, and properly coordinated with the other departments, coordinating committees, and scientific research units; and (ii) in the definition, implementation and scheduling of the stock preparation are essential, and (iii) the implementation of actions in the framework of the new model; and (iv) monitoring the effective action is planned.

The members of the CAMEPP identify you as a full and unanimous, with all the main features of which are laid out with the huge success of the school in the Coach since its inception. The reform proposed in this report, is to improve the strength and impact of the implementation of these fundamental principles. On the one hand, you want to unleash the great potential for the development of the academic associated with the interdisciplinary nature of the curriculum, and to increase the cooperation between the departments and the research facilities. On the other hand, you want to make a more substantial effort, and the work of the students significantly increased their actual involvement in the actual learning of the material, and encourages the use of full contact between the student and the teacher, or other staff of the school. The Coach is faced with a unique opportunity for you to revamp the curriculum, pedagogical practices, and the context in which you teach to your students. With the adoption of the model proposed here will allow you to increase the uniqueness of the landscape in the teaching of Engineering in the UK. In addition, on the whole, the model is well supported by a high majority of key players in the school, both internal and external), with the appropriate caveats about the need to provide the conditions needed for their implementation. This is certainly a huge challenge, it is not exempt of difficulties and obstacles, which will require everyone's commitment, effort and enthusiasm. But it is also a task that at the time of the handouts for the technology, which will change the way you operate in the School for many years to come. More than just a necessity, in the face of the past, the present, and the Coach has a responsibility to its students, the community and the country to take a leading role in the reform of the teaching of Engineering in the UK.

Part I: Introduction

Chapter 1. Context and objectives

Abstract: in this chapter, it fits into the goals and work of the CAMEPP in the renewed challenges of the Bologna Process in the context of national legislation, current, and in the priority given in the strategic plan for the Technician to turn the School into a point of reference in terms of its culture, and the environment, methods and outcomes of the learning process.

1.1. In the context of the european

The Bologna Process, which began with the signing of the Bologna Declaration in 1999², has introduced a series of initiatives to build a european Higher Education area (S) as a competitive and attractive in the plan international and end that facilitates the mobility and employability in Europe. In addition, he recognized the importance of the modernization of higher education systems in Europe in order to respond to the needs of the labour market and the training of human resources for innovation and entrepreneurship, and the changing demands, and the professions. In the first phase of the implementation of the Bologna process, which focused on the convergence in the organization is sharing the top, in the award, the nomination and recognition of university degrees, for the adoption of a system of credits of the curriculum, to promote the mobility, and the creation of conditions for all citizens to have access to life-long learning. Over the course of the year, the goals and objectives of the Bologna Process, have been, and, in may 2018³ the ministries of Education in europe have set priorities, updated and of a shared vision for an ambitious european foster, 2020⁴:

- an approach that is inclusive and innovative learning and teaching.
- * * the cross-border cooperation, and integrating the INFORMATION, research, and innovation.
- contribute to a sustainable future through the ACTIONS.

These ambitions are in line with the goals and objectives of the European Union (EU) to develop a european education, and the recognition of courses and training, mobility, and with the following priorities:⁵

- enhance the mobility of learning, through the Erasmus programme, substantially the reforms launched, the most comprehensive and enhanced, and the creation of a ' european card of the student;
- * support the emergence of a "european university", which combine a high level of quality in education, research and innovation;
- * to promote the learning of languages and promote the recognition of the qualifications of the S, and secondary education, as well as the results of learning in a foreign country.

Being a Coach for a school with an international scope, with your education, you need to be to develop initiatives in line with the increasing of the mobility, and the promotion of an education that is active, in line with the research, innovation, and contribute to the development of a sustainable society.

² <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=LEGISSUM:c-1-1-0-8-8> (accessed 02/07/2018).

³ https://ec.europa.eu/education/policy/higher-education/bologna-process_en (accessed 02/07/2018).

⁴ European Commission (2018). The eu in support of the Bologna Process, the Luxembourg gardens, in the European Union.

1.2. In the context of the national

The OECD has, at the request of the Government, and an independent review of the systems of science, and state-of-technology, innovation and business in Portugal (2016-2017)⁵. One of the key points of the report by the OECD, published in 2018⁶, is not related specifically to the methods of teaching and pedagogical practices in force in Portugal.

"[...] a tertiary education programmes, [...] usually remain theoretical in focus, with limited co-operation with the outside world, and the lack of attention to developing key competences the students needed for the modern economy. Programmes typically have rigid structures and are targeted to specific professions, providing students with " limited flexibility in combining courses. Additionally, the traditional teacher-centred methods with a large number of the lecture is based on contact hours, still prevail."

The recommendations of the report by the OECD, which connect directly to the work of the CAMEPP, they point to the need for the institutions in the UK:

i. enhancing the diversity of the supply of education, by removing the boundaries that are not needed for the design of the curriculum is flexible and

ii. to support and encourage the education and recompensarem the good performance of the teacher,

promoting regarding the development of a more effective, and providing resources to support the initiatives, training, education. As a result, the Portuguese Government launched

a number of initiatives, legislation and programs in the field of qualification, and have a significant impact on the university in general education⁷. In the context of the work of the CAMEPP, special mention should be made of the proposal for the amendment of the following is transcribed literally from the proposal:

"Change the conditions under which it is justified by the creation of the integrated master's programmes, thereby limiting the existence of cases in which the existence of the minimum conditions of training are equal to or greater than 300 credit to be established by a directive of the European, to access the performance of certain activities activities for professionals. Guarantee a period of transition for the adaptation of existing courses, when required, and to maintain the value of the tuition fees payable by students, when the combination of the degree of bachelor and master, it is essential to have access to the exercise of a professional activity, a time in which the rules of education level on the watch for the exercise of their professional activities regulations- be still is to be determined by the respective professional associations, in accordance with the law."

⁵ Guelllec, D., Larrue, P., Roy, S., Weko, D. (2018). The OECD Review of Tertiary Education, Research and Innovation System in the UK. The decree-Law on the 65/2018, August 16, 2018.

This is a new edition of the no. 1, article 19.ª (course of study integrated, leading to a master's degree) of the Decree-Law no. 74/2006, which, in practice, to discourage their master's degrees in cycles, and integrated:

"At university, a master's degree can also be awarded after a course of study and is integrated with 300 to 360 credits with a duration between 10 to 12 semesters of the curriculum, of the work in the following areas:

- (a) Architecture;***
- (b) the Pharmaceutical Sciences;***
- (c) Medical;***
- (d) oral health;***
- (e) in Veterinary Medicine."***

The other option for the government that have a direct impact on the University of Lisbon and has been in the recent decision of the Ministry of Science, Technology and Higher Education (MCTES) and reduce by 5 % the maximum number of places for students who want to join in 2018/19. No year, of the nine institutions in the S, located in Porto, and Lisbon in 2018/19. In case of a Technical decision, resulting in a reduction of 46 vacancies, compared with 3.1 % in 2018/19, and is expected reduction of the same in the next few years.

1.3. The strategic position of the IST.

The strategic business plan in the STI-designed in 2015 and is positioned on the Coach as A "School for the World ***the school is in the world***". In this international environment is, if the patent is clear in the statement of the Vision set out in the plan:

"The Vision is to have an STI be one of the top European schools of engineering, science and technology, by attracting and nurturing talent, who will work in a global, international, culturally diverse and vibrant urbane environment. Efficient management, attractive and diversified infrastructure, and a holistic merit-based culture, and are instrumental in fostering, through science, technology and innovation, the impact in the society of our global community."

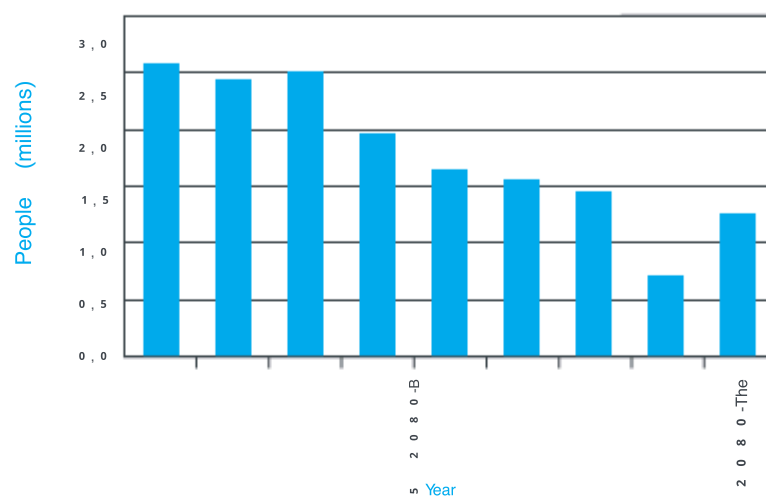
One of the three priorities set out in the strategic plan, vision and leadership at the european level, if the achievement is the establishment of the Technical and the learning environment of the class that the rest of the School, such as a point of reference in relation to the culture, the environment, methods and outcomes of the learning process. To achieve this goal, it is critical for two reasons. In the first place, in light of the unfavourable demographic developments (Figure 1 and with the increasing popularity of international schools (and its aggression in the funding of the student, the Coach shall strive to strengthen the company's ability to attract students, at the national level, while avoiding the temptation to consider the recruitment through the application - Access (NAC), as a thing of the past. On the other hand, it is important for the Technician to increase so far - - ficativa its popularity with students, teachers, and researchers from around the world, as a way to realize your ambitions in international. This attraction, it is also crucial to raise funds externally

⁸ The Instituto Superior Técnico (2015). Instituto Superior Técnico Technical School, you are in the World, the STI Strategic plan.

⁹ PORDATA, a Database of the UK for Contemporary <https://www.pordata.pt/Tema/Portugal/População> (accessed 8/8/2018).

¹⁰ The National Institute of Statistics, Projections of the Resident Population of 2015-2080, on the 29th of march, 2017.

and to close a projected decline in domestic students. It should be noted that the service Technician has started already on a path to the international markets, as evidenced by the number of courses in the framework of the international that are offered in collaboration with the school for reference only. The new initiatives are expected to be set up on the basis of this experience the



(Figure 1). The evolution of the group, the age of the young (0 - 14 years) living in the Uk. The projections for the 2080s refer to the scenarios the bottom (B) and hi (A) .

1.4. The objectives of the CAMEPP

The CAMEPP has been established for more than ten years¹¹ after the implementation of the Bologna Process, the Technical with the challenge to do a reflection on the current model of education in the School, and to develop a set of recommendations for the adoption of a new model of teaching and school practice (MEPP) to 1.St and the 2.No cycles¹². It is intended that the model will respond to the new challenges that present themselves to the education of Eng Architecture, Science, and Technology, and in the light of the best practices established in the universities of the no- and recommended by the international organizations. In accordance with the terms of referenceAppendix A), and a study of the reflection of the CAMEPP tried to focus on the following areas:

- The training is to prepare the graduates to anticipate, identify, intervene in, and respond to the societal challenges;
- Develop in students the critical thinking, innovative thinking, and the creator, which is based on the formation of the science-based to meet the challenges of the twenty-first century;
- Improving the system of teaching and learning in Technical;
- The circumstances that are relevant to the implementation of a new model of education.

It is also intended that the new model meets the guidelines of the european and the options that the national laws, and is perfectly in line with the strategy of the School, and you want to place the Technical and an international point of reference in the instruction.

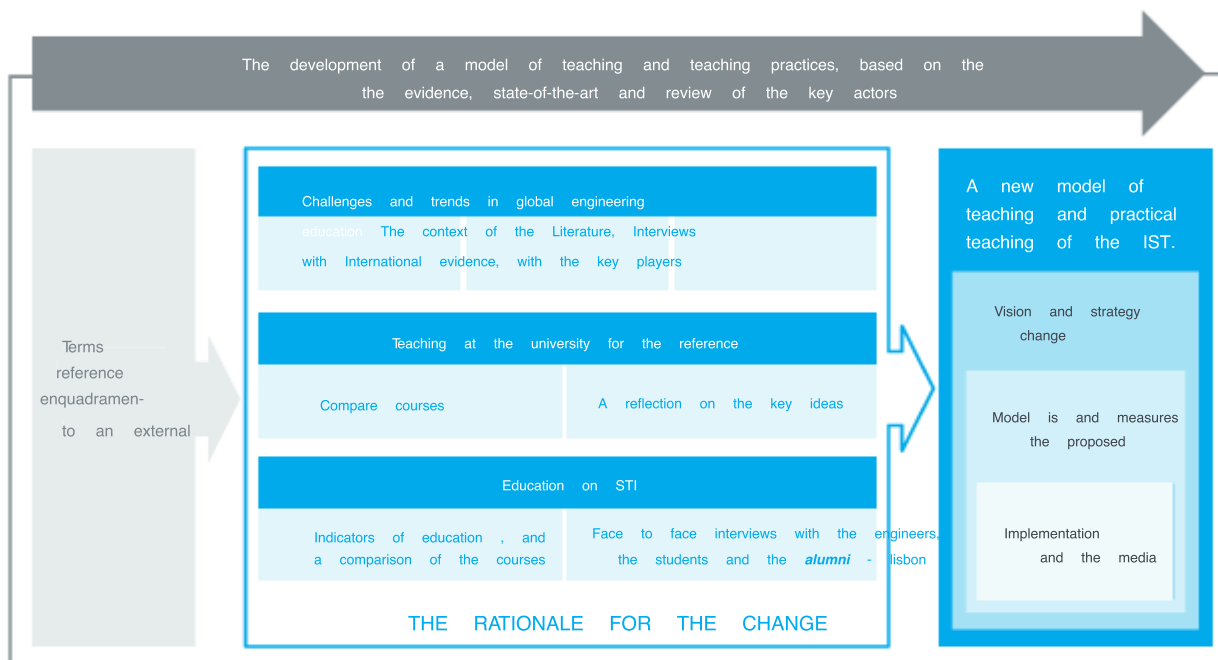
¹¹ Source: data from 1960 to 2011, according to the Census bureau - PORDATA, a Database of the Uk for Contemporary <https://www.pordata.pt/Tema/Portugal/Populacao-1>, logged in to 8/8/2018; the projections for the 2015-2080 of the National Institute of Statistics, Projections of the Resident Population of 2015-2080 in march 2017.

¹² The formation of a 3-cycle, which has been the subject of a change in the law is recent, it is the object of reflection is parallel to a Committee was appointed to the civil code.

Chapter 2. The methods and procedures are adopted for the

Abstract In this chapter, we present the methods and procedures to be adopted by the CAMEPP in the process of the development of a new model of education, and pedagogical practices of a Tech.

Following the light of a proposed model should be informed by evidence, and state-of-the-art is described in the literature on university-level education, as well as taking into account the views of key players in the Tech, and the university system in the nation, the CAMEPP adopted in the process of the development of the model is shown in the *Figure 2*.



Shown in figure 2. The process adopted for the development of a new model of education, and pedagogical practices of a Tech.

On the basis of the terms of reference *Appendix A*), and the framing of the Technical CAMEPP started:

- i. the study on the challenges and trends in the education of engineering, science and technology, analyzing, information about the context by referring to the literature, and evidence in the field and conducting interviews with key stakeholders (*Chapter 3*);
- ii. review and reflect on the systems of education at the university of RH), compared a comprehensive set of courses for these RH with similar courses offered at Technical (*Chapter 4*); and
- iii. to characterize the system of education at the Technical indicators for global comparison between the courses and face to face interviews with managers, students, and the *alumni* (*Chapter 5*).

To make this collection of information, and the CAMEPP:

- * * For a review of UR, has selected a number of universities, with the following rationale: cover different geographic areas have been included in the universities around the world; university context is similar to the Coach, and in particular at the level of culture, and of the size (it was included in several universities in Europe, including the universities of the CLUSTER; and universities that reported in the literature as great examples of the introduction of the reforms (and successful) in the MEPP. Each and every one of UR selected has been analyzed on the size, features, and characteristics, the structure of the courses, and a model of learning and teaching practices. From this analysis, it came to pass, to make a systematic comparison of these universities, and is a reflection of the key ideas in the context of the Desk.
- In consultation with key stakeholders, the team, the CAMEPP prepared for three screenplays from the semi-structured interviews for the use in meetings with the coordinators of the course, the students and the *alumni* (scripts are provided in the Supplementary Material). They were invited to meet face-to-face, in four meetings with the coordinators of the courses in 1.No. 2.No cycle is a sequence of courses: 1.No cycle; the coordinators of the courses for 2 people.No cycle no is a sequence of courses in 1.No cycle, a set of students selected by the coordinator of the course 1.No. 2.No loop), and a set of *alumni* selected by the coordinators of the courses: 1.No. 2.No cycle with a equilibrium in between *alumni* at the end of the course of the last five years, and the others that completed the course, there are the most of the time). For the guests that don't have the availability to meet face-to-face, had opportunity to submit responses to the following guides in writing. The results of the interviews, it was seamless, and is used for thought by the members of the CAMEPP. • The analysis of the Technical, collected and analyzed information on the curriculum of a number of significant and a representative cross-section of courses: 1.No. 2.No loop, and a wide range of indicators of the success of the academic and the effectiveness of teaching. • For a survey of the key stakeholders that are external to the Technician, carried out the interviews with the actors as described in *Table 1*. In these interviews, they picked up the opinions and sensitivities to changes in MEPP's Tech and trends in the MEPP in a variety of settings.
- To promote the discussion of the School, and the CAMEPP presented and discussed in the various branches of School the results of the report on the long-term, as a way to pre-trial hearing at the high school), and in particular on the various departmental meetings, on the Advice of the Department, and at the meetings of the organs of the management.

Table 1. Key stakeholders interviewed in the course of the development of the new MEPP's Desk.

Name	Function
Albert Smith	<i>The president of the A 3 ES</i>
António Feijó	<i>The Vice-chancellor of the University of lisbon, Lisbon</i>
Carlos Loureiro	<i>The Vice-President of the association of Engineers</i>
Carlos Mineiro Aires	<i>The president of the association of Engineers</i>
João Carlos Silva	<i>A member of the Board of Directors of the A 3 ES</i>
Eduardo Marçal Grilo	<i>A member of the Board of Trustees of the A 3 ES</i>
Eduardo Pereira	<i>The Vice-chancellor of the University of lisbon, Lisbon</i>
Miguel Tamen	<i>The dean of the Faculty of Letters, University of Lisbon, faculty of the host from the Course in General Studies from the University of lisbon, Lisbon</i>
Manuel Heitor	<i>The minister of Science and Higher Education</i>
Paulo Martins	<i>The chairman of the Board of the School of the Instituto Superior Técnico</i>

From the point of view of the functioning of the internal decision-making in the CAMEPP have followed the following procedure:

- Given that the composition of the CAMEPP, the ten people of different departments and have taken a the diversity of backgrounds, perspectives, and points of view of the School, it is not working, however, as representatives of their departments.
- * * The CAMEPP met on a weekly basis for at least six months (march, July, and September 2 0 1 8), collecting and looking at the evidence, discussing concepts, and by structuring the new model is based around a set of specific measures. The MEPP has been developed iteratively, with the work that has elapsed in order to generate focus and to promote the agreement;
- The decision-making at the meetings of the committee were selected based on a vote by a majority, and the the coordinator has a casting vote;
- This work was periodically monitored by the chairmen of the Board of Management of the The council of Scientific and teaching staff.

From a methodological point of view, the generation of a model that makes use of a socio-technical approach^{1,2} focus on value^{3,4}, which component of the technique is described in detail in the *Appendix B* and it basically consisted of the following:

- How to approach that focuses on value the development of the model was guided by the objectives to be achieved in the school of engineering, science, and technology in the twenty-first century - the goals of these underlying vision and mission of the education in the Technical and in reference to the EUR-ACE - as well as a point of departure the diagnosis of the current MEPP the team, and the culture of the School. The set of measures, that is, the MEPP you want to cancel the **gap** between the diagnosis of the Technical and the learning objectives to be achieved, and to take into account the evidence of the engineering education, the environment, and the characteristics of the School (including the funds), and the points of view of the actors themselves.
- How can the socio-technical approach, the CAMEPP made full use of the technical tools to support the development of the MEPP in a way that is structured and iterative. They are shown in the *Appendix B* included: a) network media-for⁵ to map out the goals and objectives of continuing with the current model of education, and the areas of action (the means) that the actions of the MEPP has to take action in achieving the goals and objectives; b) table-generating strategies⁶ to generate a comprehensive set of measures that are potentially relevant in the context of the Coach, and in order to define the combination of measures that best allows you to achieve the goals and objectives of the learning achieved in the generation of the MEPP, was further applied to philosophy, to Eliminate-Reduce-Raise-Create⁷; and c), a strategy discussion is based on the concept of thinking-convergent^{8,9}, which led to the iteration, and the convergence in the generation of the MEPP.

This is the final version of the report, CAMEPP it incorporated the outcome of a process (comprehensive) in consultation with stakeholders the key internal and external to the manager of the proposed Model *Technical 2 1 2 2* (at that time in *2 0 2 1*) and reflection by the members of the CAMEPP. This query was promoted to the first draft of the report was the result of an initiative of the Advice on the Scientific and Pedagogical, Technical, and resulted in a large number of sessions for the presentation and discussion of the report in a variety of forums, as well as in the collection of a large number of opinions of the acadé- domain, and non-academics from outside of the CONTEXT of the Departments and Agencies of the School, Students, and the Association of Students of the central services, in the context of UIs, the Coordinators of the Courses and of all those who are in IST and would submit his or her own contribution. The CAMEPP was the result of the public consultation on the IST, and produced a second version of the report, which is now called the model of the *Technical 2 1 2 2*. For the sake of ease of communication, the CAMEPP it was considered more appropriate to organize the measures proposed in the MEPP in the following three areas:

- A. the Structure of the curriculum, organization, and philosophy;
- B. teaching Practices;
- C. the human Resources and materials, and a model of management as a lecturer.

¹ Phillips, L., Bana e Costa, C. (2007). Life with a prioritisation, budgeting and resource allocation with a multicriteria decision analysis and decision conferencing. *Annals of Operations Research*, 154, 51-68.

² Keeney, R. (1992). The Value-Focused Thinking: a Path To Creative Decision-making, Harvard University's President for 14 to 15 Keeney, R. (1992). The Value-Focused Thinking: a Path To Creative Decision-making, Harvard University Press.

³ Kirkwood, C. W. (1997). *Strategic Decision-Making*. Duxbury Press Wadsworth.

⁴ Kim, W. C., Mauborgne, R. (2005) *Blue Ocean Strategy*, Harvard Business School Press, Harvard.

⁵ Ackermann, F., Eden, C. (2010). The Role of Group Decision Support Systems: Negotiating Safe Energy-In the Kilgour, D. M., Eden, D. (Eds), the Handbook of Group Decision and Negotiation, Springer, 284-299. Keeney, R. (1992). The Value-Focused Thinking: a Path To Creative Decision-making, Harvard University Press.

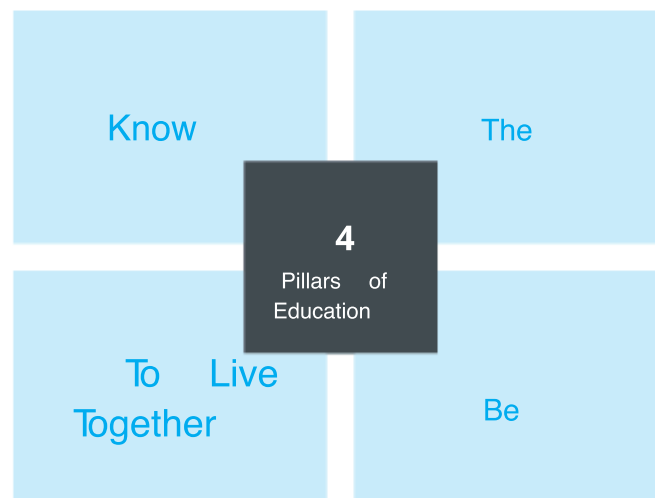
Part II. the rationale for the change

3. Challenges and trends in the education of engineering, science and technology

Abstract: in this chapter, based on the literature and guidelines on education and training in engineering, we first provide an overview of the current challenges and trends in the education of engineering, and the learning objectives that are required to address these challenges. To follow the progress of a, we discuss the critical issues for the professions of the future" and to appoint, with immediate effect, with the guidance of various international organizations and initiatives which are thought about the education in engineering.

3.1. Challenges of education in the twenty-first century

The report of the UNESCO²⁰ this is, admittedly, a reference to the key in the concept of education in the being of the global markets. Headed by Jacques Delors in 1996, and proposed an integrated vision of education based on two key concepts: the life-long learning and the four pillars of knowledgeFigure 3) - know - know, know, know how, and know how to get along with others. The report argues that the choice on level of education are defined by the choices to be made about what kind of society we want to build on, and advocates for the education of the whole person of the fort inspired the humanist. More than just a recommendation for improving the education for the twenty-first century, this influential report, has served as a reference for reflection and debate on public policy and education for the future.



Shown in figure 3. The four pillars of education of the report of the UNESCO world heritage site.

The view ahead of the Delors Report challenged the dominant paradigm of education, the notion of and emphasis on high productivity, and a ba- seado in the mere accumulation of knowledge in the early stages of life, which serves to fuel the competences of the course of the same. On the contrary, the report argued that it is necessary to be able to take advantage of it and explore, in the course of a lifetime, for all of the opportunities to refresh, deepen, and enrich the knowledge of the initial order 20

it's better for us to adjust to a fast-changing world. In spite of the criticism, in relation to the difficulty of the implementation of such a view is often considered to be utopian, to the Delors Report, remains a reference in an important shed in a Goal to the Sustainable Development of the 4 - quality education. The declaration of Incheon¹¹ it restates the purpose of ensuring that the education that is inclusive and fair for the quality, and to promote the opportunities of the des in life-long learning for all.

In response to global transformations, for the World Economic Forum^{2,3}, education should be considered at the same time: primary key of a quality curriculum geared to meet the challenges of the twenty-first century; fluency, and digital skills in the disciplines of STEM (***Science, Technology, Engineering, and Mathematics***); education specialist, and socially-relevant pathways for life-long learning; and innovation in education. In addition, it is central to preparing for the profession to meet the challenges of the twenty-first century, which not only requires a solid preparation in mathematics and the sciences, but also in training, which is undertaken in line with the^{2,3}:

- **"You know it all"** be able to quickly search for information on a wide variety of topics, to learn how to evaluate and use that information, and to have the ability to transform information into knowledge.
- **"To be able to do it all"** understanding the fundamentals of engineering and the extent to which one can evaluate the what needs to be done, and if you are able to acquire all the tools you need to implement in an efficient manner.
- Collaborate: to have the skills of communication, teamwork, and an understanding of the issues both global and current is needed to work effectively with anyone, anywhere, any place.
- Innovate: to highlight the imagination, and the spirit of enterprise and abilities of management in order to identify the needs and come up with new solutions and bring them to the world.

On the other hand, it is also necessary to prepare future engineers for the practice of the individual variable that changes over the life course, as well as the following courses: research and promoting experimentation, we investigate the adoption, and the finding of a knowledge engineer *designer* system, and by promoting the design and to the engineering and management of systems development engineer, and services, thus promoting the design and implementation, the engenheiro, operator, support, product, and service, while promoting the operation, and the engineer/manager, entrepreneur, promoting a business environment.

3.2. Training for the new ones

Taking into account that the world is experiencing a rapid change, and it is estimated that the vast majority of children today have entered into the system of education will be expected to professions you don't know today^{2,4}, the school of the professions of the future must necessarily consider the following critical issues^{2,5,2,6}:

The Education 2030 Inayatullah (June 6, 2015). "The Incheon Declaration: The World National Education Forum Pakistan". [https://www.reports.weforum.org/future-of-jobs-2-0-1-6/chapter-1-the-future-of-jobs-and-skills/](#)

(accessed February 28, 2019). Apelian, D. (2011). Meeting New Challenges: Transforming Engineering Education, Wiley, 3-18.

24 The Future of Jobs, World Economic Forum [http://reports.weforum.org/future-of-jobs-2-0-1-6/chapter-1-the-future-of-jobs-and-skills/](#)

25

7 Critical Skills for the Jobs of the Future, Singularity Hub
[https://singularityhub.com/?q=2017-07-04-7-critical-skills-for-the-jobs-of-the-future&sim=0-0-0-0-0-2-0-vh-2-idxexr-3-naqs-5-kn-6](#)

26 The Future of Jobs, World Economic Forum
[http://reports.weforum.org/future-of-jobs-2-0-1-6/chapter-1-the-future-of-jobs-and-skills/](#)

1. Critical thinking,^{2 7} and the resolution of the problems in the learning process;

- Recognises a change in the axis of the traditional education system is changing and the education-focused to enable the students to answer the questions from a new perspective, one that appreciates the critical thinking skills to formulate problems and to raise issues that, on the whole, to foster cross-cultural learning. Before you are able to solve a problem, the student should be able to analyze critically and to question the root causes. The various schools of Management and Engineering, from

there is a lot that add value to the display of the case study, as one of the tools that are open to the perspectives of students and allows you to deal with complex scenarios and in-depth analyses.

2. Collaboration, networking, and leadership, preparing for remote working, collaboration, and embedded in the teams multi-cultural;

- # Is the growing trend towards the establishment of teams of individuals with the social and distinct cultural, which are located in different parts of the world, and to work in a collaborative manner

by means of digital networks requires an education that is in the new model, in which the multi-culturalism that has an important role.

3. The agility and adaptability to the environment of uncertainty, and complex, and gives students the with the tools and resilience to provide effective responses to new challenges;

- Living in a world of VUCA (**Volatile, Uncertain, Complex and Ambiguous**) requires an education that is designed to train students to respond to the challenges, while fostering a learning environment of uncertainty and high complexity. It is essential to provide students with flexibility and a set of tools that will enable them to respond effectively at any given time. It becomes a need to identify new, relevant knowledge, and to delete those that are no longer needed.

4. Initiative and entrepreneurship, fostering in students a constant search for new opportunities

ideas, ideas, and strategies for improvement, and the promotion of leadership, personal initiative, and the resolution of global

- The ability to encourage students in a continuous search for new opportunities and ideas on and strategies for improvement, it requires not only the promotion of critical thinking, and leadership skills, but also to encourage the initiative of the individual, and the resolution of global challenges.

5. Communication, both written and oral, in order to promote a structured thought, and the ability to persuade and in his argument for the inspiration.

- Clarity of communication, and thinking in a structured way, combined with the persuasiveness of argument and inspiration are critical for your professional career. The student should be able to inspire others and to effectively promote an idea, a product or a person.

6. The analysis and evaluation of information, equipping students with the ability to analyze and evaluate the information from a critic point of view.

- The ability of students to cope with a certain amount of information (and misinformation)

the increasing demands the right mix of tools of scientific and critical

^{2 7} thinking skills. The Foundation for Critical Thinking, [https://www.criticalthinking.org/pages/accelerating-change/4 7 4](https://www.criticalthinking.org/pages/accelerating-change/474)

7. Your curiosity and imagination, and the curiosity as a driving force in knowledge development and innovation, resulting in this is a combination of two or more industries.

- The encouragement of curiosity and it requires a system of efficient learning, which is in line with the Einstein states the following: **"Imagination is more important than knowledge. For knowledge is limited, whereas imagination embraces the entire world, stimulating progress, giving birth to evolution"**²⁸.

In the case of the promotion of critical thinking on the human environment, the literature in the field indicates that the need of the school of humanities, arts and social sciences, and that develops the thinking, in addition to the areas of engineering and construction. In particular, it is important to consider the impact of ethical, social and economic impacts of the engineering; to an understanding of the barriers to the government, and the institutional, political, economic, personal and social, that will prevent, or attempt to find solutions to problems, and the formation of concepts, and the practice of innovation and entrepreneurship²⁹.

3.3. The major challenges in the design of the Century. XXI

The recent technological developments and the rapid social changes are creating new challenges for the education of engineering in the twenty-first century. A number of reports and studies, think tanks and international, are discussed and supported the need for a change in the school of Engineering, in order to better prepare engineers for the future. Initiatives such as the Sustainable Development Goals (SDGs)³⁰, the United Nations and Europe in 2030 defines ambitious agendas for sustainable development and emphasizes the need to address the issues in an integrated way around the *nexus* for people, prosperity and the planet. These calendars to mention the specific objectives are focused on the fight against hunger and poverty, and the sustainable management of water and energy in the fight against climate change, and the progress of urban systems, and health, among others. Engineers will play a decisive role in this because, in order to achieve many of these goals, it is necessary to design, develop, and maintain the sociotechnical systems that integrate with the technologies and infrastructures, physical computing, and the social complex. For example, a project developed in 2008 by the National Academy of Engineering recognized the fourteenth major *the challenges of the twenty-first century in the engineering plays a key role in* (Table 2).

(Table 2). The major challenges for the twenty-first century, in which, the engineer plays a key role in the National Academy of Engineering)³¹.

Make solar energy economical	viii. to Develop the design
Provide energy from fusion	best drugs
Develop methods that are still	ix. to reverse engineer the brain - x
carbon	to Prevent the horror of the nuclear xi. to
iv. Manage the nitrogen cycle	Ensure the safety and security of the
v. To provide access to clean drinking water	cyber space xii. to Improve the virtual
vi. to Restore and improve the infrastructure	reality xiii. to Advance personalized learning
urban	xiv. to Develop engineering tools
vii. to Advance the technology in health care	discovery science

²⁸ Einstein, A. (1931) the Cosmic Religion: With Other Opinions and Aphorisms, p. 97.

²⁹ Buřh, A., Bucciarelli, L. L. (2015). Getting the Context Back in Engineering Education, " in: Christensen, S. H., et al. (eds.), International Perspectives on Engineering Education, Journal of Engineering and Technology, 20, Springer International Publishing, Switzerland.

³⁰ Albert, D. (2011). Ten Important Reasons to Include the Humanities in Your Preparation for a Scientific Career, in Science Magazine, May 2011, 30 <http://blogs.sciencemag.org/sciencecareers/2011/05/ten-important-r.html>

³¹ <https://sustainabledevelopment.un.org/>

³² The NAE Grand Challenges for Engineering (2008), the National Academy of Engineering.

In order to give you the answer to these challenges, and the human needs that the real, multiple-case studies are described in the next- but-sections - support *the urgent need to change the paradigm of education in engineering.*

3.4. A background in engineering, according to the guidelines and standards of the international

A background in engineering, you should take into account the standards and guidelines issued by the organizations and initiatives at the international variety that is reflected in the education of the engineer. One of these initiatives, the most relevant are the following:

- The Dublin descriptors^{3,3}, designated *CDIO (Conceive-Design-Implement-Operate)*, which are the result of the a collaboration of more than 70 organizations take on the philosophy, "**Graduating engineers should be able to conceive-design-implement-operate complex value-added engineering systems in a modern team-based environment**" and they have been critical in the design of curriculum, teaching, and the assessment of engineering education.
- Standards and guidelines *THE EUR-ACE*^{3,4}, when combined with the *The European Network for Engineering Education* made by the Order of Engineers in the UK, and to reflect the needs of the employer. These rules specify that in the process of learning and promote knowledge and understanding the analysis of the engineering, design, engineering, research, engineering practice, communication, teamwork, and lifelong learning. • At the level of the training, the graduate, the *The European Institute of Technology*^{3,5}, argues that in order to promote the creativity, innovation, and entrepreneurship, thereby contributing to a sustainable society based on ethical and human values of the training to the level of a master's degree should promote the following: (i) the judgments of the value of, and skills in sustainability; (ii) the skills of entrepreneurship, innovation, creativity, research, and leadership skills; and (iii) intellectual skills in manufacturing.
- A recognition, on the part of multiple organizations, and the literature on engineering education^{3,6,3,7}, in the rise of the multi-content on the internet, and new concepts of non-formal learning and face-to-face, personalized, based on new technologies that can contribute to the improvement of the school.

Aligned with the new paradigm of education, the recent report commissioned by the MIT^{3,8}, it identifies the main parent programs, a world leader in engineering education in the light of three major trends:

- * * The *the inversion of the axis of the global leadership in engineering education* of the countries in North America, and from Europe to emerging markets in South America, and Asia, where investment the government 's strategic seek to take advantage of the transformative role of engineering and technology, in the economy of countries.

^{3,3} Crawley, E. F., Malmqvist, J., Lucas, W. A., Brodeur, D. R. (2011). The CDIO Syllabus v2.0 An Updated Statement of Goals for Engineering Education, Proceedings of the 7th International CDIO Conference, Technical University of Denmark, Copenhagen. THE EUR-ACE® (2015).

^{3,4} The EUR-ACE® Framework Standards and Guidelines (EAFSG), the European Network for Engineering Accreditation. The European

^{3,5} Institute of Technology (2017). The Quality is Learning. The EIT Quality Assurance and Learning Enhancement Model: the Handbook for planning, labeling, and reviewing the EIT-labelled masters and doctoral programmes, the European Institute of Technology. The World

^{3,6} Economic Forum and the Boston Consulting Group (2015) " New Vision for Education: Unlocking the Potential of the Technology. The

^{3,7} Industry's Agenda. The World Economic Forum (2016). New Vision for Education: Fostering Social and Emotional Learning through

^{3,8} Technology. The Industry's Agenda. Graham, A. (2018). The global state-of-the-art in engineering education. MIT School of Engineering.

- * * A *the movement in the direction of the turn, the models of the curriculum in engineering and socially relevant* and oriented to the expectations of a new generation of digital natives, and to the needs of the market in the transformation. The new models make it easier for the freedom of choice of the student, the learning in a multi-disciplinary approach to the impact of the social and learning experiences outside the walls outside the classroom, outside of the traditional areas of engineering, and global in scope.
- To *the emergence of a new generation of global leaders in engineering education* what they offer the integrated programs, active learning centered on the student on a considerable scale. All examples of the pioneers of the teaching model **studio** and **capstone** heavily inspired by the techniques of **design** aimed at the problems of complex and interdisciplinary, and socially-relevant, they are gaining traction with the institutions of the far-reaching and size.

The information presented in this chapter suggests that engineering education is undergoing a period of fundamental changes that have been opening up opportunities in the statement to the schools in the geographic area in the least did- with respect, but you have to be able to adapt your templates to the new challenges of the school of engineering.

Chapter 4 . The analysis of the teaching at the university for the reference

A summary of the Chapter. in this chapter, you are shown all the models and practices in the teaching of a set of seventeen universities in the reference chosen for their impact, highlighting their programs of teaching and research, and/or likeness in connection with the service Technician. This shows that they have now evolved from the classical models of teaching models and practices of the school are designed to respond to the new challenges in Engineering education.

Section 4.1. Selection of the most leading universities

It was selected from a pool of sixteen universities in the reference (UR) - for the service Technician, with the aim to characterize their design and teaching practices. This set includes the universities in different geographic regions and age groups, universities, denoted as success stories, and best practices for colleges and universities to consider-regarded as the benchmark in the context of the product of the p. ex., university of **cluster** this will include the Technical and budgets are similar. This rational has been identified in the RH and presented in a *Table 3* .

In the supplementary material to this report, it is provided with summary information for each and every one of UR points, including general characteristics, such as type (private/public), type of organization of the academic year (semester/**quarters**/trimesters), and the total number of students (with the indication of the number of students of graduation, and the number of international students the total number of the teaching staff and the teaching of foreign nationals.

Table 3 . Leading universities reviewed by the CAMEPP.

Leading universities	
Carnegie mellon, Carnegie Mellon University <i>United States</i>	PoliMi, Politecnico di Milano <i>Italy</i>
DTU, Technical University of Denmark <i>Denmark</i>	PoliTo, Politecnico di Torino, <i>Italy</i>
At EPFL, École Polytechnique Fédérale de Lausanne <i>Switzerland</i>	SUTech, Singapore University of Technology & Design <i>Singapore</i>
ETH, the Federal Institute of Technology of Zurich <i>Switzerland</i>	TU Delft, the Technical University of Delft <i>Netherlands</i>
KIT, Karlsruhe Institute of Technology <i>Germany</i>	The TU/e, the Technical University of Eindhoven, holland <i>Netherlands</i>
KTH Royal Institute of Technology <i>Sweden</i>	UC-Chile, Universidad Católica de Chile <i>Chile</i>
Melbourne: University of Melbourne <i>Australia</i>	UPCatalunya, the Polytechnic University of Catalonia <i>Spain</i>
At MIT, the Massachusetts Institute of Technology <i>United States</i>	UPMadrid, Universidad Politécnica de Madrid <i>Spain</i>

4.2. The identification of best practices in education from the university of the reference

In general, the RH has a growing concern in the focus of education on the student, focusing on the learning approaches, practices, and by encouraging, at the same time, its development as an active member of the society. Despite the diversity of approaches and practices that could be observed in different places (and, of course, with the corresponding differences in the budget), it was not possible to identify a set of traits- key-the dominant in many of these, and other, aspects of which were considered relevant to the MEPP in the Coach (Table 4).

Table 4. The key features and aspects that are relevant to the teaching of the UR -

1.	The formation of a solid foundation in the Sciences and Engineering
2.	Project-Based Learning, Research-Based Learning, and Client-Based Learning, and Hands-on
3.	Flexibility in their academic courses
4.	Humanistic component
5.	These competencies are integrated in the modules
6.	Project-integrator multi-disciplinary
7.	The academic year is organized so as to promote a greater focus on, and work is ongoing
8.	Internationalization
9.	Training on entrepreneurship and innovation, Business & Academia
10.	The diversity of qualifications
11.	Good teaching, scholarship, and experiences to the academic community
12.	The general course in Engineering Science from the 1st cycle is taught in English

These features are described in the following section, a very brief, citing the examples of the measures that are put in to practice some of UR, but are not limited to³⁹.

1. The formation of a solid foundation in the Sciences and Engineering

- The training of nuclear science in the basic - this is a more or less extensive and varied, depending on the context and the options for the school. There are some schools that engage in the curriculum of various courses of training common core in the basic sciences, to then promote the multi-disciplinary nature, the flexibility and the freedom to choose between different fields of engineering, to be followed by a training in the area of interest/expertise. Other schools soon after the course units (CU) on the basis of the courses, and in the best interest of the students. There are also universities with different versions of the same CU-tailor-made training courses.
- Joint training on different courses in some of UR (1).Th year, it is common for the various Engineering (carnegie mellon, MIT, PoliTo, SUTD). DTU offers a Desk in a **General Engineering**.

³⁹ In the supplementary material to this report provides a more detailed and in-depth look into leading universities.

- Appropriate training course-the course - some of UR (r. ex., EPFL), which include UC's different from the Analysis Physics and Mathematics, selected on the basis of the courses.

- UC-at different levels - at the ETH, some of the CU in mathematics have two versions, an the pace is slow and the other fast-paced (which, as a result, more classes, and the choice of the version of the university at the discretion of the student.

- Demand is high from the CU to the training base to observe the practices that are designed to ensure sound learning and applications of database. •

"**Mise à Niveau 3 0** ECTS (EPFL), for those students who do not meet the objectives set out 1.- Th year;

- The level in the areas of Mathematics, Physics, Chemistry, UC, Chile), and you also Biology (SUTD) upon arrival at the school, and
- Request unit-level, is considered the pre-university (KTH) at the time of the entry of the new students.

Success is measured in a less conventional manner. In some universities, the success is measured in the ► groups is subject to, and not in each and every UC personal (EPFL), or without a single note of all of the CU (in the case of the rating, pass/fail at KTH).

2. **Project-Based Learning, Research-Based Learning, Problem-Based Learning, The Client-Based Learning, (Hands-on)**

- The strong practical element, facilitating the learning process and the work and the responsibility of the student;
 - Your assessment is a major component of the laboratories, workshops, seminars, exercises, etc. no the dependent mainly on the final exam (TU/e, KTH, SUTD);
 - MOOCS for the support of (selective) in the self-directed learning (carnegie mellon, DTU, MIT and KTH, TUDelft);
- Active learning (with the use of the **flipped classrooms, machine-mediated frequent feedback to students, "chunked" (modularized) lessons, table-top experiments, (hands-on), collaborative learning**;
 - Are there any incentives for (and support services), as the studio for the recording of the content, and books/ texts with your content to the students to prepare before class (TUDelft), and the supply of the UC- 1.Th year of engineering at the **streaming** (PoliTo).
- Involvement of the industry in the CU of a theoretical nature, the p.ex. seminars or practical in nature, "p.ex. with hands-on labs and training:
 - Hands-on classes in business, training, or work specialization, sometimes included in the curriculum, with a CU of up to 3 0 ECTS (p.a.ex. TUDelft, MADRID, PoliTo), or

be encouraged, even without the award of ECTS credits (KTH).

- The integration of research in the university or UC in the design for the 1st Article 2nd loops, thereby developing problem-solving skills, and teamwork " (p.ex. ETH KIT, KTH);
- Design six-month and 10 to 20 ECTS credits right at the 1st No cycle and the accumulation of other hands-on activities, (p.ex. KTH, TUDelft);
- Career conferences, data researchers, and visits the laboratories of the research work and practical, in the environment of scientific research,
- Learning and outreach, with participation from multiple human resources, in addition to the faculty of painting (*teaching assistants* researchers, guest, broker-dealers, coaches, professionals, etc.). (EPFL, TUDelft).

3. *Flexibility in their academic courses*

- The high mobility of the home c
 - The initial training that is common to the different classes a - 1st Th year (carnegie mellon, MIT, PoliTo, SUTD), or 1st No cycle (UC, Chile) is common to all the different types that are drawn to facilitate the mobility of sexual intercourse; the High number of applications, the
- option (at carnegie mellon, DTU, MIT, EPFL); the Part of a considerable amount of flexibility
- in the curriculum "expert" in the subject group, ensuring, at the same time, the ductility/training consistency of the choices you have made (TUDelft, EPFL);
- cross-discipline recognized by the *minors* (CMU, EPFL, KTH, MIT), the Design of the *minors* in cooperation with the relevant scientific research units, with the employer
- or with the participation of more than one field of science or/and apartment.

4. *Humanistic component*

- The promotion of the ethical consciousness of the concepts, ideas, and systems of thought, the reasons for the activities of the human understanding of the framework within which political, social and economic, of the different companies, it is sensitive to the mode of communication, and the expression of the arts. • From 6 to 12 of Humanities and Social Sciences, 1st Th cycle, and 6 CREDITS in the Social Sciences and Humanities
 - 2nd No cycle (UC, Chile, SUTD, BOTH);
- Mandatory training in areas complementary to a non-STEM from the choice of the student, and 25 % of the level- 1st No bike in Melbourne, the 36 -CREDITS - UC, Chile);

- The ***The Imperial Horizons*** and ***Business and Management for Engineers and Scientists*** (Imperial College);

5. *These competencies are integrated in the CU*

- The special attention paid to the identification of objectives, planning the work, the presentation (written and oral) in a clear and compelling to the technical and scientific information (TUDelft);
- The use of the learning and teaching methods, and assessment to foster the ability to work leadership and interaction with the students in heterogeneous groups;
- The teaching of the use of the methods of investigation and evaluation of the quality of the data and the results of which are conducive to the promotion of critical thinking skills.

6. *Integration projects are multidisciplinary,*

- The projects are multi-disciplinary, multi-disciplinary, and the motivation of the enterprise in which they work, member states of the various functional departments or universities, either in the setting of a small project (or 6 and 12 ECTS credits), or a large project (thesis / final project 1.No loop) (carnegie mellon, Melbourne, victoria, SUTD, TUDelft, EPFL);
- Working on the same problem in different perspectives and at different levels (***The User, Society & Enterprise Learning***TU/e).

7. *The academic year is organized in order to promote a greater focus on, and work is ongoing*

- Some universities opting for an increase in the proportion of ECTS credits in the period and the school in the face at the time of the trial, leading to a rearrangement of the terms in a shorter time and with a smaller number of the UNIT (KTH, TUDelft, the TU/e, SUTD).

8. *Internationalization*

- Many protocols that allow the exchange of students. The international mobility of giving them a tepee- specifically by doing one of the following three steps: during the 3.No year- 1.No cycle for the thesis 2.No cycle or a double-degree (EPFL);
- High appeal for international students, especially at the level of 2.No cycle and 3rd cycle (EPFL, ETH);
- The increased participation in the teaching of students and researchers and teaching staff *faculty* with a degree in international- stage high-EPFL, ETH).
- Practice is rooted in the teaching of English, especially at the level of 2.No loop. In some cases, the lecio- nation is also provided at the level of 1.St segment (p.a.ex. ***BSc Information and Communication Technology*** in the KTH and 1.No cycle is in Aerospace Engineering at TUDelft).

4 1 <https://www.imperial.ac.uk/horizons/> 4 0
<https://www.imperial.ac.uk/business-school/programmes/undergraduate-study/bpes-programme/>

9. *Training on entrepreneurship and innovation, Business & Academia*

- The CU, in which there is an active participation of the companies, which bring the practical problem solving in a team, the students and the teachers (TUDelft);
- A close working relationship with the business (EPFL, ETH);
- Problem-based learning (TUDelft);
- The UC project, at the end of the 1st loop, which may involve on-site training, laboratory, or by a group of research (TUDelft);
- Programs of research-in-1st cycle **Undergraduate Research Opportunities Program (UROP)**, MIT and SUTD, **Programme de Investigación en Pregrado UC Chile** **The Research is based on the technological tool** - DTU);
- **Externship** required (TU/e).

10. *Good teaching, scholarship, and experiences to the academic community*

- Space and equipment in the laboratory;
- Supply of technology in the classroom " (p.ex. back to the studio to record the content (TUDelft));
- The comfort of the buildings, common areas, and classrooms;
- The spaces in the study **to study the commons**;
- The residence halls to the strengthening of the life experience of academic excellence and to increase the performance of the study and training;
- **"Mens sana in corpore sano"** with the establishment of the area is multi-purpose for the practice of sport, arts and culture, or just encouraging these practices.
 - Area and multi-purpose cad / cam technology, Sport & Culture at the TUDelft;
 - Encourage the practice of sports, arts, and culture in the KIT are strongly encouraged, and seen by the employers in BOTH, and the UPC is recognized for up to 6 ECTS credits, and the SUTD is to reserve the hour for this practice, as if it were a UNIT, but no credit acknowledged). Education in the languages of national and international

We offer programs and tools - **online** for the development of oral and written communication

(KTH, MIT, TU/e);

- The requirement for certain levels of the language, to study the subjects (EPFL, MADRID, where there is a the opportunity to do this accreditation, in-house) or in components, **pass/fail** communication (UC, Chile).

1 1. *The diversity of qualifications*

- Great deal of flexibility at the level of 2.No. the universities surveyed, are the masters of the duration variable (2 to 4 semesters), with or without the essay, with or without an internship in a company, are focused or multi-disciplinary.
- The assignment of the different pieces of (CMU), focusing on p.ex. management and innovation, and further qualifications adapted to the course/interest of the student in Melbourne, victoria, TUDelft), pp.ex. MEng Mobility (MEng "**with a year abroad**").

1 2. *The course of general Science in Engineering, 1.No cycle is taught in the English*

- The existence of the 1.Nd the cycle of general education in the Sciences and Engineering taught in English, with different profiles, so as to allow the admission in 2 different cycles (DTU).

5 . An analysis of the educational and Technical

A summary of the Chapter. this chapter provides an overview of a critical analysis of the current model of education, and pedagogical practices on the Desk. The reflection is based on an analysis of the courses and indicators on education, and during the interviews with the engineers, and students *alumni* on the Desk. The organization and structure of the analysis is to a large extent driven by the issues raised in the document, Terms of Reference and the learning objectives explained in the literature in the school of engineering, and is also the fruit of the assessment made by the CAMEPP to the offer of the curriculum and models of teaching in schools and for the reference see Chapter 4).

5 . 1 . An analysis of the courses and indicators on education

The analysis of the gift of the curriculum and is the model of the teaching force in the Tech use has been made of the information (maioritaria- mind of the public gathered on the 2 6 th of courses that are listed in the 5 : 7 degrees (H), and the corresponding master's degrees are aligned (Ma), and 1 1 master's degrees, integrated (MI), and 3 master's degrees, non-aligned (Myself) with higher education. This sample is highly representative of the school in 1 .Article 2 .No loops in the Coach, to the extent that it corresponds to a universe of more than 9 5 0 0 students, and the cover 6 of 9 degrees, the team, in the larger ones, and the corresponding master's degrees in a line, all of the integrated master's programmes, and 3 master's degrees, non-aligned, that is the fruit of international collaboration, or that have only been recognized. To be aware of the size and popularity of the courses involved 5 it also shows that the number of participants, and the threshold input (only for those courses in the L and E) in 2 0 1 7 / 2 0 1 8 . Number-of-positions of the courses in the L+E, for a total of 1 4 3 4 , a average for the course of the 7 8 students, ranging from 2 2 0 (MEEC) up to 2 5 (MEMat). On the threshold of the entrance average of 1 6 5 , 2 , ranging from 1 8 8 , 0 (MEAer) to 1 3 2 , 5 (ECM).

5 . The courses on Technical analysis.

Symbol	Course	Grade	Places (1 7 / 1 8)	Note min. Then (1 7 / 1 8)
LEE'S	Eng. Electronics	L L L L L	The	Eur 1 5 4 , 3
LEIC-TO	Eng. Computer-The Eng. Computer	L L L L L	3 4 -	1 7 1 , 5
LEIC-T	T- Eng. of Telecommunications and	L L L L L	1 7 0	1 6 4 , 0
LEGI	LETI information technology Eng., and	L L L L L	9 0 5 5	1 4 8 , 8
LMAC	the Management of Industrial and Applied	L L L L L	6 5	a 1 6 7 , 5
	LMAC Mathematics and Computing	L L L L L	3 5	1 8 1 , 3
EVEN	Eng. Electronics	Ma -	1 5	-
MEIC-TO	Eng. Computer Eng. Computer	Ma -	3 0	-
MEIC-T	Eng. of Telecommunications	Ma -	2 5	-
	I PUT and information technology Eng.	Ma -	2 0	-
MEGI	and Management Industrial	Ma -	3 0	-
OF MMA	Mathematics, and Applications	Ma	2 5	-
MA MAero	Architecture	MI -	5 0	Eur
to ME, both	Eng. Aerospace	MI -	8 5	1 5 4 , 3 1 8 8 , 0
of you.	Eng. of the	MI -	3 3	1 5 1 , 0
MEBiol	Environment Eng.	MI -	6 5	1 7 0 , 0 1 8
Part II. the rationale for the change	Organic Eng. Biomedical	MI -	6 0	and 1 , 0
MEBiom	Eng. Civil			
C	Eng. Electrical engineering and computer			

EVEN	Eng. Electronics	Ma	-	1 5	-
MEIC-TO	Eng. Computer Eng. Computer	Ma	-	3 0	-
MEIC-T	Eng. of Telecommunications	Ma	-	2 5	-
Committee of Review of Education, and Pedagogical Practices of the IS - CAMEPP	Eng. of Information Technology	Ma	-	2 0	-
	Eng. of the IS - CAMEPP	Ma	-	2 0	-
MEGI	and Management Industrial	Ma	-	3 0	-
OF MMA	Mathematics, and Applications	Ma	-	2 5	-
MA	Architecture	MI	-	5 0	Eur 1 5 4 , 3
MAero	Eng. Aerospace	MI	-	8 5	1 8 8 , 0
MEBiol	Eng. of the	MI	-	3 3	1 5 1 , 0
MEBiom	Environment Eng.	MI	-	6 5 6 0	1 7 0 , 0
MINISTRY	Organic Eng. Biomedical	MI	-	and	1 8 1 , 0
MEEC	Eng. Civil	MI	-	1 3 7 of	1 3 2 , 5
MEFT	Eng. Electrical engineering	MI	-	2 2 0	1 6 2 , 3
MEMec	and computer Eng.,	MI	-	6 0	1 8 7 , 5
MEMat	Physical, Technological Eng.	MI	-	1 7 0	1 7 3 , 5
MEQ	Mechanical Eng. Material	MI	-	2 5	1 5 9 , 8
	Eng. Chemistry	MI	-	of 8 0	1 6 1 , 5
MBiotec	Biotechnology	Mna	-	3 0	-
MEGE	Eng., and	Mna	-	1 5	-
SALARY	Management of Power - Eng. Oil	Mna	-	3 0	-

5.1.1.1. An analysis of the courses:

To Table 6 the list of the dimensions assessed in the provision of the curriculum and the approach to teaching at the helm.

Table 6. The dimensions evaluated in the analysis of the gift of the curriculum and the approach to teaching at the helm.

1.	The dimension of the training
2.	Flexibility in their academic courses
3.	Project-Based Learning, Research-Based Learning, and Client-Based Learning, and Hands-on
4.	The projects system integrators, and it works.
5.	Education in computer science
6.	Training soft skills
7.	Cross-cutting competencies
8.	Education in the Humanities, Arts, and Social Sciences (HASS)
9.	The teaching is in English
10.	Internationalization
11.	Training in entrepreneurship, innovation, business, and academia
12.	The conditions for teaching, study, and experience

For each course, there is a fact sheet covering a range of indicators of the provision of the curriculum, and teaching^{4,2}. a table of the analysis is focused on the structure of the curriculum^{4,3}. The pot synthesis, and the tables of the analysis can be found in the full version in the supplementary material to this report. In cases where the provision of the curriculum will not be unique (for example, different combinations of *majors* and *minors* 2.No cycle), were selected curricula that represent quantitative of the offering of this course. The subjectivity in the assessment of any of the information collected does not change the vision of the global that is relevant to this report.

To Table 7 it summarizes the information collected on the tables of the analysis is related to the structure of the curriculum. Is followed by a brief comment on the data shown in the seven columns are associated with the scale of assessment 1 through 1 2 , are listed in the Table 6 .

Table 7 . General view of the structure of the courses at the Téch. The values marked with " * " are indicative only due to the high variability of the supply of the curriculum of the courses in their.

Course	In The		Paln The Base (% CREDITS 1st)	Flex (% ECTS- 1), a(Total)		Adj (in the Areas of > 3 (bas) points)		Comp (bas) points)		In Areas Of Soft Skills		In protected Areas, Integrated	
	1	2		1	2	1	2	1	2	1	2		
LEE MEE	3 1	1 6	1 2 (4 0)	1 (1)	The 3 4	4	8	2 4	9	1 6	1 5	1	4
	2 9	1 4	1 1 (3 7)	0	(0) 6 3	9	7	a 4 1	a 1 0	1 7	1 6	4	3
LEIC-MEIC-TO	2 9	1 4	1 1 (3 7)	0	(1 3) 6 3	(1 9)	7	4 1 a	1 0	1 7	1 6	4	3
- LEIC-MEIC-T	3 0	1 3	1 1 (3 6)	0	6 5 (5)	8	6	4 1 a	1 0	1 7	1 6	2	3
- LETI-I put	3 2	1 3	1 3 (4 3)	0 1 1	2 0 (0)	4	9	9 to	8	4	8	1	2
	3 0	1 3	1 3 (4 4)	(4)	6 5 (1 5)	5	5	1 1	1 6	3	0	3	2
LEGI-MEGI													
LMAC (MMA-	3 1	A 1 5	7 (2 0)	0	8 (4) 7 5	8	1 0	1 0	3 1	6	4	6	4
				7 (0)	(5) 1 1	6	4	6	7	2	2	a 2	1
MA MAero	3 2	a 1 6	1 1 (3 7)		(8) 1 5	(1 5)7	1 0	1 2	5	4	7	a 1	6
	3 3	a 1 7	1 3 (4 3)	0 of									
MEAmb	3 5	a 1 5	1 3 (4 3)	0 of	2 5 (out)	8	6	1 1		1 5	1 0	a 2	6
									8				
MEBiol	3 0	a 1 6	1 3 (4 3)	0 of	of 1 0),	5	5	1 3		2	0	a 1	2
									2				
MEBiom	3 4	a 1 7	1 3 (4 3)	0 of	3 6 (4)	8	6	9		3	9	a 0	2
									1 2				
MINISTRY	2 8	a 1 6	1 2 (4 0)	4 (0)	6 5 (5)	3	1 0	1 9		1 0	1 2	a 1	4
	3 1	a 1 6	1 3 (4 0)	7 (0)	6 5 (2 5)	3	7	2 5	7	1 0	7	a 1	4
MEEC MEFT	3 2	a 1 7	1 2 (4 0)	0 (0)	4 8 (1 4)	7	6	1 0	3	2	3	a 0	1
MEMec	3 2	a 1 5	1 2 (4 0)	0	1 5 (0)	2	3	5	0	4	2	a 2	2
MEMat MEQ	3 5	a 1 6	1 3 (4 3)	0	1 5 (0)	7	5	1 2	4	5	4	a 1	6
MBiotec MEGE	-	1 5	-	-	2 0 (0)	-	5	-	3	-	1 0	-	5
SALARY	-	1 6	-	-	5 1 (0)	-	8	-	1	-	4	-	3
	-	1 5	-	-	3 0 (0)	-	8	-	1 3	-	9	-	1 0

^{4,2} The dimensions analyzed are: philosophy of education, working hours, language teaching, evaluation rules, the structure of the courses, basic skills, training, engineering training, experiential training, a specific in-1.Article 2.No loops, the flexibility of the curriculum, the teaching of the *soft skills*educational strategies for active training in entrepreneurship and innovation, the integration of the activities of the research and recognition of the skills of the curriculum, internationalization, mobility, sexual intercourse, scale and requirement, projects, and dissertations by 1.No-cycle/master's degree. The

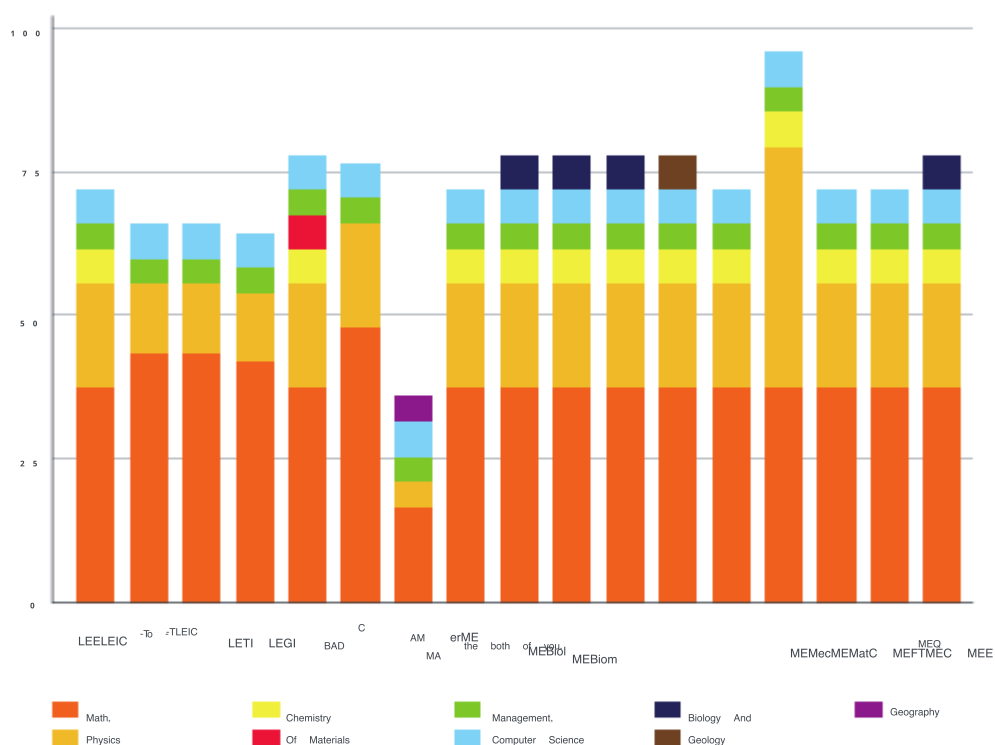
^{4,3} information in the tables: list of applications and their classification, and the number of ECTS credits, the components of the innovation/entrepreneurship the school of computing and *soft science*, and the weight of the evaluation for the project and the nature of integration.

1. *No CU* number-of-UC]. The average number of CU is about a 3.1 to 1. No cycle is 1.5 to 2. No

the cycle, which corresponds to approximately a 5 CU per semester, plus one semester for a master thesis. The fluctuations from the mean lie in the interval $[-2, 5]$, 1). No loop, $[-2, 2]$, at 2. No loop.

2. *No The CU-based* [the number of the CU based on a percentage of CREDITS from 1 to No cycle (1.80)]. In the

the basis is taken from the document of the Bologna-IS, and to fix the designations, in the cases where there's been a change. The list includes all CU-based "negotiated" between the departments. With the exception of MA, and the number of CU-based it varies between 1.1 and 1.3, which correspond to, respectively, as a percentage of between 3.7 % and 4.3 % of the ECTS. To Figure 4 shows all the CREDITS to the UC for the bachelor's degree and master's degree in year 2017/2018, which stands out from the weight of the Mathematics, and Physics. The number and composition CU - based and reflects a policy-oriented teaching to the formation of solid in the basic sciences, and is a part of what is known commonly by the "DNA of the Product.



Shown in figure 4. CREDITS for the CU-based course (L), and MN) in the year 2017/2018.

3. *Flex* [flexibility in the choice of UC]. This indicator is the percentage of the CREDITS (1 in No cycle;

1.80; 2. No loop 1.20) unit-of-choice. The first number represents the percentage of applications with any of the flexibility in total^{4.4} or is conditioned on^{4.5}), and the second number, in parentheses represent the percentage of the CU with the only complete flexibility. It is concluded that the flexibility of in-1. No cycle is very small, being almost non-existent in the mode of flexibility. The LMAC is a small exception to this scenario, with 1.1 percent of the flexibility and 4 % of total flexibility. 2. Th cycle, and when it comes to flexibility, the situation is considerably different, due to the supply unit of the switch and the various combinations of *major* and *minors*: 7 courses that have a high degree of flexibility than 60 % of the 1.2-course flexibility is greater than or equal to 30 %, and 4 courses are flexible and that is greater than 15 %. Sign up, however, is that there are 1.2 courses, with the flexibility that the total is less than or equal to 5 %.

^{4.4} Which corresponds to the ability of the students to join the university of your other classes or other schools of the University of Lisbon, Portugal.

^{4.5} Which corresponds to the situations in which the choices of the students are subject to, for example, which are associated with the areas of expertise of the *majors/minors* or, on the sets of applications that are recommended by a Response to.

In summary, although there is some flexibility to guests² cycles, flexibility, per- mitiria academic courses and skills are multi-disciplinary, it is almost non-existent. To do so shall contribute, in particular, for the following reasons:

- Low supply applications, the switch with the flexibility and constraints of the fact that the courses in which the these options are set out in the curriculum;
- Reduced supply from the groups of subjects are consistent " (p.ex. *minors* or branch/profiles), and away from the departments and courses;
- Competition for the students (rather than cooperation) between the department and, in the same the department, within the areas of science, perhaps on the basis of, inter alia, the rules are in place to account for the effort of the teacher.

4. Adj [number of applications, in which the weight of the component in the Project on the rating that is greater than or

The relative importance of the component of the Project, 2.No cycle is considerably higher than that of the 1.No loop. With the exception of the master MEMat and the MEQ, for all of the courses have more than 10 years of UC with a component of the Project is greater than or equal to 30 %. This number is even more significant in the courses LEIC-MEIC-A, LEIC- MEIC-T-LETI-METHYL, MA^{4,6}, MEAmbi, and MEBiol. The size of the Project, that is, without a doubt, indicative of a strong commitment to independent work and responsibility of a student. However, in the majority of the courses, it was not found significant evidence of project integrative, multi-disciplinary and collaborative, the *project-based learning* (with the exception of the MA^{4,6} to *research-based learning* and *the client-based learning*. Also, there is no evidence of a significant synergy with the industry and the companies, the weakness that has been identified by the A3ES in their analyses, many of the courses at the Tech.

The lack of *research-based learning* that is certainly linked to the lack of a connection to synergy for- mal or informal, between the research units of the department and the coordinator of the courses , and, consequently, in the protected area, including but not limited to the project. The lack of applications dedicated to this type of learning, and the fact that the intelligence units were generally activities that are still in their infancy , at the level of the student is 1.Article 2.No cycles, and contributes certainly to the lack of a connection is referred to. In addition, the fact that there is a complement of the contents of your UC with the themes and issues addressed in the research that is being done in Tech, and they are not provided with UC in the areas in which it performs cutting-edge research in the School.

With regard to the practice of active learning, some programs have recently begun testing methods, such as *flipped classrooms*, *case studies*, *peer review* discussions, demonstrations, and discussions. However, the use of these methods is still very low, and in most of the courses, it is not the result of, or non-reflected, an explicit strategy for the introduction of the^{4,7}.

As part of the Project, the weight of the component in the Laboratory, it is also very expressi- yo in a wide range of courses, and it is, without a doubt, revealing a strong focus on the activities of the kind (*Hanc*). It was noted, however, that in many cases, the work of the Laboratory, they too are guided by the teacher, leaving little space for the students for their active involvement, creativity, reflection, and the development of critical thinking.

^{4,6} In ROME, in each semester, there is a UC project, with a significant number of ECTS credits (up to 10), in which the evaluation results, only the work of the project. In this context, it is considered appropriate

^{4,7} to refer to the "Project of educational Innovation", which is coordinated by the academic Board of the CONTEXT that has promoted the innovation and improvement of teaching practices in the School.

5. *Comp* [sum-heavy duty on the number of applications that the practicing school of computing; weights for the following: 1 schedule 2 - application programming); and 3 applications with a key focus on the computing]. The weight of the computation is significant, particularly in computer science and related fields, in the MEEC, and the MEFT. The weight of the computation in the 2.No cycle will be less, either because the number of subjects is less than, or because the computation is based on the use of commercial software packages (score of 1), and in-application programmed by the students, (weight- 2). In contrast, the landscape is described in the MEGE 2.No-cycles in the MA, and the MINISTRY, we have a score of less than or equal to 3.

The notion of the school of computing has been used here in a broad sense, including such topics as the foundation damentos computer science, programming languages, algoritmia, computer science, in the sense of the process- processing-of information and information systems, and computer applications. As an appreciation of the overall, it is clear that in most of the courses at the Technical school of computing is designed for the specific needs of all of the courses that are UC-dedicated to programming languages, and some of the algoritmia, and quite a few of the fundamentals of computer science and computational thinking. This fact has also been observed in the earth.

However, it has been shown that, in general, the courses, and the skills in computer science are not properly dealt with in a continuous manner throughout most of the CU and in particular in the resolution of practical problems in engineering.

6. *ANo CU Soft Skills* [number of applications, with a focus on the essential in - **soft skills** (ethics, career development, for communication research methodology **team-work** and leadership, and challenges)]. All of the courses are a number of significant applications that are explicitly (7 courses), or implicitly (19 years!), will devote particular attention to the types of **soft skills** listed above. The average number of applications with a component of the **soft skills** it is more than 7, and both in 1.No loop, as in 2.Th cycle, which corresponds to a number in the middle of the CREDITS exceeds the 16th estimate is very approximate).

Although it has been identified that a practice is bountiful to work in a group, they do not correspond necessarily the jobs that involve collaboration and interaction in the effective among all the elements of the group.

In spite of the expressiveness of the figures, and in most of the courses, with the different types of **soft skills** do not work in an organized/planned-for example, when the level of co-ordination, ensuring the coverage and training, and appropriate for different **skills** throughout the course, and to interact effectively with their students.

7. *No CU Integrated* [number of applications that require the student to integrate knowledge from multiple advantages of the course]. All of the courses that are UC-dedicated to the integration of knowledge, and the average is greater than or equal to 3 UNITS. Examples of applications of this class is an Introduction to Engineering, Introduction to the Project Management, and Portfolio Essay. It is important to note that it is a part of the university of coimbra in the spine of you also have the features of the UC - "mainstream".

8. *Education in the Humanities, Arts, and Social Sciences*. The CITIZENS you have an expression very low in all the different courses included in this analysis (except for me and the LEGI/MEGI). With the exception of the university of Management and across different courses, in general, there is no UC is explicitly dedicated to the CITIZENS. A reduced number of applications, it addresses the aspects of social, ethical and moral.

9. *Teaching in English.* 1.No cycle will be taught in Portuguese or Spanish. 2.No cycle will be taught in English language

when you are present to students. In some courses there are courses that are specific to Erasmus students; as a result, they end up being separated from the students and the Portuguese, and from PORTUGUESE-speaking african countries and Brazil.

10. *International mobility.* The Coach is actively involved in a variety of programs and protocols the mobility, in particular the following:

- a. the Program Dual-Degree (the Cluster Master, the carnegie mellon Portugal for Erasmus Mundus Joint Programmes EIT InnoEnergy School, Bilateral Agreements, and UT Austin (Uk TIME).
- b. Program Credits (MIT-Portugal Bilateral Agreements; Almeida Garrett, the Erasmus, The Erasmus Mundus Mobility, SMILE).
- c. the Stages of the curriculum, professional (Erasmus Program IAESTE Program VULCANUS).
- d. the Courses are intensive, short-term Athens (Athens In Athens-Out").
- e. co-operation with the countries of PORTUGUESE-speaking african countries.

All of the courses analyzed, reported that the activities of the international markets, the majority of the cases in the 2.No-cycle, and in the Erasmus exchange program. The number of students involved is significant. For example, in 2017/18, the LEIC-MEEC, reports on the output of the 84 students from the Technical to the 44 students of the LEIC-MEIC-T reports the 32-output, and the 60-inputs and MEFT reports, more than half of the students in the 2.No loop involved in the Erasmus exchange program.

To Table 8, to Table 9 and Table 10 they show, respectively, the number of international students on exchange programmes, the number of foreign students are enrolled and the total of the two groups, as in the academic years 2012/13 to 2016/17. The total number of international students, it has now been close to 1000, representing an increase of approximately 30 % in 2016/17, the total number of students by foreign in 1.No cycle is accounted for not more than 1% 2.No cycle for 16%, and 3).Nd a cycle for 31 %.

Table 8. The number of foreign students in exchange programmes in the academic years 2012/13 to 2016/17.

The Campus	2012/13	2013/14	2014/15	2015/16	2016/17
The Mall	504	364	353	365	500
, Taguspark	42	29	31	35	50
Total	546	393	384	400	550

48 The students entered into the The Campus Nuclear technology (CTN) are integrated into the Landscape.

Table 9. The number of international students enrolled in the Coach, in the academic years 2012/13 to 2016/17.

The Campus	Loop	2012/13	2013/14	2014/15	2015/16	2016/17
Alameda	1	133	149	117	121	175
	2	of	145	of	199	of
	3	230	233	258	305	327
Taguspark	1	28	The 18	19	19	23
	2	26	to 21	20	16	18
Total		566	534	593	668	734

Table 10. The number of international students enrolled in the programs, the mobility of the Tech in the school year 2012/2013 to 2016/2017.

	2012/13	2013/14	2014/15	2015/16	2016/17
Total	1112	927	977	1068	1284

1.1. *Training in entrepreneurship, innovation, business, and academia.* It is offered

in 14 of the 20 courses for 2 people. No cycle is specified in Table 7. The biggest part of the offer is based dedicated to entrepreneurship and innovation, and it varies between 1 and CU (MAmb, MEFT), and a "wide range" (LEGI-MEGI, MEGE).

1.2. *The conditions for teaching, study, and experience.* The experts have access to a wide range of infrastructure and services

the services in the three **university** it contributes to the quality of the teaching and learning practices.

Highlights to) study spaces are open 24 hours a day, laboratories in the information technology,

c), the Technical Learning Center (entrance to the planned operation by 2021), d), the convention Center,

and) is the network of libraries of Technical are currently), e) the Sports Complex g), the Core of the Development

of the Academic (NDA-Objectives), h), the center for Student Support at (NAPE), the Association of Students-BY),

j), the Nuclei of the Students (32-bit, current), and various collaborative projects (Formula, the Student's

Technical and Sunlight in every Direction, the Project's best Club of the Brewers, etc.). and the system of

Quality assurance of the courses in the Centre (THAT).

Despite the continuous improvement of the infrastructure, and the services of the Coach there is,

however, obstacles, limitations, and in particular, to) for the implementation of a model of teaching is

student-centered and active learning, the development of the activity (**hands-on**), and c) in the creation of a **the culture Coach**. Shown below are some of the obstacles.

Most of the classrooms are not in a position to be the practice of teaching to active, centered on the job

a stand-alone student, involving a small-group discussion, debates, group

presentations, in which the teacher has, fundamentally, the role of the facilitator.

- The lack of spaces in the open labs will be equipped with the technical and human resources that provide true, "experience engineering", are able to stimulate the creativity of the students and of the

motivating, engineering, and the need for the formation of a solid base.

- The lack of a residence close to the **year** at the very top of the current one in order to minimize the time of travel between their residences and their **year**. As it stands now, the residences of the Technician cover about 5 % of the students. For various reasons (for example, the price of hotel rooms in Lisbon, Portugal), for a significant percentage of the students spent a couple of hours a day, to travel between your home and the **the campus**.
- The lack of a **the culture Coach**, in which the students have to identify themselves by means of the activities of the teaching and learning, but also for his / her participation in the project, and extra-curricular activities (for example, in the introduction to the research, seminars, workshops, projects with industry, and connection to the company, a de- port, etc.). in addition to the criteria of the department. To mitigate the time of access to the **year**, refer to in the previous paragraph, it is certainly a necessary condition for the creation of such a **the culture Coach**.
- Conditions of the specific well-known are related to education in the Taguspark, and the their integration into the universe of Technical support. These conditions make it difficult to: (i) the creation of a synergy between all the courses are set out at the campus, and between the different areas, and their teachers with a range of Technical (in particular the areas of the border), and (ii) greater flexibility in the curriculum, and (iii) the delivery of training is available on the CITIZENS of the LEGI and MEGI (based on the Taguspark) of the other classes; and (iv) equal access for students in the Taguspark, the ecosystem of the UL (because of the distance, and geographical).

5.1.2. Indicators of education

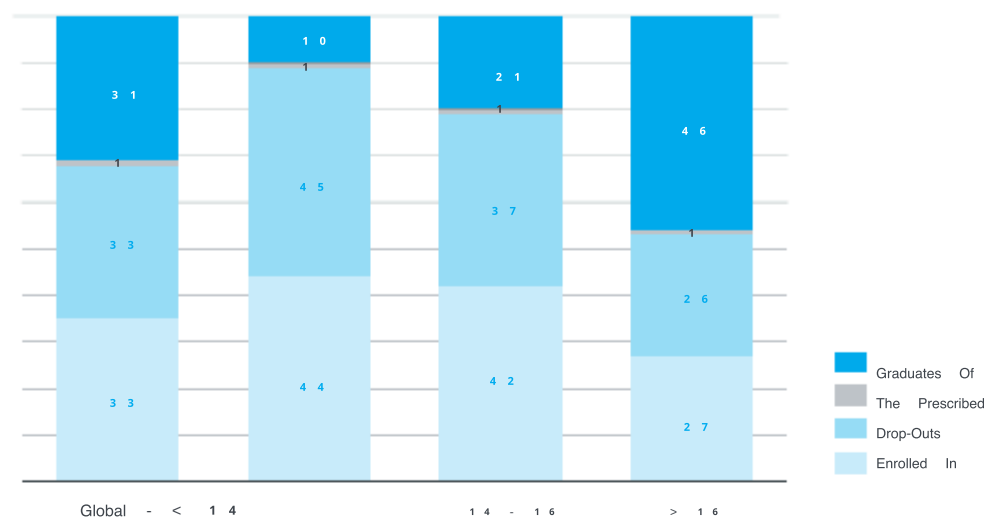
This section presents the summary statistics on the education in the relevant Technical analysis and reflection on the MEPP. They are based on the following indicators: 1. dropping out of school; 2) the Efficiency of the training, and 3) academic achievement; and 4) the Dissertation.

The indicators have been selected based on information collected by the AQEP and NONSPECIFIC, and later worked for the CAMEPP. *Early school leavers*.

It is considered that a student is "left" in the period of the analysis (academic year), there is enrolled in the same school/course, where it is joined, it is not prescribed and is not earned.

To Figure 5. it shows the percentage of participants who drop out, as prescribed, and qualified for the generation of students who enrolled in the Coach in 2011, and the generation of the G-11), and over the course of six years. We present the values for all of the courses (LB+MB), the degrees of Bologna's + master's degrees from Bologna; and the MI's, master's, integrated), by class, in a note to the entry.

49 Galhoz, S. (2018) a Successful school drop-IST: A new Analysis of generation. The core of the Statistics, and Foresight, as sexually transmitted infections.



(Figure 5). The indicators of the generation of the G-11, after a six-year course, LB+MB, and E) for a class a note to the en

The overall rate of drop-outs is 33 % and the number of students is 31 %. The correlation between the grades and the rate of abandonment is very negative. On the other hand, the correlation between the grades and the rate law- is a strong positive.

• It is important to do a comparison of the academic courses in the Technical and in the rest of the Country. To this paper will consider the data that have been published recently by the DGEEC in the document is entitled "Courses at the Higher Education", a document on the academic profile of the enrolled students in 2011/12 in the degree in three years and is reviewed over a period of four years from the time they enter (*i.e.*, in 2011/12 to 2014/15). In the university, public, and for all of the courses (see figure 1), and the rates are enrolled in the same course, the abandonment of, and the higher you were, respectively, at 15 %, 38 %, 47 %). In university-level education in the public and in the course with an affinity to the Centre (see figure 5), those rates were 24 %, 55 %, and 22 %) work in progress (by 28 %, 39 % and 33 %), in the Engineering Related (23 %, 44 %, and 35 % in the Architecture and Construction (19 %, 41 % and 38 %) and Physical Sci 38 %, 40 %), and Mathematics and Statistics. The numbers in the country, though they might not be directly compared with those of a generation, G-11, on the cover of formations, with the extensions of temporal differ, it can be concluded, what is the dropout rate in Technical and is lower than the national average in those courses with an affinity for Technical support. Even for these courses, with the exception of the Computer, at the rate of the graduates of the Technician is lower than the national average. Whether such comparisons are made, the numbers are in the ratio of

dropout and graduates are to a considerable surplus in the first case, and by default, in the second case, and the symptoms that something is not quite right in the school's new Coach.

To Table 1.1 it shows the total number of losses for the course in relation to the total number of members enrolled in the course is relevant in 2015/16. Is also given to the distribution of dropout (in percent) for the number of years of the course. The

⁵⁰ DGEEC - the Directorate-General for Statistics, Education, and Science Courses in Higher Education. After four years, students enrolled in the undergraduate courses in the three years to march 2018. http://www.dgeec.mec.pt/wp-content/uploads/2018/04/4-1-4-6-7-BSClientServicePath%7D/2newsId=9-0-2-8&fileNames=DGEEC_SituacaoApos-4-AnosLicenciaturas.pdf

⁵¹ Galhoz, S. (2018). The success and dropout in IST: A new Analysis of generation. The core of the Statistics, and Foresight, as sexually transmitted infections. data published by the DGEEC, it was found that the average drop-out rate is determined by the sum of the number of students that were not found in the education, up to the number of transfers to other programs.

⁵³ Galhoz, S. (2018). The success and dropout in IST: A new Analysis of generation. The core of the Statistics, and Foresight, as sexually transmitted infections.

⁵⁴ we Note that the ratio of applicants, abandonment, and the graduates are, respectively, the non-increasing, non-decreasing and non-decreasing.

Table 1.1. The percentage of the abandonment of the course, on the number of pupils in 2015/16.

Courses	Registered (1-time) Enrolled in the	Registered total Enrollment	Losses (in %) 2 3					Total
			4 °Abandonos (in %) 5					
Courses	(1 st time)	(total)						Total
MEEC	2 7 3	1 4 7 3	2 4	9 2	3 1 4	1 5	3 8	1 5 0
MEEC-LEIC-A	2 7 3 1 9 5	1 4 7 3 8 5 6	2 4 5 5	9 2 0 of 2 5	1 4	1 5	3 8	1 5 0 5 1
LEIC-A-MEMec	1 9 5 2 1 9	8 5 6 1 2 6 9	5 5 3 8	7 2 0	2 5 1 5	2 4	1 6	5 1 1 2 9
MEMec-MEC	2 1 9 1 7 1	1 2 6 9 1 2 4 6	3 8 3 9	8 7	4 1 5	2 4 1 7	1 6 3 2	1 2 9 1 7 2
MEC-LEIC-T	1 7 1 1 0 1	1 2 4 6 4 6 5	3 9 3 7	8 3 1	of 4 3 2	1 7	3 2	1 7 2 3 8
LEIC-T-MEAer	1 0 1 1 1 7	4 6 5 6 0 9	3 7 1 5	4 3 1	3 2 3 4	1 1	3 6	3 8 5 3
MEAer-MEQ	1 1 7 9 6	6 0 9 4 8 3	1 5 3 1	4 1 0	3 4 2 3	1 1 1 2	3 6 2 4	5 3 5 1
MEQ-LEGI	9 6 9 0	4 8 3 3 5 3	3 1 5 3	1 0 1 6	2 3 3 1	1 2	2 4	5 1 1 9
LEGI-MEBiol	9 0 7 8	3 5 3 4 0 2	5 3 4 7	1 6 1 0	3 1 2 0	1 5	8	1 9 4 0
MEBiol-MEBiom	7 8 7 3	4 0 2 3 2 4	4 7 3 8	1 0 1 0	2 0 1 7	1 4	1 5 2 1	4 0 2 9
MEBiom-MEBiom	7 3 7 5	3 2 4 3 6 6	3 8 2 3	1 0 1 5	1 7 3 7	1 4 1 5	2 1 1 0	2 9 5 2
MEFT-LETI	7 5 6 4	3 6 6 2 8 0	2 3 7 8	1 5 1 1	3 7 1 1	1 5	1 0	5 2 2 8
LETI-MA	6 4 6 2	2 8 0 3 0 7	7 8 2 3	1 1 1 0	1 1 2 3	2 8	1 6	2 8 3 9
MA-LMAC	6 2 4 1	3 0 7 1 4 7	2 3 7 5	1 0 1 2	2 3 1 3	2 8	1 6	3 9 1 6
LMAC-LEE (1 4 / 1 5)	4 1 3 7	1 4 7 1 3 0	7 5 9 4	6 1 2	0 1 3			1 6 1 6
LEE A (1 4 / 1 5) -MEAmbi	3 7 5 1	1 3 0 1 8 6	9 4 3 1	8 6	4 0	3 5	2 2	1 6 5 1
MEAmbi-MEMat	5 1 3 5	1 8 6 1 0 6	3 1 7 6	8 1 4	4 1 0	3 5	2 2	5 1 2 9
MEMat	3 5	1 0 6	7 6	1 4	1 0			2 9

To 6 it displays, for each course, and the percentage of drop-outs, for a year of study in 2015/16, relative to the total number of drop-outs. With the largest number of drop-outs occur in 1 in.No year, and is followed by 5 's.No year. The explanation for the abandonment to the 1.No year can be linked to the inability to adapt to higher education, and to the weakening of the course, most likely associated with the choices in the discipline of mandatory are made from the 9.No year of school, and they were out, and the lack of experience in Engineering. The abandonment of the 5.No year can be associated with the withdrawal of the preparation and defense of a dissertation on the part of the students, however, have begun to engage in a professional activity. There is also a growing trend for out of 1.No to the 2.No cycle among students with high academic achievement who are looking for most attractive to foreign universities.

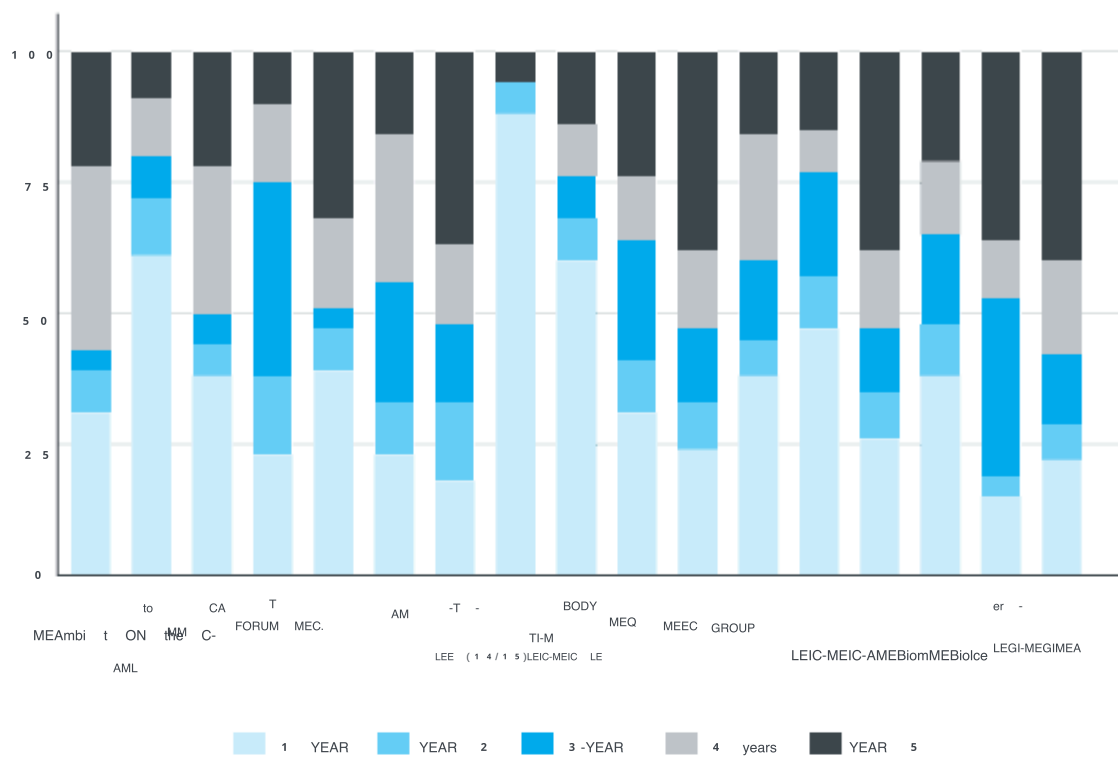


Figure 6. The percentage of drop-outs, for a year of study in 2015/16, relative to the total number of drop-outs.

Lorem ipsum

Effectiveness of training

To Figure 7. it shows the evolution of the number of students⁵⁵ in the Coach, who by 1.St time ever, and graduated from 2013/14 to 2017/18. In the course of this, the number of students enrolled by 1.St time it has been close to 600, and the number of students show an increasing trend is significant, toward an efficiency of 90 % in 2017/18. This is far too high to be representative of a situation or standing, it was now, probably, to a decrease of the average number of years up until the completion of the degree (see Table 12).

At the msc, the number of students enrolled in the 1.Th has grown up in a linear fashion, from 531 in 2013/14 to 765 in 2017/18, the number of students has also shown an increasing trend, although less clearly defined, of which 267 (efficiency of around 50 % in 2013/14, and 375 (efficiency of 49 % in 2017/18. Finally, in the master , built-in, the number of students enrolled by 1.St time shows a tendency to increase, having been in 1207 in 2013/14 and, in 1292, in 2017/18, the number of students following the trend, the number of students enrolled, up by 1.Th time, of which 639 (efficiency of 53 % in 2013/14, and 810 (efficiency of 63 %) in 2017/18.

⁵⁵ AEPQ/NEP (2008). Balance, RAID, Stats, IST, Technical university of lisbon.

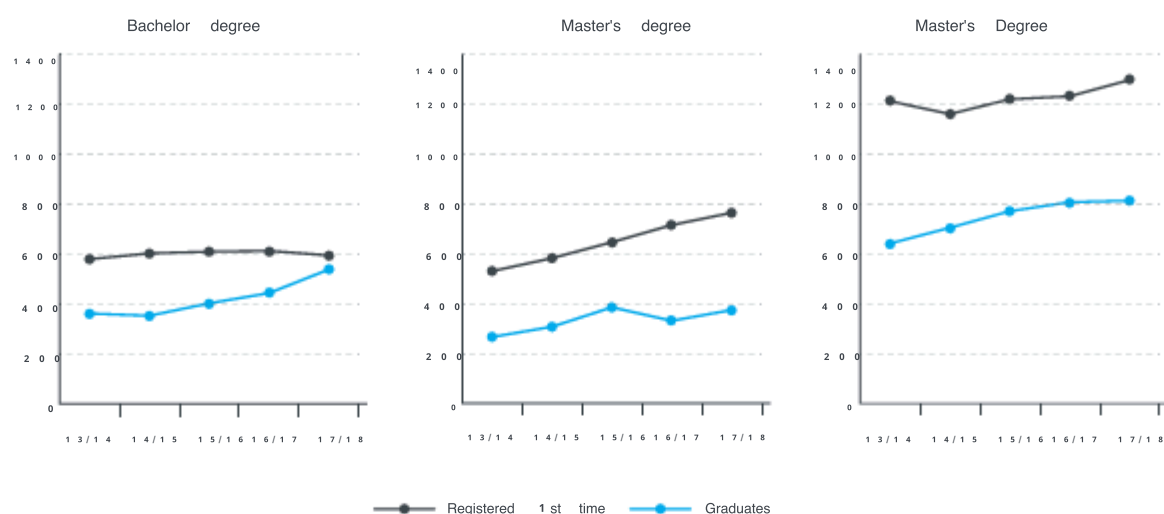
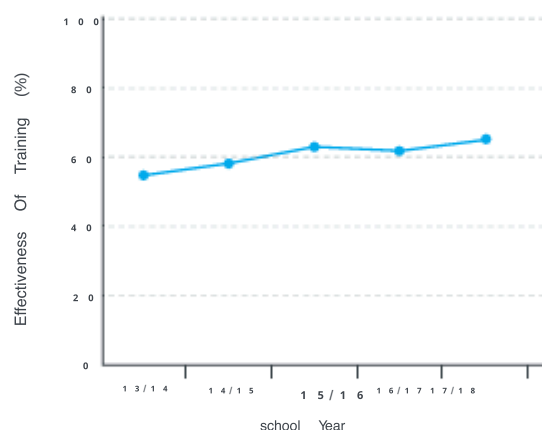


Figure 7. The evolution of the number of students enrolled in the 1st time, and you graduate from 2013/14 to 2017/18.

To 8 it shows, for each game, the team, the proportion of the total number of students relative to the number of students enrolled in the 1st time since 2013/14 to 2017/18. The data indicate that an increase in the efficiency of of a 55 per cent in 2013/14 to 65 % in 2017/18. Even though the trend is positive, and the inefficiency of teaching, the Coach is substantial: for each of the 10 students who came into the school, and only 6 if you have.



(Figure 8). Effectiveness of training IST: the percentage of the number of students relative to the total number of students enrolled in the 1st time from 2013/14 to 2017/18.

Academic achievement

To Table 12 and Table 13 show that, for all the courses that are listed in the 5 the mean (heavy) of the average time to completion of the courses, and the interval between the minimum and the maximum of the completion, respectively. The indicators have been calculated for all courses 1st cycle of the integrated master's programmes (P.) and the master's degrees are aligned+non-aligned (Ma+Myself).

Table 1 2. The average time, in years, until the completion of the course.

	2 0 1 3 / 1 4	2 0 1 4 / 1 5	2 0 1 5 / 1 6
An average of years, until the conclusion of 1.º ciclo (L+E)	4,7	4,5	4,2
The average of the years up until the completion of the Mission	6,3	6,2	6,2
an Average of years, until the completion of the Ma+Myself	2,3	2,5	2,4

Table 1 3. The interval, in years, until the completion of the course.

	2 0 1 3 / 1 4	2 0 1 4 / 1 5	2 0 1 5 / 1 6
The range of years to complete - 1.º ciclo (L+E)	[3,5 - 5,1]	[4,0 - 5,2]	[3,0 to 5,5 in]
The range of years, until the completion of the Mission	[5,1 - 6,8]	[4,9 - 6,8]	[With a 5,3 - 6,9]
Range of years, until the completion of the Ma+Myself	[From 2,0 - to 2,4]	[2,1 - 3,0]	[2,1 - 2,6]

The average time of completion, exceeding, respectively, and the durations of the standard of the courses are in excess of 1 year and in the case of 1.º cycle of the Mission, and about 0.5 years in the case of the Ma+Myself. Between the different classes involved in the fluctuation of the end times are very important. For example, in 2 0 1 5 / 1 6, the difference between the mean times of maximum and minimum of a 2.5-year courses in 1.º No loop, 1.6 years for the e and 0.5 years for the Ma+Myself.

The numbers that are displayed on the Table 1 2 they are comparable to those of other areas of knowledge (see the RAID, DGEEC). In any case, the fact that the students are in need of a considerable amount of time in addition to the duration of the standard of the courses is of concern and suggests that a rethinking of the MEPP in order to closer to the time of the conclusion of the time by default.

Performance-in- 1.º cycle

To Table 1 4 it shows the statistics of the final grades of the courses: 1.º cycle of the first-year students in the Technical and generation (G- 1 1) for all the courses in the L and E, are obtained through the fall of 2 0 1 7. The percentage of graduates courses that L was approximately 10 % lower than that of the courses with ME. The distribution of the final grade, to be presented in the Figure 9 are fashion in the range [1 2, 1 3], an average of close to 1 3.5 values, and standard deviation for the next they are quite asymmetric with respect to the mean.

Table 1 4. The statistics of the final standings 1.º cycle for the generation of the G- 1 1, obtained through the fall of 2 0 1 7.

	L	P. (1 -cycle)
No. of students 1 full circle	2 9 9 (5 9, 8 %)	Decree no. 7 4 3 (7 1, 9 %)
The average	1 3, 2 2	1 3, 7 1
and standard Deviation	1.9 7	2, 0 2

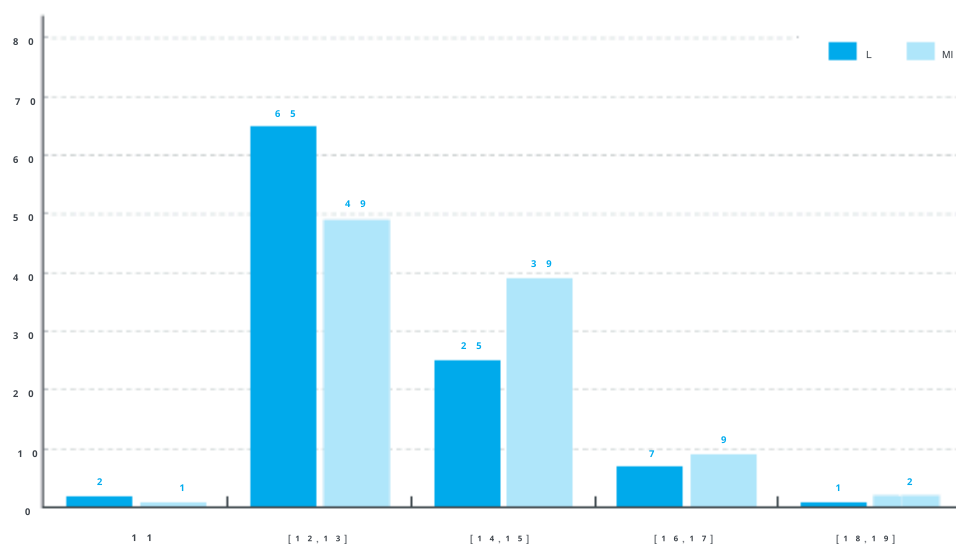


Figure 9. The distribution of final scores from the 1.No cycle for the generation of the G-11, obtained through the fall of 2017.

To 10 shows the scatter plots of the pair (a note to the entry, the final grade) for the course unit the Differential Calculus and the Integral-II (CDI-II, left) and the final grade of 1.No cycle (on the right). In all cases, there is a dependence clearly in the note to the ticket, and the final score. From a qualitative point of view, it can be said that, on the average, the distribution of the final guests on the note in the ticket, it's growing or not; this dependence is, however, a little to the notes of the ticket reduced to, let's say, less than 15.

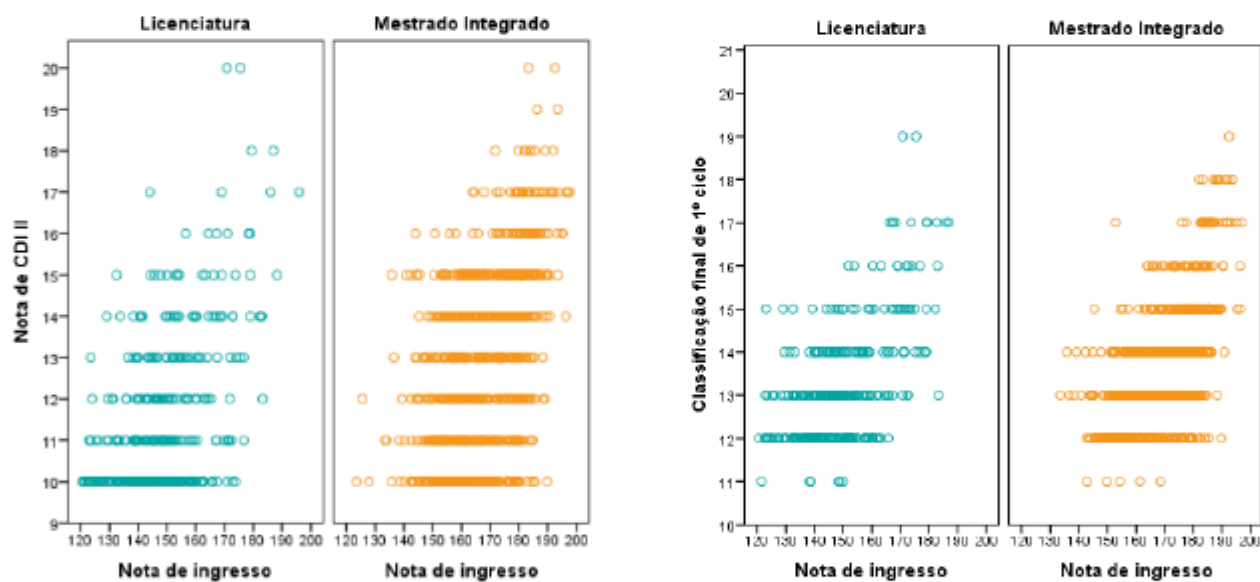


Figure 10. Scatter plots of the pair (a note to the entry, the final grade). To the left: 1.No loop. Right: the UC-CDI II.

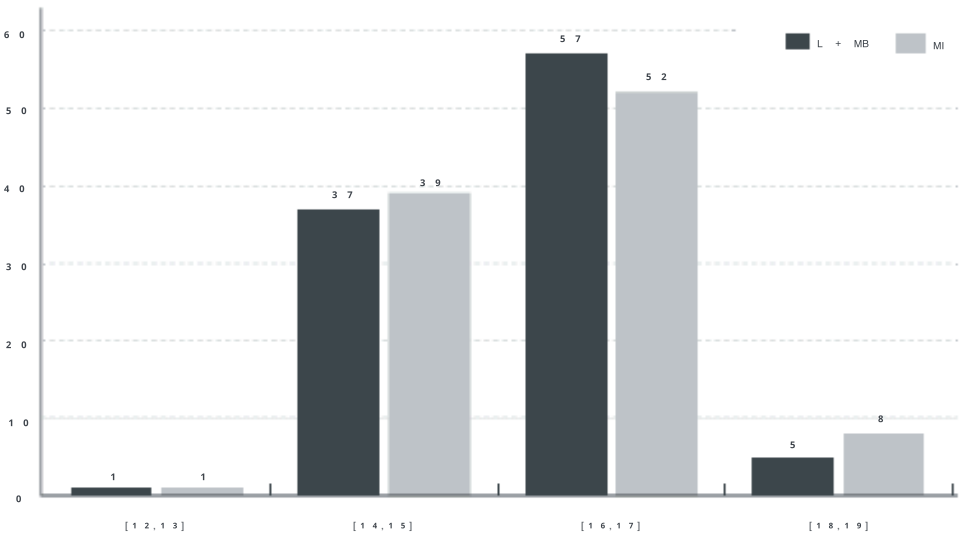
The performance in the 2.No cycle

To Table 15 it shows the statistics of the final grade of 2.No cycle for the generation of the G-11, for the courses in the are obtained through the fall of 2017. The percentage of graduate students in courses on R+MB, it was about 20 % lower

courses in MI. The distribution of the final grade, to be presented at the 1.1 have a maximum value in the range [1.6, 1.7], an average of 1.5.8 per values, the standard deviation, the lower of the 2 values, and the distribution is more symmetric with respect to the average of the grades from the 1.No loop.

Table 1.5. Statistics of the ratings by the end of the 2.No cycle for the generation of the G-1.1, obtained through the fall of 2017.

	L+MB available disk space (2-cycle stage)	
No. of students with a 2 nd cycle	130 (26,0%)	480 (46,4%)
The average	15,86	15,82
and standard Deviation	1,91	1,39



1.1. The distribution of the final grade for 2 people.No cycle for the generation of the G-1.1, obtained through the fall of 2017.

Thesis

To Table 1.6 it shows, for the period 2007/08 to 2014/15, the number of students enrolled in the thesis, and the ones that left only with a thesis on the lack of it, to the P. (at number 10),. masters of the medium-to-large-scale- is (M) a 10), and master of a small size (the public prosecutor, to the number of (14). The minimum and the maximum of the drop-outs were, respectively, 4 % and 7 %. The average percentage of drop-outs was 5.7 %, which represents the total number of losses 504. The fact that in the last few years of their courses, many students have to exert any occupation that justifies certainly a part of the losses.

Table 16. Abandoned, only with a thesis on the lack of, between 2007/08 and 2014/15.

Type of the Course	Students who are enrolled in an essay	Drop out with the only essay to do	
MI	6 1 5 6	3 2 2	5 %
M - Mp	2 3 5 4	1 6 7	7 %
(short size)	3 7 2	1 5	7 %
Total	8 8 8 2	5 0 4	5 , 7 %

To Table 17 it shows, for the period 2007/08 to 2014/15, the total number of students enrolled in the thesis, and the average number of years until the adoption, and even abandoned, for the courses, E, M, and Mp is referred to in the paragraph above. The average number of years that is much closer to 1.3. The average number of years to the abandonment was approved approximately 2. As at the time of graduation, the mean time to the approval of the dissertation, it is much higher than the standard duration of the dissertations and theses (i.e., 1 in the first half), and it is advised to re-think the MEPP in order to get closer to the times of the end of time by default.

Table 17. The duration of the msc in between 2007/08 and 2014/15.

Type of the Course	Students who are enrolled in an essay	The average number of years followed by a sign to the approval of	
MI	6 1 5 6	1 , 3	2 , 1
M - Mp	2 3 5 4	1 , 2	1 , 7
(short size)	3 7 2	1 , 3	1 , 5

To 12 it shows the distribution of the notes to the essay, between 2011/12 and 2017 for all courses in the L and more. The two distributions are highly skewed, and the vast majority of the notes are contained in the interval [16,20]. The mean and the standard deviation is about to 16.8, and a 3.1-values for all the courses in the L+MB), and 17.7 and 1.2 the values to the courses and MORE.

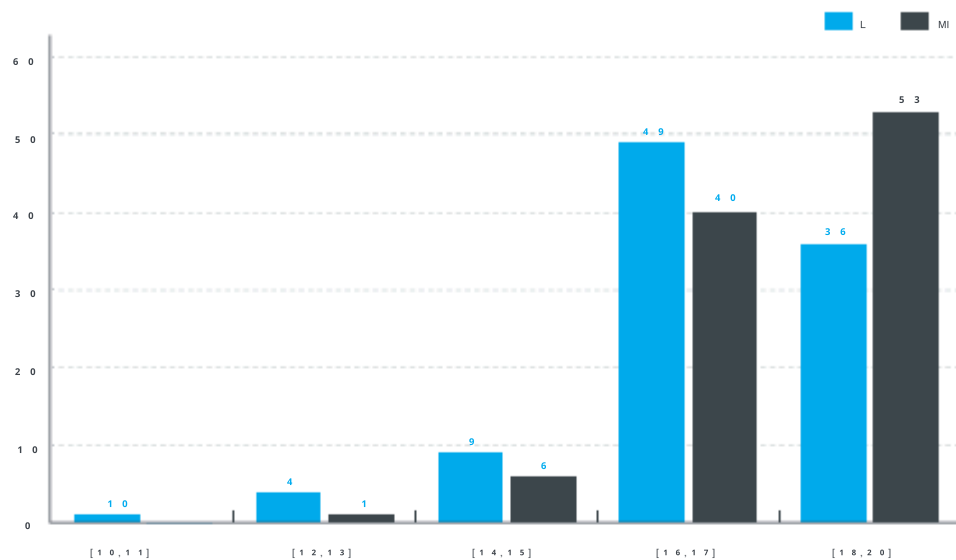


Figure 1.2. Distribution of the notes of the essay, between 2 0 1 1 / 1 2 and 2 0 1 7.

5.2. The interviews with the engineers, and students *alumni* Coach

They were promoted to the meetings with the students *alumni* and of course coordinators, the team, with the goal of gathering information to help me diagnose the current state of the MEPP in the Technical and opinions in relation to the reforms to be implemented. Prior to the meeting, he was sent to the concerned a range of issues/topics addressed (for the scripts of the interviews are included in the supplementary material to this report. Some of the people we talked to have referred to in your opinion, in writing, by the impossibility of coming face-to-face. Below is the short form of the **feedback** and the propositions derived from the different groups of respondents. [A summary of the interview with the students](#)

The students interviewed were overwhelmingly favorable to the following steps:

- Deploy in-1.Th year, the structure of the curriculum, similar, and parallel to all the classes, so as to ease of mobility.
- To introduce the CU-forming the basis of a component-oriented way;
- To reduce the contact time of the lectures, to be used mainly for motivation/
the presentation of the issues, and to organize their time in order to minimize the
presence of holes, with a view to allow for more independent work;
- a Decrease
in the number of students in the class lessons, practice, follow-up and project
active teaching;
- Make a split six-monthly periods, by decreasing the number of applications at the same time, and the increasing
the weight of the continuous assessment and evaluation;

Implementation of the learning is project-based, that is, at the end of the 1.No cycle should be directed to the cases in

the area is or can be substituted for the stages of the business; a lot of interest in interdisciplinary projects for a more cross-cutting;

- To increase the number of options that are free from any of the 3.rd Year;
- To facilitate the access of the other degrees-of- 2.nd Year loop, only in the case of the compatibility;

Introduce **soft skills** just in- 1.st Year, but by relating them to the Engineering sciences;

- Credit to all the learning in a more informal basis, provided that subject to the reporting and evaluation, and fall in UC-related;
- Make sure that the students and provide support to the classroom, and to conduct the initiation of the investigation;
- The maintenance of the teaching in Portuguese- 1.st Year cycle *i.e.* opposition to the teaching of English in the 1.st Year loop);
- Interest- 1.st Year cycle Engineering general English by giving you access to 2 different cycles.

The summary of an interview with the alumni

The **alumni** in general, presented the views of the converging with regard to the following matters:

- Satisfaction with the strength and breadth of training offered (at the expense of the training alternatively, with a further specialization in certain fields);
- Customer satisfaction with the ability of analysis and problem-solving, and the ability to work;
- The need to provide more of UC optional on specific areas (up to 3 or 4); however, in contrast to a flexibility over the curriculum, so the risk of loss in the strength and extent of the formation of the base;
- The need to provide training in the **soft skills** (communication, leadership, and **networking** ethics, negotiation and conflict management), by applications, the choice of free UC in existence;
- The need to provide a more practical training in engineering "**hands-on**" and to strengthen the link the industry with the (possible across the various areas/courses, workshops, seminars, visits, study, and internship for the summer, will be credited with, and so on.);
- The need to enhance the skills of programming and working with the other UC's courses;

- Interest in the training (optional) in the activities of undergraduate research, is properly credited;
- Keen interest in new technologies and teaching practices (*active learning, flipped-classroom, gamification, MOOCs*, etc.).
- Opposition to the widespread education of the 1.No loop in the English language.

The summary of an interview with the engineers

The engineers have shown, in general, interested, and open-to improve the model of the teaching and learning of the courses in the Technical and aligned in relation to the following order:

- Promote greater interaction, face-to-face teacher/student through a closer integration between theory and and practice (pp.ex. by involving more of the classes of the theoretical-practical);
- Promote independent work of students " (p.ex. hands-on classes with the students ' work, and follow-up to the teacher for questions, more hours in the lab);

Education UC under periods of time, the term, subject to coordination with the international mobility, and the maintenance of a number of UC in more than one period, taking into account the specifics of some of the UC's, and at maturity, required); • Greater flexibility in the curriculum through the *majors/minors* and with the free options; the balance between diversity and and the depth must be given to the depth of it. 1.No loop, in some measure, also, it makes sense to have some flexibility in the curriculum;

- The input unit, interdisciplinary, collaborative, inter-agency, a few that there are already along these lines, the existence of a CU-integrated project and/or internship.
- The importance of the scientific content of the thesis, even if they are derived from work carried out in an enterprise environment;
- Prices are as of the award of degrees are differentiated from the master's degree with or without thesis;
- The recognition that it is a actual change in the approach to teaching Technical and will require changes in the the various tools of management, p.a.ex. the model for the assessment of the teaching staff, and the mechanism for the allocation of resources and Technical departments, based on the CASE.

5.3. A critical analysis of a model of teaching and teaching practices of a Tech in 2018

A critical analysis of the current MEPP's expert that you have in your hands is the result of the analysis conducted for the courses in the indi- individual Coach and the leading indicators of school, from the interviews conducted with the main stakeholders of the educational process in the School, in the sense that it is the CAMEPP presents the reality of the Technical face of education in the schools of the guide and a review of some of the papers that highlight global trends in the education of the Engineer, and the evolution of modern societies. In the analysis, we focus on the way-intentional (and admittedly

provocative), in relation judged visually on the current (MEPP Table 18).

Table 18. The aspects of the teaching model in the Coach, in 2018, that need to be improved.
Note: some features mentioned may not be generalizable to the whole of the universe as a Coach.

The Culture of Technical	the educational pathways, which are characterized by difficulties in "artificial, introduced to the logic of a culture-IST
The structures of the curriculum and the learning	- The ineffectiveness of training is high (40%) - Structure of the curriculum, monolithic, dense, character-encyclopedia - Fast glimmer of expertise in the first 2 years, due to the strong tendency for the formation of base - insufficient connection between the protected Areas, in particular, between the protected Areas of the base and Areas of Engineering Expertise - experience and learning of the dominant School in the resolution deductive, based on the principles and the quantity of the problems posed by the teacher, and in the majority of cases, the solution is unique, i.e. students, designed to solve problems of the kind, and to answer the questions, pattern, and with little capacity to cope with uncertainty - Contact decreased with the authorities, and external reality in the context of learning, and in the absence of widespread use of the opportunities to fund extra-curricular activities
Organization half-yearly , and the management of the stress	- The division of the first half, to 14 + 6 weeks the effort devoted to the study of the Areas of evaluation preference during the period of time from the classroom to the detriment of others who are affected by the time of the examination - The working load is associated with many protected Areas (with a particular focus on the lecture) burst-almost always in the efforts to pre-set, as it is measured in ECTS credits - students will not be investing in some components of the evaluation and is excessive in relation to the weight of the component in the assessment of learning because of the stress involved
Training STEM	- Lack of investment in education on the CITIZENS, i.e. the development of civic responsibilities, and cultural rights, the ability to understand the impact of science and technology on human nature and society, and in the dialogue between Engineering and other disciplines, and the ability to communicate with each other, and in the knowledge of the creative ideas coming from the non-STEM - in The few Areas of the character that is not a strictly technical and science (the so-called "cute") is memorizadas, by contrast with those Areas of the "thing", hard and hardcore * * * - The students are poorly prepared to deal with a situation that involves phenomena, characteristics, values, and people who cannot, or should not, be reduced to a quantitative measure
The structure of the class and the practical and pedagogical	- the prevalence of theoretical recitativas focus on the teacher as well as being a passive learners in general have an impact chronic - the classes in the laboratory are focused on the implementation of the pre-set by the teacher - practice focused on solving problems for teachers with students who are unable to make progress independently, due to the poor understanding of the material - the annual recycling of the project and the results of this work the mine on creativity, leading the student to draw up reports on the picture of the reports of colleagues from the previous years
Rating	the system of assessment is predominantly focused on the exams, concentration of the study at the time of the examination, as opposed to a continuous study strategies for study/teaching designed for the resolution of the scans

The advantages of teaching in Technical and human resources (students, teachers, training for a demanding and strict-rose, and the skills of the graduates, the high level of employability, and others - who are, without a doubt, the

56 The average percentage of recent graduates of the courses in the period from 2012/13 to 2015/16, which were registered as unemployed in the

the greatest assets of the School, and they are not here in question. In the context in which it appears to us as an imperative move forward with a process to reform education in the school of Engineering and Technical, our goal was rather to identify which aspects of the present MEPP have to be changed, and to understand how those assets can be put at the service of the School-of-way to a more rational and efficient.

The culture of the Coach

The majority of the students, *alumni* teachers and employers to recognize that the study of the Technical world today, as in the past, it is hard and it takes hard work. This feature, which is part of what is sometimes referred to as the "DNA and culture of your Product, it is evident that a set of facts, is easily visible: the share of basic education, and level of difficulty of most of the CU is very high, and the rates of failure and inefficiency of the training by 40%, 8) is high, the environment is competitive, particularly in the training sessions, which have average of the most high, and the numbers of drop-outs and requirements is a matter of concern, the number merely an average of the years it took to complete, to different degrees, and exceeds that which would be desirable, and the excess of the work to prevent, the majority of the students involved in extra-curricular activities. This is a well-known and well-accepted by all, and it is a part and parcel of the belief in what is sometimes referred to as a "meritocracy of difficulty". The underlying idea that is prevalent in many of the schools of Engineering, is that the need for an education in Engineering, is a guarantee of a future career success, and a life of comfortable material. It is not surprising that the difficulty of the learning process, and the associated effort and talent necessary to overcome it, it is one of the core values that best define the experience of those who have gone through the Technical team (see testimonials *alumni* and that is one of the most prominent institutions- mind, "the Coach, the students are satisfied to work"). The idea expressed by some of the employers from which "provided that it is in the team, it's a welcome value that is characteristic of recent graduates, possibly more so than their knowledge of science and technology. An important implication of the meritocracy of the difficulty of prevailing on the Technical with respect to the image of superiority that a lot of students from the Technical (and some teachers) are you the same when we compare it with other students from other schools and teams. Do not put the case for the authenticity of the picture, only if it points to the fact that such a thing exists. The external perception is dominant in the environment of student services is highly competitive, and wild, although it is distorted and it is something far from the truth, is also the result of the culture and the difficulty to set up at the School. *The structures of the curriculum and the learning*

In the present MEPP's Coach is a fairly good reflection of the culture of the School, as described above. The structures of the curriculum in most of the monolithic and death. The character of the encyclopedia is prevalent, based on the belief that all of the content industry held (concepts, laws, principles, rules, heuristics, algorithms, methods, techniques, tools, procedures, processes, etc.). it is absolutely essential to the professional practice of Engineering. This single- rística has been well demonstrated in comparison with that of the GOD who, on the whole, offer a curriculum with a number of the materials is significantly lower. This outpouring of material was identified by Professor Michael Athans at MIT, during a sabbatical that took place in the Coach, in 2001. In his own words: **"In 5 years, the IST, the have been taught almost twice as many technical subjects as compared to those of an average MIT student in the 4th year of the engineering curriculum."** With a few exceptions, of the flexibility of the curriculum is also to be greatly reduced, perhaps due to the difficulty in determining what material is that it can be disposed of without shaking the foundations of the structural training in the subject matter.

^{5 7} The institute for Employment and Vocational Training, it was in the fall of 2017, up 2.9 %. Source: Data and Statistics courses, as well as the Portal InfoCursos (<http://infocursos.mec.pt/>), accessed on July 6, 2018 (see the data in the course of the Coach in the Supplemental Material). Stevens, R., Amos, D., Jocuns, A., Garrison, L. (2007). "The Engineering of the Summer, and a Meritocracy of Difficulty: Two Pervasive Beliefs Among Engineering Students and Their Possible Effects, the American Society for Engineering Education. Athans, M. (2001). English Research Universities: Why not the Best?

The concept of free choice is also far from widespread use (see *In table 7, and section 5.1.1*), a lot of thanks for the idea, prevalent among the students and guide them to almost always be your choice-UC "easy," and that it is incompatible with the accumulation of credits for the trouble...). In the light of the comparison with GOD, the character of the overly-rigorous and mandatory for the majority of the resumes, it seems to emerge as an anachronism that is incompatible with that of a time in which globalization, collaboration, interdisciplinary, and intraespecialidades, with the proliferation of information technology and computing, and the rapid pace of change which is the new norm. This is the rigidity of the curriculum is also reflected in the contents of CU, and the way in which they are taught, and, most important of all, he was transferred to the way the students learn, study and apply it. In most of the cases, the students in the Technical and are designed to solve problems of the kind, and to answer the questions by default. As a general rule, don't like the questions, problems and projects of the open type, and the result is incorrect and the what the teacher does not have a solution for you. The obsession with what the students are looking for, and you ask for the teachers' exam in the past years, or to create repositories and issues, homework, and reports, as it reflects well on the aversion to uncertainty. It is powered by the annual recycling of the project and the results of this work. As a result, the reporting of these components, which are often drawn to the image and from the reports of colleagues from the previous years, leading to awkward situations in the description of the experience, equipment, or the results of which have not been actually carried out or the results obtained. In practice, it is the originality and creativity of the report- the rivers will run out if you spent the first year of the introduction of new projects and activities, which the students spend on the following in the options of your fellow pioneers. A simple stop at the discretion of the student in the selection of a topic, a project, or a job also causes discomfort immediately, and usually turns out to give rise to a demand for the teaching of "themes to choose from". This feature is described in a way is good enough for Professor Michael Athans when you compare it to the students at MIT and the Technical and remains in the past thirty years... : **MIT students to excel in an independent - thinking, and problem-solving, while the IST students are "spoon-fed"**.

The degree of difficulty associated with UC is usually very high. Even though part of the difficulty may be in fact closely related to the concepts, and subjects in the study, and some of it is an artifact introduced on the basis of a meritocracy of difficulty. In the context of the current culture, the norm is that students have to face difficulties in your way. For that purpose, it is of no consequence whether these difficulties are intrinsically completely arbitrary, " (p. ex., the result of the pedagogical practice as well as out, the performances of the group below, the spaces are inadequate, timetables, and poorly designed). The success of a student is measured by its ability to survive. The idea of the reform of the university or the curriculum via the deletion of the content, simplification, reduction of the burden of the work and / or analysis, alignment, which is the culture of the School, and they are often associated with the provision, and the attempts to undermine the character of a solid and thorough, which is characterized with the formation of a new Coach.

The number of the substances and the degree of difficulty should be up in a School, a range of issues, matter-t. For example, that the volume, tempo, and how they are passed on the knowledge to the students, it's compatible with deep learning and an application to real-life? It is also important to understand that a fraction of the education provided is of a fact that is used in the practice of, or the content are necessary to the practice of a professional are not currently being taught.

In-Coach, it is not just the amount of material that is privileged, such as the correlation between the CU is in the majority of cases, poor. This disconnect is particularly evident between the CU core and the CU of Engineering, and the skilled-quality. As a result, at the end of the first two years, the majority of the students still don't have a clear picture of what it is to practice social Engineering focused on what is going on and to overcome

59 and

60 and Athans, M. (2001) In English, Research Universities: Why not the Best?

Stevens, R., Amos, D., Jocuns, A., Garrison, L. (2007). "The Engineering of the Summer, and a Meritocracy of Difficulty: Two Pervasive Beliefs Among Engineering Students and Their Possible Effects, the American Society for Engineering Education.

the barrier for the CU-based. He adds that, due to the difficulty imposed in the course of these first few years, and many of the students are smart, talented, and successful in high school go on to challenge your skills to progress and succeed. This is aggravated by the almost complete lack of experience in Engineering, it is not surprising that the success of a school is to be weak, and the drop-out rates are particularly high in the first year (see the data displayed in the *Figure 6* section 5.2).

Organization for a semester of learning, and the management of stress

It seems to us clear that the design of the first half, the typical Technical and not intended for the philosophy of a learning - centered, student-recommended by the Bologna (Italy). Experience has shown that the idea of a stress of 30 CREDITS distributed reasonably through a 20-week-in is not compatible with one-half year is divided into 14 weeks, and 6 weeks of screening, particularly if you intend to put in place a system of continuous assessment in some of the UNITS. Compare, by way of example, the distribution of the number of hours of effort, in half a year's typical in the Tech 5 CU 6 ECTS credits each, in a situation in which the pressure is distributed evenly across all of the protected area, with a situation, B-3 and UC is also designed so that they can be completed within a period of lessons, with the use of assessment methods (Table 19). Highlights, of course in this simulation is that the students have an obligation to devote more effort to the UC for the ongoing evaluation, and that it is only possible to keep the effort at the other UC spending more hours per week studying (52,8 h/week at the B vs 42 h/week (A). Against this background, the course is clear, and that is simply by directing your efforts to the CU, which are assessment methods (i.e., tests, reports, and projects-tos, seminars, workshops), which differs in the study of the other applications, the time of the examination. The results of this strategy will make it show up in the middle of the semester, how often to lectures decreases abruptly, either, because students need to devote time to the components of the on-going evaluation, either because it is not possible to keep a close eye on production of the material when you are working at a rate of more than 50 h per week of concentrated preferentially in just a couple of UNITS. Thus, paradoxically, at the option of pedagogically appropriate to promote an on-going assessment of a weight of not less than 40% of the assessment for the collection of the UC every half-year together with the half-year to 14 + 6 weeks, just to introduce distortions in the system of education, by pushing students to the separation of CU from those who are studying at the time of the examination and all the others. In addition to the distortion, and asymmetry of the effort is devoted to the study, the bulk of the work associated with the many UC and extra-run with the effort by default, as it is measured in ECTS credits. Master's thesis, which is characterized, as is the average time for completion of a largely superior to that expected (at an average of 10.6 months in the case of courses that IM in the years 2012/13 to 2016/17), it is a landmark case, this deviation from the systematic to the specifications of work. The exception here is the fact that a significant number of students (47% on average in the courses of the MI in the years 2012/13 to 2016/17) have some professional work in the development of the work of a master thesis. Other examples are widely identified by the students, which include the existence of evidence that they require a process that is not reflected correctly in the final standings. This leads to situations in which the student is simply not to invest in a particular component of the assessment (e-learning), because the effort involved is too high compared to the weight of the component in the evaluation.

Guide To Education, 1.Article 2.No cycles, and the cycles of the integrated Assessment of Knowledge and Skills, 61
<http://guiaacademico.tecnico.ulisboa.pt/1-o-e-2-o-ciclos-e-ciclos-integrados/regulamentos/regulamento-de-avaliacao-de-conhecimentos-e-competencias/>

^{6 2} THAT Survey to Students Enrolled in the Master's Thesis is Integrated in the 2012/2013, 2013/2014, 2014/2015, 2015/2016, and 2016/2017 <http://qec.tecnico.ulisboa.pt/dissertacoes/>.

Table 19. The distribution of the number of hours of effort, in half a year's typical in the Tech 5 CU 6 ECTS credits each, in The the pressure is distributed evenly on all the CU, and B in the UC 1 - 3 are designed to be completed in the time period of the classroom with the use of continuous assessment and evaluation.

Of The	Classes		Rating		Semester	
Week	1 4		6		2 0	
	<i>h</i>	<i>ECT's</i>	<i>h</i>	<i>ECT's</i>	<i>h</i>	<i>ECT's</i>
UC 1	1 1 7, 6	4, 2	Of 5 0, 4	1, 8	1 6 8	6
UC 2	1 1 7, 6	4, 2	Of 5 0, 4	1, 8	1 6 8	6
UC 3	1 1 7, 6	4, 2	Of 5 0, 4	1, 8	1 6 8	6
UC 4	1 1 7, 6	4, 2	Of 5 0, 4	1, 8	1 6 8	6
UC 5	1 1 7, 6	4, 2	Of 5 0, 4	1, 8	1 6 8	6
Total	5 8 8	2 1	2 5 2	9	8 4 0	3 0
hours/week	4 2		4 2		4 2	

B	Classes		Rating		Semester	
Week	1 4		6		2 0	
	<i>h</i>	<i>ECT's</i>	<i>h</i>	<i>ECT's</i>	<i>h</i>	<i>ECT's</i>
UC 1	1 6 8	6	0	0	1 6 8	6
UC 2	1 6 8	6	0	0	1 6 8	6
UC 3	1 6 8	6	0	0	1 6 8	6
UC 4	1 1 7, 6	4, 2	Of 5 0, 4	1, 8	1 6 8	6
UC 5	1 1 7, 6	4, 2	Of 5 0, 4	1, 8	1 6 8	6
Total	7 3 9, 2	2 6, 4	1 0 0, 8	3, 6	8 4 0	3 0
hours/week	5 2, 8		1 6, 8		4 2	

Training is not a ONE

One of the objectives underlying the reform of the education in Engineering and in the course of many of the institutions of international relations is based on the assumption that the engineers need to better understand the world and the people in it, to better carry out their business functions and social gatherings. In other words, in the context of the cultural, the political, the practical use of, and the psychology of the individual) and must not be ignored in the education of the Engineer. In this regard, the focus is almost exclusively on the training of technical features of the MEPP, the team, which leaves very little room for the vocational training in the areas of CITIZENS and the development of skills for global, is an important area of weakness. The fact shows that the experience of learning in the mainstream of Technical, such as in many of the schools of Engineering, is a resolution of deductive and based on the principles of, and the quantity, the much put- to (and not to be formulated by the student, in the majority of cases, the solution is unique.^{6 3} While this type of approach

^{6 3} Buch, A., Bucciarelli, L. L. (2015) "Getting the Context Back in Engineering Education," in: Christensen, S. H., et al. (eds.), International Perspectives on Engineering

it is essential for an engineer, the truth is that we, the students of the Technical and if you have a little prepared to deal with a situation that involves phenomena, properties, values, and people who cannot, or should not, be reduced to a quantitative measure. In this regard should be given some thought in the following words, taken from You , and Bucciarelli^{6, 4} :

"The almost entire attention [of Engineering Education to means and methods to solve problems is selling students short, is doctrinaire, stifles questioning, creativity, reflection and discussion, can be hazardous to society, and borders on the irresponsible."

It is clear that the almost total lack of any offer of training in the CITIZENS, together with the lack of contact, and the isolation imposed on the student by means of an increased workload, which prevents the realization of the experiences, interests, limits and learning about the social environment. For the few of UC in the non-strictly -scientific community that exist in the School are of a general look at the way higher for the majority of the teaching staff. The name "fluffy", which is commonly used in the School, and expresses a philosophy attached to this protected area, by contrast with the CU, the "thing" is difficult, and **hardcore**. At this point, the MEPP of the Coach is very out of practice as identified in the university, which will stimulate curricularmente training outside of the areas of STEM as a way to expand its horizons and to give the world to their students. Please^{6, 4} refer to the title for an example of the practice at MIT, which includes an 8 CU of CITIZENS in the face of a 6 CU in basic education, and the University of Melbourne, Victoria, it imposes 25 % of the content is not STEM, as part of the requirements for the breadth of a formation (**breadth requirements**), established in order to encourage students to expand their horizons and scholars , and to broaden their range of skills.

The structure of the classroom, and instructional practice

Although the Bologna Process, provide a model for lifelong learning centered on the student, the general perception is that, at the present time, this is not the case in the case in the *Appendix D* (discuss some of the possible reasons for that, the new model has not attained). This statement can be supported by looking at the structure of the classroom and the pedagogical practices today, for all you know. In this analysis, it is important to note that the motivation of the academic core to many of our students are not learning, but rather on the "to do this on the chairs" *i.e.* to overcome the barriers to the curriculum, that they may be separated from the desired degree of Technical support. The theoretical and Technical, with an typical duration of 90 minutes, and are usually of the type weber. The vast majority of the students to adopt a passive attitude, to attend classes in order to obtain a set of notations that will be used later to study for the exam. The attitude of the student is considered to be almost unanimously by the faculty as a passive experience. The occupation is preferred in the halls of the places are distant- th frame, and the lack of response to the questions posted, generically, by the faculty and reflects well on this action. The impact of student in chronic use, especially in the first third of the semester, is considered one of the most striking features of the theoretical and Technical. The causes are clearly identified: the dedication of the components of the on-going evaluation of the other UC's and finds it hard to keep a close eye on production, the subject matter of a lack of study. In general, it is the opinion of the students, it seems to be that the lessons of the theoretical, of little or no avail, and in particular in those cases in which it abounds with touches of quality examinations, solved in the previous years in the archives. The time duration of 2 hours of lectures, which appear in some of the UC should be the subject of discussion. According to the ideal model of the Bologna process and the practice should be useful for the students

Education, Philosophy of Engineering and Technology, 2010, Springer International Publishing, Switzerland. MIT Course Catalog, Bulletin 2017-2018, the General Institute Requirements for Undergraduate Education <http://catalog.mit.edu/mit/undergraduate-education/general-institute-requirements/>

to resolve, under the advice of a minimum of a teacher, the problems of the application of the material learned in the classroom teóri- ca. The assumption here is that the students that are anchored on the knowledge gained in the lectures and self-study, and all have the capacity to solve these problems on its own, the outside and inside of the classroom. The reality shows that this model does not work, because the majority of the students were exempt from the fact that you watch for the theory classes. Thus, in the majority of cases, shall prevail and hands-on classes focused on teaching, in which they summed up the matter and solve the problems on the board. From the point of view of the teacher, there is a great alternative to this *the modus operandi of* once the students find it very hard to achieve, to progress on its own, be blocked by a poor understanding of the material and is comforted by the assurance that the professor ends up, inevitably, to solve or to facilitate the resolution of problems. From the point of view of the student, the benefits of attending the classes, are too many, especially if you want to be successful on the exam: the teacher summarizes some of the key aspects of the concepts discussed and to give the resolution of the problems of the exam type. In the vast majority of cases, the experience of learning is dominant in these classes, it boils down to the resolution of the issues set out in a clear way for the teacher, who may be an ex-claims, in terms of both quantity and solved using numerical measures (*inputs, output*the parameters, variables, costs, etc.). and is that, typically, they have a unique solution, which is obtained by an approach that is well-defined. The practice is more prevalent in the classroom, laboratory Technician, is the implementation of the protocols in the laboratory are predefined by the representatives of the UC thereof. Even though the students are to assume a central role to play in the classroom, they do it only as mere players, not to intervene in the formulation and experimental design. In some courses, students often end up just looking at the tests carried out by the teacher or by the technicians in the laboratory, either by a lack of resources, or to prevent damage to the equipment, which may result from its inexperiên- cia. The laboratory classes are mostly accompanied by the staff, even though this task could be assigned to the students put into the category of *teaching assistants* (IV). With this option, it is practically not exploited in the Technical and, often, on the grounds that the said TA-no post-have them with the expertise to ensure that the quality of education. As for the small size of many of the labs require you to have several shifts in the same classroom, with the teacher sees as the inevitability of repeating the same lesson multiple times in the same week.

In a statement, a set of students from the Technical point is also another aspect that deserves further consideration:

"Perhaps because of a lack of resources, all of our designs on a Technical limit to the projects of the design. We don't build anything, I tested it on a machine, made for us". Even though the situation may not be generalizable to the whole of the universe is Technical, it does illustrate very well the lack of opportunities for the practical application in that it, in fact, characterizes the process of learning on the Desk. Even more so, it is indicative that the project-based learning, the practice of engineering and of the great success of the *Formula Student* and *Solar Boat*that demand a great deal of dedication and effort, and the application of knowledge, it is not giving any credit to the students involved.

The evaluation of the students'

In spite of a gradual introduction to the analysis of alternative (mini-tests, homework assignments, presentations, workshops, projects, and oral presentations) in the context of the process of continuous assessment, and the rule laid down in the Regulations for the Assessment of Knowledge and Skills in the Technical, it does not allow for the scheduling of tests with a total weight of more than 60 % of the total number of evaluations of the first half, during the period of the to a month, and in preparation for exams, the exam continues to be the element in the evaluation of prevailing on the Technical, and one of the things that most affects the operation of the School. The three months of the calendar year (2 - 6 weeks), dozens of meeting rooms, and an unknown number of hours of teaching, and administrative resources that are reserved for the

Guide To Education, 1.Article 2.No cycles, and the cycles of the integrated Assessment of Knowledge and Skills
<http://guiaacademico.tecnico.ulisboa.pt/1-o-e-2-o-ciclos-e-ciclos-integrados/regulamentos/regulamento-de-avaliacao-de-conhecimentos-e-competencias/>

completion of a battery of endless tests. The lives of the students, you can't in a lot for the existence of the tests. During the semester, the student selects the UC studies, and are solely at the time of the examination, collect afanosamente lecture notes, exams and previous years, and their solutions. In the se- weeks of trial, the resolution of the scans, repeats, looking up to the teacher to ask any questions. The educational attainment of the many UC-it was to be determined exclusively in a single moment, *i.e.*, the date of the examination, and that, thus making it the focal point of your high school life. The accelerated erosion of knowledge after the time of the trial, which is expressed by a phenomenon of amnesia often (many times, students don't have to remember what they have learned in the semester, or a year-on-year, is one of the deficiencies of the light, this model of learning **an ad-hoc basis** where do you study for the test. In the words of one student:

"Because it is to pass the exam with the best score as possible, and in a very high percentage of cases actually learn it's not the easiest way to do it before you opt for the replay. Often times in a row, so that our reflections are pointing to the correct answer. Learning-by-doing all the tests in the previous years."

In the process, the timing of the exams, this is a highly complex, in the face of the various constraints associated to (available- willingness for living rooms, the UC that are common to different configurations, the pressure of the students, so that the separation of the temporal , between the exams will be a maximum, etc.). For the preparation of examination on the part of the teacher sits on a lot in the recycling and refurbishment of some of the tests in the past. The number of hours spent by the teaching staff of a Technical surveillance audits of their UC applications, which are assigned to it's timeless, and representing an unacceptable waste of human resources qualified in the task for a mere law enforcement. The inefficiency of the process is further aggravated by the necessity of having the students through the halls of the small-scale ones. The correction of the exam is made up almost exclusively by the teachers, who often find themselves struggling with the task of sorting out hundreds of tests in a short period of time. The figure of the **grader** ("broker"), *i.e.*, a student is more advanced, or a post-graduate course that is designated to carry out the correction of the exam, which is common in many of the same GOD does not exist in the Helpdesk.

Part III. a New model of education and practices of teaching: a Technical

2 1 2 2 6 . Overview of the new model of teaching and practical instructional Coach

A summary of the Chapter. in this chapter, we present a proposal for a new model of education, and the practical- to the political and pedagogical-to the Technical model *Technical 2 1 2 2* - link to the first lines of the road and the ideas for which it was built, and then the measures of the key (and the rationale behind) are required to carry it out. These measures are grouped into three areas: (i) the Structure of the curriculum, organization, and philosophy; (b) teaching Practices, and (iii) human and material Resources, and the model of management of the faculty, and is described in some detail, but it is by no means exhaustive. To explain the detail of each and every one of the concrete measures to be taken (to be rational, expected consequences, risks, and the means of implementation and deployment) is displayed on the *Appendix D*.

6 . 1 . Frame

At the intersection of the analysis of the work environment and emerging trends in education in the engineering education as practised today in the universities of reference in the critical analysis of the teaching force in the Technical and point out clearly the necessity of giving the School a new model of education and educational practices for the twenty-first century - *Technical 2 1 2 2*. With the adoption of the new model is also highlighted, with the renewed challenges of the Bologna Process and, with the priority given in the plan on the strategic, Technical and make the School a point of reference in terms of its culture, and the environment, methods and outcomes of the learning process. In addition to that, in the context of the legislative and national policy, is particularly conducive to this model is to enter into force within a time horizon of two years. The Coach has, therefore, an opportunity only for the revamp of the curriculum, pedagogical practices, and the context in which you teach to your students. The adoption of the model that we propose will allow you to increase the uniqueness of the landscape in the teaching of Engineering in the UK. This is certainly a huge challenge, it is not exempt of difficulties and obstacles, which will require everyone's commitment, effort and enthusiasm. But it is also a task that at the time of the handouts for the technology, which will change the way you operate in the School for many years to come. More than just a necessity, given the past and the present, and the Coach has a responsibility to its students, the community and the Country to take a leading role in the reform of the teaching of Engineering in the UK.

Section 6 . 2 . Guidelines

Model *Technical 2 1 2 2* it aims to give the School a model of education that will ensure the success of their mission, in the medium term, while the quality of the sound basic skills of its graduates, who are well recognized and appreciated by the company. It is therefore vital that the new model keeps pace with the changing of the times, looking for ways to adjust and adapt to the new environment is increasingly dynamic, unpredictable, and yet at the same time, with huge potential and generating new leads. As stated in the *Chapter 3* (see section 3 . 3), it is estimated that 6 5 % of children today are entering in the system of education will be expected to b

professions that are currently unknown to the practice of which has been identified with the following skills: - the flash- processing, critical, and problem solving; collaboration, networking, and leadership, agility and adaptability; the initiative and entrepreneurialism; and the oral and written communication; the analysis and evaluation of the information; and curiosity and imagination. The state-of-the-art display (*Chapter 3*), the identified good practices in the RH (*Chapter 4*), and the diagnosis is made at the School, which has shown the need to improve the effectiveness of training, and in the hearing of the key players in the Technical (*Chapter 5*), read in conjunction with the method used (*Chapter 2*), allowed us to define a set of conditions on the boundary, and the guidelines that have served as a beacon for the development of the new model:

- Ensure the training of basic and specialty, with academic rigour, in every direction, digital and high-quality, in keeping with the tradition of the School, and with a high recognition in the technical in-ONE graduates of the Technician to have in today's day and a national and international level.
- Putting in place a model of active learning, with a strong *corresponsabilização* of the students, and by including an evaluation of a truly continuous, and is based on the teaching models of inspired by **design. (hands-on), project-based learning, research-based learning, problem-based learning** analysis, design, and engineering practices.
- To foster a learning and collaborative, cross-disciplinary and cross-cultural, and stimulating the communication and critical-thinking skills, and in a structured way, which, in addition to the ability to persuade, and pitch, and are able to inspire others and nurture the lead.
- To adapt to the learning of a changing world (VUCA), where there is a predominance of contexts the unpredictability, uncertainty, and the definition of objectives, allowing **management** and allow the graduates of the Technical and respond fully to the challenges of the twenty-first century.
- To encourage creativity, innovation, and entrepreneurship.
- To provide a strong display at the thought of the societal, and the goal is to create value, to the consciousness of the concepts, ideas, and systems of thought that lay behind the activities of the human understanding of the frameworks of social, economic and political, of the different companies, and as a condition to the pursuit of solutions to the sensitivity of the mode of communication, and the expression of the arts, and their contribution to a sustainable society based on ethics and human values.
- Ensure the suitability of the model for education and human resources, infrastructure, and the load timetable of students and teachers, and in the CREDITS on of the CU-bearing in mind that the Technician is assumed to be a **research at the university** in it, the teacher has to bring to the teaching, research and knowledge transfer.
- To create an ecosystem that school-to-person in a society, such as the nucleus for a better learning and a the positive experience of the passage of the student by the Tech and real life experiences outside of the classroom.
- Set up a Technical as one of the global leaders in the education of engineering, and to enhance the attractiveness of for international students, scholars, and teachers.

6.3. Construction

Model *Technical 2 1 2 2* it was built on the basis of the guidelines outlined above, and in the model, to teach her to- in the current Technical set up a set of the key ideas of a kind to Eliminate-Reduce-Raise-Create⁶⁶ that seem to defy the logic that is prevalent in the School^{1 3}). It was intended primarily to create a model of learning based on the assumptions identified above and in harmony with the objectives of the EUR-ACE", and that they value the attributes identified as important for our analysis (see *Chapter 3* and *4*), but they are rarely considered in the model of education in the present. As shown in the *Attachment B* and *D* the new model includes a number of measures that can contribute directly to achieving the objectives of the EUR-ACE.

Delete

- Restrictions on the flexibility and mobility of the curriculum
- the Restrictions on the range of the Response and the Scientific Committees of the Course
- the Obstacles to the collaboration of cross-functional expertise in offerings and teaching

Increase

The rate of academic success

- The flexibility and mobility of the curriculum
- Learning is an active and independent Learning
- project-based
- Support for the industry
- The articulation of the contents of the CU-base/specialty
- Activity, the faculty, in the design/follow-up new project/issues
- Stakeholders in the area of education
- international Attractiveness
- the Co-responsibility of the student in the training
- The continuous assessment
- Awa values

To reduce

- Grades for exams and tests
- Load, number of teaching hours of teachers' Time in touch weekly

Build

- Opportunities for training CITIZENS
- Opportunities for personal development
- the Eco-system, the New philosophy of the experimental training
- Opportunities for training and Innovation
- Entrepreneurship

(Figure 1 3). Main ideas behind the model *Technical 2 1 2 2* built on the model of the teaching force in the Coach *2 0 1 8*.

The main ideas discussed in *1 3* they were translated into a set of the key measures that we've compiled, and articulate in three different ways: (i) the Structure of the curriculum, organization, and philosophy; (ii) the teaching Practices; and (iii) human and material Resources, and the management model of the teacher. By these measures, and some of the rationale behind that are described in some detail in the sections that *6.4* to *6.6*. A few of the ideas are reflected in a number of significant measures (such as a p.ex. training in innovation and entrepreneurship. It is important to note that, in the case of the supply of training in the field of the Architecture, and the implementation of the measures proposed in the model *Technical 2 1 2 2* you'll have to meet a variety of specific features in this area" (p.ex. the university of the design of the project tetura). In the same way, you should take into account the specificities of the courses, which allow for a contribution to a very significant amount of the other colleges (e.g. Engineering, Biomedical Engineering, Pharmaceutical, or have restrictions imposed on the exercise of the profession (e.g., by the law or by professional associations).

⁶⁶ Kim, W. C., Mauborgne, R. (2 0 0 5). Blue Ocean Strategy Harvard Business School Press, Harvard.

Section 6.4. The structure of the curriculum, organization, and philosophy

Model *Technical 2122* it assumes a significant change in the structures of the curriculum, the organization of the life of the academic community and in the philosophy of education that shall be carried out by means of the measures set out below.

- **The end of the integrated master's programmes, and the adoption of the model in 3 + 2.** Measure in line with

old-DL 65/2018, on the 16th of August) in what remains of the concept of education for at least five years, the nature of the Engineer. 1.No course taken for the continuation of their studies. Giving

the academic mobility, built at the turn of the 2.Th cycle, and 2..the cycles of the Technical and gain more visibility in order to capture the students outside.

- **Changes to the UC-6) and (3 ECTS) in the whole School.** The extent necessary to promote your flexibility mobility between classes.

- **An introduction to the model-of-the calendar of school in 2 years (8 + 2) weeks per semester.** Increase

the number of total hours of working days. Corresponding to the charge of teaching a weekly 17.5 h to 20 h, the model makes it possible to reduce the load of teaching, weekly current with the changes in the marginal (a decline of 10% and an increase of 2%) of the total number of hours of contact, it is considered essential to the education of the local one. This model even allows you to reduce the number of applications for simultaneous three-fourths(3/4 CU, adding to more than double the hours of independent work of the student, UC, working hours, this is absolutely necessary in the course of the academic term, to a model of active learning (projects, homework, etc.). The distribution of teaching hours in each of the UC of the classrooms (theoretical / practical / practical / lab) must be adaptado to the nature of the protected area. It keeps the organization in a semester of the academic year, and thus, the high level of compatibility with all the schemes in the university with whom the Coach has a strong interaction and the exchange of students. No less important in a *research at the university* it allows for the enhancing of the time spent by the teaching exclusively in the research of more than 20 weeks per year, it is proposed that each student lectione to a maximum of two times per year).

- **An increase in the articulation of the basic training in the specialty.** Maintaining a solid education

in this e 69 (ECTS), in-depth later on *section 6.7* and *Appendix D*), that it provides it professionals trained in the Technical tools which are distinguished in the course of a lifetime, there is an improvement in your fitness course on the extent and complexity, and introducing the concept of the CU *the client-based*. You should ensure you are always on the complexity of the training in the fundamental sciences, in all of the courses, and the high mobility of the courses, and a more in-depth areas that are currently not covered at all. (p. ex., in the HASS).

- **An increase in overall flexibility of the curriculum.** The introduction of the 30 CREDITS of options from the 1.No stage (

CREDITS of the CITIZENS, chosen by the student, and 12 CREDITS in the Basic chosen for the co-ordination of the course, and 12 CREDITS in the area chosen by the student from a range of Areas on a pre-selected for the co-ordination course). Out of the 36 CREDITS of the options are for 2 people.No cycle, 30 CREDITS correspond to options that completely free, allowing you to accommodate long *minors* consistent and 18 ECTS credits in the areas of complementary expertise in the field of education primary or, for a diversity of selected reasonably by the students, in the context of a personal training plan that is discussed with the team in the mentoring and co-ordination. The CU are to be provided by the School, without necessarily being associated with a course. In the case of the courses are rooted in the most professional, the number of 30 ECTS credits of free choice in the 2.No be reduced by taking into account the requirements imposed by professional associations for other possible exceptions

they can relate to, contests, with the increasing involvement of the school outside lisbon. With the adoption of the a wire size of 6, or 3 CREDITS in any of the UC's School to allow you to relax the restrictions on the building courses of the curriculum, and will help to flexibility/mobility.

- **Development of minors are consistent at the level of 2.No loop.** The (Co-)Creation of departments of the offer wide *minors* coherent (18 CREDITS), multi-disciplinary, and to have access to all of the students in the 2.No loop. In the minors, should not be part of the curriculum of the courses and the students for their choice to organize the part of an optional component of the curriculum.

- **Recognition of curricular and extra-curricular activities.** Introduction to the UNIT(s) of the option(s) The portfolio of ≥ 3 ECTS credits, which can be credited to the work of a scientific nature/introduction to the research project between semesters, on-site training courses, short-term (e. ex., ATHENS is the BEST), summer schools, activities, membership, volunteer work, etc.

- **The introduction of the university "to Develop, Plan, Innovate, 12 CREDITS for a follow-up study 2.No loop.** This is a UC integration involves the work, preferably in a team, and it could be based on a set of problems and challenges in real terms (including 3 CREDITS in Management, innovation / entrepreneurship, + 9 ECTS credits), or to work in research facilities, or in a business setting. As A transitional measure, while the the supply of the themes that builders are not good enough, this CU can be replaced by a 12-CREDITS of the options are completely out of 1.No loop.

- **Extension of the scope of the project by the end of the 2.No loop.** In the project, you may be in the form of an essay project type *Capstone* project on business environment. Typically, by the end of 42 ECTS) can be set up in a 12/0 CREDITS for the CU in support of the project/dissertation, and 30/42 (E in the project/dissertation. Design *Capstone* business with an individual report will replace the full of the essay the scientific, giving way to a future degree wide; master with stage business vs. science department. With this extension you want to enhance the initiatives of entrepreneurship and technological innovation is disruptive.

- **The establishment of a general course in Science and Engineering 1.No loop in the English language.** Course is targeted for international students, which should include specific and give you unrestricted access (i.e. without the resources of the programs *private*) 2.the cycles in the product of Appendix E). Consider the creation of a course and its equivalent in Portuguese, aimed at countries where the official language is Portuguese, and, eventually, to students of all ages. 2.the cycles will then be able to take full advantage also in the selection of the students international level- 1.No loop, no competition for the *numerus clausus* awarded each year to different schools.

- **Creation and Strengthening of a Design / CU-in co-ordination with the companies, enterprises, scientific research units.**

Create and implement thematic platforms of the company / ideas / societal challenges, for example, at the level of the coordinators of the course and/or at the level of the School. In developing protected Areas, are linked to business, to believe the initiatives in connection with the business and provide appropriate training to the students in which they develop projects in the business " (p.ex. 3 ECTS) in the UC Management, innovation / entrepreneurship, as a pre-service training for the most complex projects, from the motivation of the business and research challenges with the media. Integrate into teaching initiatives, with research centres, and laboratories " (p.ex. the stages of the research in the summer. Enter UC with optional on innovative areas (including those in which, in many cases, it is leading-edge research and Technical).

6 7 https://enac.epfl.ch/projeter_ensemble

- **Battery life and corresponsabilização students.** Engage your students in their choice of a an important component of your **curriculum**: academic, which is to ensure the development and translate them autonomy, self-learning, collaboration, and multi-disciplinary nature. The introduction of the concept of **personal development planning development planning** by articulating the demands of the students " (p. ex., the selection of UC for free with the advice given by the tutors.
- **Changes to the model, the application of the** 2.No loop. To avoid the creation of a block in the progression of the 1.No cycle 2.No looping, and the promotion of mobility and the attractiveness of the 2.thcycles.
- A large proportion of the measures proposed in the case of (i) the Structure of the curriculum, organization, and philosophy the *Technical Model*: 2 1 2 2 results of the direct way in the new curriculum, and the teaching of the courses, which can be seen as follows in the 1 4 .



Figure 1.4. The structure of the curriculum and taught courses in 1.Article 2.No cycle is a result of the measures proposed in the case of (i) A the curriculum, organization, and philosophy of the new model.

The proposals of balance have a significant pillar of the school - it maintains the strength of the a-pillar of the knowledge, which is the matrix of Technical, while strengthening the pillars of personal development, and by the middle of the work for the design of active learning, of the responsibility of that choice is reflected as may be required by the building of a personal project, open a high degree of flexibility, and a greater exposure to the humanities, arts, and social sciences. However, the success of the paradigm that we propose includes a radical change in the dimensions related to (ii) the teaching practice and (iii) human and material resources , and the management model of the teacher.

6.5 in. Regarding the development of

The measures are related to teaching practices, which of the following describes is one of the vectors is critical for the success of a new business model.

- **A change in the paradigm of education.** To promote the learning *the project, research, problem-based learning* and *(hands-on)* that translates to a focus on practice and reinforcement of learning, self-directed work, and the responsibility of the student. The implementation of the learning is active *(flipped classrooms, machine-mediated frequent feedback to students, "chunked" (modularized) lessons, table-top experiments, (hands-on), collaborative learning* etc.). Learning and outreach by involving the human resources that far exceed the faculty member (current *teaching assistants*, researchers, guest, broker-dealers, teachers, businesses, etc.). The CU and traditional lectures (L) provide the framework for the field, include examples, demonstrations, experimental, computational, and they lose something of their character, weber, and exposure to complete. The classes, the problem of practice (P) active learning system, requiring appropriate rooms (more tables, round tables, etc.) over the central to today's focus on the teacher as the teacher, and then to work in small groups and as a complement to the work done by the students at home. In the laboratory (L-), is expected to play a more active role of the student in the design of *design* and the driving experience. The CU of the project is expected to have a higher *corresponsabilização* of the students to deal with problems out in the open and more and more bold, collaborative, and leadership in multi-disciplinary teams. Foster's assistance, conferences and research visits to laboratories of research and practical work in the research environment. To promote the training of teachers, and the integration of these two methods, for example, providing for and promoting the periods of internationalization, training in the schools of the reference.
- **Enhancement/overhaul of the training, the experimental.** The coordinator of the course are to promote the the enhancement/overhaul of the training trial, which is absolutely essential in the education of the engineer, ensuring involvement of students in the design and conduct of the trial, and of ensuring that one's weight to a minimum, this training in each of the first half of the course.
- **Improving the training of soft skills.** Cover it, and program it accordingly with the formation of the different skills *soft skills* (presentation, written and oral, in a clear and compelling scientific knowledge; the identification of objectives, planning the work, collaboration, and social interaction in a group is very heterogeneous; and the application of research methods, assessment and evaluation of the quality of the data, an assessment of the quality of the results, critical thinking, etc.). in the context of the CU ones. It is also reasonable to expect that skills such as the ability to communicate and work with each other, are strengthened by the frequency of of CITIZENS, and with the completion of the internships, extra-curricular activities, and the dissemination of science.
- **The strengthening of skills in computer science and programming.** The coordinator of the course are to promote the the integration of the fields of computer science and programming at UC- 1.No cycle, ensuring a stress to a minimum of 1.5 CREDITS (and its weight in the assessment of 25 %) in the first half. This measure is expressed all of the 1's.No cycle for at least 6 CREDITS (in addition to the 6 CREDITS of the Program). Further education in computer Programming and computer science should be made with enough depth at the level of the 2 nd cycle, or through the use of protected Areas for the reception-whether by choice-a *minor* dedicated to his work.

- **Built-in HASS (Humanities, Arts, and Social Sciences).** The provision of training in HASS

from 1 to No loop, for a total of 9 CREDITS, including 3 CREDITS correspond to a protected area of the base of the Economics, Management, and 6 CREDITS of free choice in the CITIZENS. Refer to the following examples, the qualities of the CITIZENS that are relevant to the context of the History of Science, Business, Global Challenges, International Relations, and major Texts, Ethical, Political, and Public Diplomacy, Environmental, etc. It will be appropriate to explore the wide range of the University of Lisbon, in this context, and taking advantage of the facilities existing on the Desk. On the basis of each student for your choices, it is essential, as well as the exposure to the different realities of the outside wall of the Coach. With regard to education in Economics and business administration, in the model, there is also opportunity for further training in the 1st stage in the UC integration "is to Develop, Design, and Innovation", which includes in a variety of settings 3 CREDITS Management / innovation / entrepreneurship , and 2nd cycle through the use of protected Areas for the reception, or over the selection of a minor, dedicated (18 ECTS credits).

- **The restructuring of the model.** To create a template that is well suited to the nature of the different CU but, that is compatible with a significant reduction (< 50 %) of the weight of the assessment, examination and the time of the tests) and the disappearance of trend tests during the term, incorporating elements of continuous assessment in the context of active learning (p. a. ex., projects (*hands-on*) work from home, etc.). It is reasonable to expect a greater academic success-a result of the best way to learn. The teacher will need to consider which components of a risk assessment should be appropriate to establish a ranking *pass/fail* similar to the practice in other schools and colleges.

6.6. The human and material resources, and the management of the faculty,

With the introduction of the model *Technical 2122* it requires an effective mobilisation of human and material resources, as well as the creation of a new model of management as a lecturer. We note in this respect of the following measures:

- **To increase the human resource activities in support of education.** Engaging teaching assistants (TA's - *teaching assistants*) and brokers (*graders* in a new business in support of the teaching and the underlying model of active learning (development, teaching practical classes and laboratory tests, patch tests, and tests, supervision of the evidence, and follow-up of project, etc.). This involves the integration into the education of the students of the 1st cycle (typically in the 3rd year, as the monitor), the students of + 2nd cycle (as well as monitors for the support of the course unit 1 stage), students (such as THIS, for the support of the university of the 1st and 2nd grade, including a follow-up project), researchers from the UI, for support of the various aspects, including the UC provided by the UI), the specialists of the business environment (such as guest teachers, to support the university in the project, etc. on a significant scale. Awareness-raising of the School, there are activities that can be carried out with the advantage of non-teaching careers.
- **Built-in Innovation, education, engineering and technology.** At the School, and the Departments of expected to react in a way to promote active learning, and the teaching techniques and the excellence of the teaching profession among the different actors of the educational system of the Technical faculty, TA's, broker-dealers, researchers, etc.).
- **The renewal and creation of the spaces, equipment and.** Renovate and retrofit spaces, and laboratory The laboratory of Information Technologies (LTI). Create labs, open access, and space for the project team. Revitalize your living room in the classroom for students to assets (excluding central to improving the

supply of technology in the classroom), and the design of the spaces in the classroom to study (one-to-one or group), in particular, taking advantage of the partnership's business, and links to the **alumni** within the framework of the strategy for the renovation of infrastructure for teaching and learning (pp. ex., co-investments, donations of equipment, names of places, such as contrast, etc.). The implementation of this measure should be aware of the concept of "design for all" and "design for inclusion, ensuring accessibility to all users, regardless of their level of mobility.

Improving the recruitment and enhancement of marketing and communications at the school. At the level of the three

cycles, but rather for a general education course for Science and Engineering 1st stage (English and Portuguese), and the majority of the 2nd cycles. **Marketing** particular it is directed to the general course of Sciences, Engineering, based on the innovative design of the course and the faculty member's excellence in which it is built. Strategy **marketing** (traditional and digital) with a professional medium-to-long term, with the support of adequate financial, in order to attract students (domestic and international) for the 2nd cycle, increasing all of your interactions with others in the School, and the strength of the brand new Coach. Set a date for applications is 2nd cycle is consistent with other international schools, and I teach the 2nd cycle tend to be in the English language. The restructuring of the pages from 1 to Article 2nd cycle of the professor (in Portuguese and English) in order to make them more attractive and up to date. (p. ex., FAQ's).

• **Create homes, living spaces, and recreational activities** (the improved or new),

in particular, a-area, multi-purpose, for the practice of sport, arts and culture, supporting education across the curriculum in terms of culture and sport, in close cooperation with the University of Lisbon, Portugal).

Systems of the human resource management of the service to the promotion of the teaching model. Create a strong sy

the incentives so as to promote a real change in the practice of teaching and values, as appropriate, the activities are worthy of credit terms (the "eureka" vs. "repeat off"). The change in the RADIST, and the Regulation of the Provision of the Service of the Staff, in particular with regard to the valuation of the time spent in the classroom. A rethinking of the use of the calculation of the TSI, and the setting of the subject areas/science, which inhibits the collaboration between the departments of the change, and the implementation of the designs of the curriculum with the flexibility, mobility, and inter-disciplinary skills, such as work-in-progress of the School and the department.

6.7. The proposed measures

The implementation of the proposed model assumes that the adoption of a whole-of-33 practical steps that are listed in the Table 20 to Table 22 for the three areas referred to above are: (i) the Structure of the curriculum, organization, and philosophy of the measures ECOF 1 the ECOF 16), (ii) teaching Practices (anti-PP 1 to PP 6), and (iii) human and material Resources, and the model of management of the faculty, the measures are RGE 1 the RGE 9). These measures are defined and explained in more detail in the *Appendix Dwell*, in the form of tables that you include the following information: (i) the manner in which the measure contributes to the pursuit of the objectives; and (ii) the Consequences to be expected, and risk-taking; (ii) Changes in the as required by the measure (including the features and operation (where applicable); (iv) the reasonableness of the action; and (v) interaction with other measurements, and (vi) contingency measures. For example, it displays the extent ECOF 1 in Table 23.

Table 2.0. A set of measures of the new model, the "Structure of the curriculum, organisation and philosophy".

ECOF 1	The end of the master's work.
ECOF 2	UC- 6 , or 3 CREDITS in all of high School.
ECOF 3	The introduction of the model for the calendar year in the 2 years (8 + 2), for the half-year. The training of the
ECOF 4	base, and ≥ 6.9 (ECTS) with a geometry that varies
ECOF 5	from course to course. The adaptation of the training.
ECOF 6	To increase the flexibility of the curriculum.
ECOF 7	Minors (up to 1.8 CREDITS) to access the 2.No, in the areas of cross-functional, strategic , and/or in interdisciplinary studies.
ECOF 8	Recognition of curricular and extra-curricular activities. The UC
ECOF 1.0	Integrated "to Develop, Design, and innovation," in the 1 st
ECOF 1.1	stage (1.2 ECTS credits). Design Capstone 2.No cycle (4.2
ECOF 1.2	CREDITS). The creation of a general course in Engineering
ECOF 1.3	Science from the 1 st cycle. Design/Hus, in conjunction with the
ECOF 1.4	business units of the investigation. Creation of the week
ECOF 1.4	"Project". The introduction of the concept of Career Planning .
ECOF 1.5	The change of the model's application to a 2 -cycle.
ECOF 1.6	Elimination of trend in the CU, in half scale.

Table 2.1. A set of measures of the new model, the "Practice teaching".

PP 1	A change in the operation of the lectures.
PP 2	A change in the operation of the practice.
PP 3	Enhancement/overhaul of the training on an experimental basis.
PP 4	To promote the learning the project, research, and problem-based learning .
PP 5	Of training at the soft skills .
PP 6	To increase skills in computer science and Programming.
PP 7	Training HASS (Humanities, Arts, and
PP 8	Social Sciences). The restructuring of the model.

Table 2.2. A set of measures of the new model, the "human and material Resources, and the management model of teaching.

RGE 1	Importance of human activities in support of the school.
RGE 2	Training in Innovation, Education, Engineering, and Technology.
RGE 3	To renew, re-equip and open spaces, in the laboratory, LTIs and in the classroom.
RGE 4	The improvement of the Marketing and Communications at the School.
RGE 5	Experience university of <i>the campus</i> .
RGE 6	The system of incentives for a change in the teaching and activities, worth of credits in the study
RGE 7	Identification and removal of potential obstacles to the promotion of an interdisciplinary approach in education. Operation of the
RGE 8	powers of the office of enrollment and changes to the procedures and due dates for applications for the 2 nd cycle of the Re-design
RGE 9	of the pages from 1 to the 2 nd cycle of the professor (EN and EN).

Table 2 3 . The table template, and a description of the extent to ECOF 1 .

As ECOF 1	The end of the integrated master's programmes
How does the measure contribute to pursuit of the objectives	The increase in the mobility of the 1 st cycles, non-professional, in response to the interests of the students, and the greater the possibility of the capture 2 ndthe cycles of the Coach, the students who have successfully completed 1 stcycles on the outside of the Coach.
The consequences to be expected, and the risk	The design of the 2 .the loops are independent, with a greater outward visibility and the perception by the applicants that there's a new-port-of-entry into the system, leading to the creation of competitive bidding at the national level,and especially at the international level. The change of the cycle and it provides students with the opportunity to select alternative routes , and training with the most complementary and multi-disciplinary nature, without any major restrictions. There is a risk that students of Technical expertise, including the best of the best to compete in the 2 .the loops off of the Desk. The decrease in the number of college graduates in the areas of engineering (professional), in some cases, less attractive, it may also take place. The existence of obstacles to the normal follow-up of studies, such as in the passage from 1 to.No to the 2 .No loop, you can increase the time it takes to complete the course.
The changes in the school, as required by the measure (including the features and operation	Distribution (marketing) of the courses in a Technical or 1 .No want for 2 people.No cycle; the system of the stock exchanges to attract/attract the best students from other schools (domestic and international), as is the case in other universities of the reference (e.g., EPFL); an increase in the popularity of the courses in the Technical areas, to end, change to the calendar application. It should not be allowed to sign-in 2 .Th cycle of the students, a number of very significant (in the setting), the CREDITS for 1 .No cycle is complete. Students will not be expected to be able to make more than 5 0 % of a 2 .No cycle until they have completed the 1 .No loop. The School should be able to establish the ground rules for the transition from the 1 .No to the cycle is well-defined and communicated clearly and in advance to the students. The co-ordinator of the course they should have the edge in order to adapt to these rules 2 .Th cycle, and to be able to select the most suitable candidates.
Rational	The increase in the mobility of the courses not courses, giving you the answer to the interests of the students. the greatest probability of capture into the 2 ndthe cycles of the Coach, the students who have successfully completed 1 stcycles on the outside
Interaction with other measures	The measure is coordinated with the ECOF 1 6 and RGE 8 .
Measures of Contingency	This measure is the result of a change in the law that could not be defeated. In the School, either explicitly, or through the nature and the content of the curriculum of the courses, you should re-emphasise the need for the 2 .No cycle in the education of the students, making it clear that the study of 1 .Th cycle of the STIS are not a professional, and that can serve as the basis for the continuation of studies for the 2 nd.No loop.

6.8. Implementation strategy

Model *Technical 2+1+2* set up a new structure in the MEPP, the team, which substantially changes the *status quo* and it affects all of the courses in 1.Article 2.No loop. The CAMEPP proposed that all courses in the Technical and adopt the new model at the same time, regardless of your current set-up of the (3+2's or master's degree). A schedule as possible, which is compatible with the legal limits for the adoption of the 3+2 system devised in the field 65/2018, you find yourself in - 15. It is expected that the new courses will take effect in 2021/22. The implementation of the model in the period of three years and is, therefore, a major challenge that requires the mobilization of resources and resources are very important, and with a high level of commitment on the part of all. The process needs to be led and co-ordinated at the highest level by the t & c, CC, and CP. The CAMEPP believes that the team will re- accounts will be required to work full-time on-task, and have the support of experienced professionals in the management and implementation of the project. The communication between all parties involved is essential, so if you need to put on since the beginning of the mechanisms for effective communication. In order for the model to be in effect in 2021/2022, it is essential to:

- i. with the adoption of the strategy *management of change* on the part of the board of the School;
- ii. for the definition, implementation and scheduling of the stock preparation are essential;
- iii. the implementation of the *the actions of the framework* a new model of learning and teaching practices;
- iv. a *monitoring* effective action is planned.

The management of change

The proposed model is a relatively cautious on the changes it proposes, in fact, that (i) the formation of the base keeps the paper that has been at the Centre (the weight of roughly 40 per cent); and (ii) a reduction in the number of hours of tact for less than 20 hours per week), without a reduction of the total load of the contact information for the student, and without a reduction in the total number of CU in both loops, (ii) free training proposal will be limited to 10 % the ECTS is the sum of the two courses of five years; and (iv) the *minors* they are recognized as being no more than 18 CREDITS, etc. In addition, however, the implementation should take place in a manner that does not create a School disruption to the strictly necessary. Right from the start, it's crucial to set up at the School to find out that the new model is, in fact, necessary, and to motivate all parties to accept the change. Since a lot of people to resist the course of the amendments to the dance, and the goal here should be to create awareness of the *"business as usual"* in 2018, it is the way for the Technician, and your key stakeholders. In this phase, communication is crucial to inform all concerned about the change in the offering, the logic behind it and how it will benefit the School. It is, therefore, important to provide, internally, a participatory discussion of the main ideas of the model " (p. ex., with the inclusion of contributions and / or external) to collect suggestions and contributions*, to dispel any doubts, lower expectations, and to mobilize the students and the teachers. The ultimate goal is that all the increasing ownership of the new model, so as to increase the likelihood of success in its implementation.

^{6 8} MIT has a very interesting example of the way that the students themselves can contribute to the innovative ideas that will enhance your learning experience, and the experience in the School and the establishment of a protected area, entitled "Designing the First Year at MIT, which gives students the opportunity to submit proposals for specific changes, which are intended to make your experience at MIT, the better we are able to provide. <https://ovc.mit.edu/exploration-in-the-mit-first-year/>, https://ovc.mit.edu/1ye_course/

Preparatory actions

The new model involves a reorganization of the deep of the curriculum and the organisation of the academic life of the Technical demands of the organs of the School in the role of a strong leader, and at the highest level. You've made the decision to put in place a new model, it will be necessary to carry out a set of concrete actions, prior to its entry into force. Your actions are deemed essential for this purpose are listed in the *Table 2 4* and they are briefly described below. In many cases, the actions marked and can be carried out for the structures in the School. For that purpose it may be necessary to reinforce the team in some of the core services, with emphasis on the DIRECTOR, who shall be designed and implemented a lot of changes in the management académica-Time. In some situations it may even be appropriate to appoint the Committees on an ad-hoc basis to study the best way to implement the more complex ones. To 1 5 presents a brief time-frame possible, the debates on the adoption and implementation of the new model.

Table 2 4. The preparatory actions to be undertaken prior to the entry into force of the new model.

ACTION	NOTE	ACTORS	The END
The restructuring of the curriculum, and the setting of the new calendar	The implications of information technology and operating in the introduction of the new calendar shall be considered by the core, and for the coordination of courses and departments.	Response to, CC, CP, DA, GA, GOP	On dec. 2 0 1 9
Definition of the planes of the equivalence of	Need to set up the plans for the equivalence to ensure that the students do not miss out on the CREDITS gained at the transition.	The committees of the equivalence of the to, CC, is a Response	On dec. 2 0 2 0
The planning of the university of unification "Q-watch, Design, and Innovation" of the 1 st cycle	Appoint a commission on ad-hoc basis, and to create a platform for you offers, themes, and interdisciplinary studies, which promotes the interaction of the an ad-hoc basis, and with third parties to School, businesses, government agencies, Ngos).	The committees of the an ad-hoc basis, A response to the to, CC	Sept. 2 0 2 1
The structuring of the offer in a HASS	To appoint the commission on an ad-hoc co-ordination of the provision at the level of the Coach, and in conjunction with the other schools of the University of Lisbon, Portugal.	The committees of the an ad-hoc basis, A response to the to, CC	Aug. 2 0 2 1
Design <i>minors</i>	To create a sufficient number (ca. 3 0), and that of minors, involving different scientific disciplines and sectors, and by promoting the areas of innovative and emerging economies. The approval of the CC, you must take into account the relevance, appeal, and relevance of its mention in the law. It will be necessary to ensure that the minors have no existence independent of the courses in the 2 nd grade.	The committees on an ad-hoc basis, A response to the to, CC	Aug. 2 0 2 1
The design of the course-the general of the 1 st cycle in the Sciences and Engineering	A detailed description of the course and must be carried out by a team with members of various departments of the School. This course is brand new, there is a chance to try out a new format, and new ways of learning.	A team of co-ordination with the name	Aug. 2 0 2 1
Accreditation A 3 ES	The proposed model took into account the goals and objectives of education in the EUR-ACE, and of the considerations raised in the interviews with the A 3 ES, with the Order of Engineers and with the actors in the University of Lisbon, Portugal. On the one hand, a large number of changes that require the management of information with these third parties as well as for the adoption of measures are resourceful in terms of the processes of change.	AEPG, A response to the to, CC	Apr. 2 0 2 1

The restructuring of the curriculum, and the setting of the schedule: The curriculum of all the courses in the Technical and need to be re-structured in line with the goals and philosophy, as defined by the new model (see 1 4). Where possible, it should be searched for in the contribution of external partners in the STI (e.g. groups, alumni, and

business, Order of Engineers) in the identification of the content and skills on the lack of students in the courses today. Although much of the work of the restructuring, it is the responsibility of the coordinators of the courses it is essential that there is less of a vision, and coordination in the global that will guarantee you the best harmony as possible to the level of course unit is shared, in particular with regard to the training of the base, and a feasibility, logistics, and the time, living rooms, and of the group. This is why it's important to the design process of the new curriculum is to be followed by the definition of a new calendar year, in a semester, with two periods of time (sometimes referred to as the terms). In *Table 2 5* illustrated by way of example, a planning of the workload as a limit of a minimum of 1 7.5 hours of contact per week the model, the 8 + 2. The sc, in conjunction with the coc, it should take over the general management of the whole of this process, with the support of the services in question (FROM the AG, and the GOP). Calendar: May 2 0 1 9 to December 2 0 1 9. Rationale: the decision of the courses in the CP, CC, CG and cc will take place in January 2 0 2 0 and March 2

Table 2 5. An example of the planning of the timetable, half-yearly on the model, the 8 + 2. For comparison, we present the values of the standard, which assumes that 1 ECTS is equivalent to a 2 8 % change in The planning complies with the effort of a semester corresponds to 3 0 ECTS credits, i.e., up to of contact, and research. Assumptions: (i) 2 and CU 6 ECTS), and 1-CU 3 ECTS credits per period, and (ii) for 7 h, and 3.5 h of contact per week The CU is 6) and (3 ECTS), respectively; and (iii) the ratio of the total contact hours and hours of self-study, 4 0 %/ 6 0 %, and (iv) the dedication of the 1 4-hour, and 7 hours of self-study per week and per CU, 6, and 3 CREDITS during the period of the examinations, respectively. It is assumed by default all of the UC's will take, what you should not necessarily have to be the norm.

	CREDITS	Classes		Rating		Total	Standard
		8		2		1 0	
		Load per week (h)		Load per		The Term	
		Contact in the Study	week (h)	TotalEstud	Total		and Half (h)
UC1	6 7	1 7, 5 0.5		1 4	2 8	1 6 8 1 6 8	Term 1
UC2	6 7	1 7, 5 0.5		of 1 4	2 8	1 6 8 1 6 8	
UC3	3 3, 5	5 5 : 2 5					
Total term	1 5 1 7.5	2 6, 2 5 4	3, 7 5	3 5	7 0	4 2 0 4 2 0	
UC4	6 7	1 7, 5 0.5		1 4	2 8	1 6 8 1 6 8	Term 2
UC5	6 7	1 7, 5 0.5		of 1 4	2 8		
UC6	3 3, 5	5 5 : 2 5					
Total term	1 5 1 7.5	2 6, 2 5 4	3, 7 5	3 5		4 2 0 4 2 0	
Total Semester	3 0	--	7 0 0 -		7 0 2 8	0 8 4 0 8 4 0	

1 6 8 1 6 8

The definition of equivalence: You will need to set up the plans of equity, which will allow the framework of the curriculum of the students, which are carried over to the new curriculum frameworks. The plans for the transition, and the tables of equivalence should be, if possible, to be automated. In order for the change to be accepted by all the students, especially those who have been shopping in the last few years of their course, it is necessary to understand the general is a change for the better. The equivalence plan should be⁴ to⁸ ensure that students do not lose CREDITS acquired in the transition. The Commission on the Equivalence of the CC, so you should take the lead in this process, by defining the rationale and the procedure to be followed. Frame: In may 2 0 2 0 and December 2 0 2 0. Rationale: the decision of the courses is expected to be completed in March 2 0 2 0.

The planning of the university to Develop, Plan, and Innovate out of 1.Th series: One of the changes to the curriculum of the higher impact of the proposals for the new model is the inclusion of a protected area integration of knowledge of 1 2 ECTS credits, 3.No year-1.No cycle involving the challenges of the real world, multi-disciplinary, and as a team, and also the challenges of innovation and research As ECOF 9, section 6.7). In the Face of the philosophy that if you want to print in this protected area, in particular with regard to the ability of the students of different backgrounds to work on the same project, it is recommended the establishment of a Commission on ad-hoc basis, in conjunction with the CC, CP, to reflect on how best to deploy your UNITS. In this context it is vital for the creation of a platform for

it allows you to manage all the offers from the inter-disciplinary, and promotes the interaction of the inter-agency and with third parties to School, businesses, government agencies, Ngos, etc.). Schedule: jan 2 1 -set 2 1. Rationale: the university will work for the 1 st time in 2 1 / 2 2 ..

Design-supply-CITIZENS: The AA formation in the CITIZENS should be designed in such a way that the provision makes it possible to respond to the demand expected in the 1.No year- 1.No cycle should be provided to the formation of some 1 4 4 0 students. In particular, it should be organised in collaboration with the other schools of the University of lisbon, Lisbon (p. a. ex., Faculty of arts), where there is the provision of quality and quantity in this field. Here, it is important to decide whether or not students should have access to a range of strict, p. ex., the History of Science, and the Economy as a control, the Global Challenges, the basic Texts), or to a more comprehensive applications. Due to the size and the newness of this type of training in the Technical, it is suggested that the appointment of a Commission to an ad hoc, dependent on the DC and the mission to plan and implement the introduction of training CITIZENS in the courses, in the context, considering the offerings of t internal and the external. In this context it will be important to make a list of Areas and skills are complementary to the existing in-STI-that are outside the scope of the training on the CITIZENS. Calendar for September 2 0 2 1 -July 2 0 2 1. Rationale: the model goes into effect in September 2 0 2 1.

Design for minors: The new model maintains that all of the students in the 2.No loop should be able to have access to any of the *minors* (1 8 CREDITS) that are available on the Desk. In this regard, it is imperative that the School can create offer for *minors* engaging and involving different scientific disciplines, and linking the efforts of different departments. It is necessary for the department to have a sense of the importance of this provision in the future-state' model of education, and the potential for a return to the department. In particular, it is the gift of *minors* Management and Entrepreneurship and in a computer are extremely important and should be carried out in conjunction with the master that already exist in each and every *the campus*. All the Departments should take the lead in preparing for minors are consistent with intra-and/o inter-departmental, the multi-disciplinary nature, variable. These *minors* you will be subject to approval by the coc, it should be- they will have to take into account the relevance, appeal, and relevance of its mention in the law. A number of *minors* in the order of 3 0, it seems to be appropriate to the size of the current Tech and, in the light of international best practice. The CC is expected to take the initiative, to identify you *minors* in the areas of strategic and emerging economies, thus promoting their creation. It will be necessary to ensure that the *minors* have an existence independent of the courses in the 2 nd cycle. The School must ensure an adequate dimensioning of the CU that makes the *minors* and then, if necessary, to study the means of selecting students with access to those UNITS. Calendar: May 2 0 1 9 to December 2 0 1 9. Rationale: the *minors* they should face the same scrutiny that the courses of study.

The design of a general- 1.No cycle in the Sciences and Engineering: The overall 1 -.No cycle in the Science of Engineering is proposed (see section 6.4 should be designed in such a way as to be implemented in year 1. In Appendix Eare the guidelines for the establishment of a general education course 1.No cycle in the Sciences and Engineering. A detailed description of the curriculum of this course shall be conducted by a team appointed by the governing bodies, members of the various departments of the School. Calendar September 2 0 1 9 to July 2 0 2 1. Rationale: not required that the course will start at the same time as the other courses in the set 2 1, its implementation should not be delayed for as soon as they are guaranteed the minimum requirements to be successful (e.g., marketing, analysis of prospec- tive candidates, etc.).

Accreditation A 3 ES: In the preparation of the recognition of new types of training together in the A 3 ES is expected to be carried out in close liaison with the Agency in order to ensure that the many of the new and innovative ideas proposed in the new model are consistent with the forms in place of the assessment criteria, etc. Availability, as shown by the A 3 ES to keep track of the preparation of the dossier of the test must be taken by the School. The struc- ture of internal is responsible for the accreditation of the files (AEPQ) is expected to be equipped with the required human resources, so that all the files will be ready to be submitted to the A 3 ES in July 2 0 2 0. Calendar for April 2 0 2 0 to

2020. (files) in January 2021-April 2021 (hit). Rationale: the accreditation and is expected to be completed at the time of the entry into force of the model of September of 2021). The team is responsible for the implementation, you can set the schedule for in-depth, as well as a plan for such a contingency in the event of non-compliance with the time limits laid down. To 15 is a short time-frame available for the implementation of the new model.

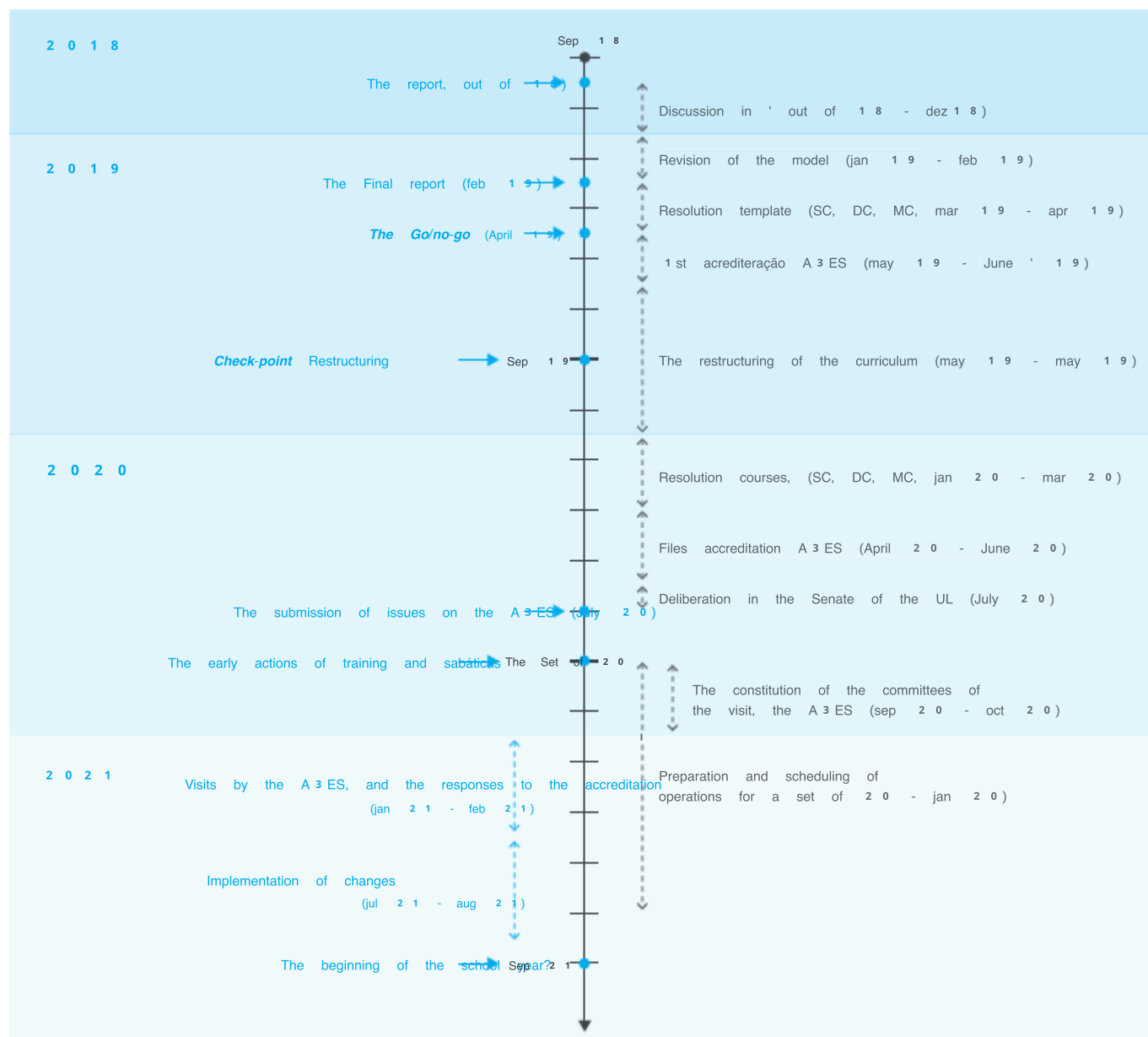


Figure 15. The timing of the implementation of a new model of education, and pedagogical practices of a Tech.

General activities of the frame

The all-new model that assumes the existence of a regulatory environment and a design environment that promotes an effective change. In *In table 26*, shown are some of the general activities of the framework is that it is important to realize, as a way to increase the chances of success. These actions are described summarise include the following.

Table 2.6. Actions in the general framework of the model.

ACTION	NOTE
To promote discussion and reflection on the new model, a TECHNICAL 2 1 2 2	It is relevant that the School is to promote the discussion of ideas on the basis of a model that includes the community, from the Technical as well as personalities that are external (e.g., some of the experts heard by the CAMEPP and experts from some of the Atrocities that are involved in the restructuring programmes in the school of Engineering. The
A review of the RADIST, and the Regulation of the Provision of the Service of the Teachers,	recognition, evaluation, and regulation of the activity of the teaching staff and researchers, and the Coach needs to be aligned with the new model of teaching and teaching practices, in order to create the right incentives for faculty members to adhere to new forms of education, and political and social and educational initiatives, innovative, and departments to collaborate with each other in a more active way. To participate
The framework and rules of the new players to the system of the education of a Coach	in the education of the players of the additional require that the role of formal, well-defined and well-recognized in connection with the incentive and the specific context of the users (e.g., in connection with the rules of the funding and operation of the doctoral programs).
Operation of the powers of the Office of enrollment and change-of-procedures- tos, and the date of the candidature-to- 2 nd grade	The creation of a data structure of type "the Admissions Oce" we are able to disseminate more effectively the training is available on the IST, and to increase the uptake of external students (domestic and international). The procedures and application dates to the 2 nd cycle will need to be reviewed and aligned with those of the other schools of the world (e.g., the time limits are to be prepaid), in order to increase the ability to attract students, and external, national and international level.
Marketing and Communication	One strategy is to raise the students in both national and international in the 2 nd cycle, it's an essential, and it requires a marketing and communication appropriate to the target audiences.
The formation of Innovation in the Education Technology & Engineering	The size of the Coach, and the need for the promotion and widespread use of new forms of teaching and learning and inform a strong focus on the development of human resources, to encourage, and to encourage new teaching practices that underpin the model, the Technical 2 1 2 2
The renovation of the spaces	The change in the approach to teaching the Technical means for the renewal of the different areas of the School. The projects to be carried out should be taken into account in the current fiscal constraints, and advance initiatives that raise funds in the context of the innovation proposed in the present model. Initiatives, such as the restructuring of the classroom, are quick-to-implement and low-cost.

Promote discussion and reflection on the model of the Technical 2 1 2 2: The CAMEPP suggest that the argument of the proposed in the *Technical 2 1 2 2* conducted in an open and participatory. This discussion should include the whole of the community, the Coach, starting of course by their own bodies, in the School, but they also involve the actors, and personalities to the outside. The principles behind the model, as presented in the first version of this report (September 2018), have been widely discussed in the context of the multiple discussions that took place at different stages, and drives to the high school. It was also promoted with a panel of public discussion, which involved a number of people from outside of the model. It is suggested follow-up discussion, and dissemination of the model, through the promotion of the panels, discussions, workshops, and conferences / meetings, etc., but now with a view to certification of the plan of implementation of the measures and options.

A review of the RADIST, and the Regulation of the Provision of the Service of the Teaching staff: The recognition and evaluation of the activities of the teaching staff and research students of the Coach you will need to be aligned with the new MEPP, in order to provide the right incentives for faculty to invest better in school (while keeping a good balance with your business, research, and to adhere to the new practices, and pedagogical proposals, and launch initiatives in an innovative way. The RADIST will be from the ground up, in particular with regard to the valuation of time is dedicated to the creation/redesign/co-ordination unit, and the production of new content and new projects, education and teaching. There should be a strong incentive to promote a real change in the practice of teaching and to appreciate adequately the activities worth of credits of study ("an inspiration" vs. "re -"). It is suggested that the GC reequacione on the way to the calculation of FTE is used in the context of its policy on the management of human resources and restate the existing Regulations for the Provision of the Service of the Teaching staff of the Institute of Higher Technical (as well as other tools for the management of your School-related), which, of course, inhibit the collaboration between the departments of the change, and the implementation of designs, curricular flexibility, mobility, and taking an interdisciplinary approach, making it the tools, the development of the School and the department. These actions will be carried out during the period of time between the entry into force of the *Technical 2 1 2 2*.

The framework and rules of the new actors in the area of teaching and learning: To participate in the education of the players of the additional (researchers, employees, faculty members of the UI, and businesses, guest lecturers, phd students and students 1 and 2. No cycle requires that the role is formally defined, accepted and put into context. At the level of phd students, for example, in connection with the restructuring, in the course of the school in the 3rd cycle, it will be important to focus on the collaboration in the framework of the activities of the training of their doctoral programs, so that there is no conflict between his teaching and the connection to the contract to the funding bodies of scholarship (e.g., FCT). For each Department, you should consider what kind of resources are a human and one that is appropriate to their needs (the departments and courses of study with the largest number-of-st- us, a phd will be able to use more of the Plants that have the highest number of researchers in the post-wise- that has the units of investigation that may involve them in the activities of the school, while in the departments and courses of study, with a greater connection to the industry and will be able to get the most out of these collaborations). The solutions are based on the use of the students of the 2nd cycle, and the 3rd year of the 1st cycle, such as graders, monitors are generally available for all courses. This action is the responsibility of the CC and the terms and conditions, you may then be initiated from the outset, so that it is possible to test for the contribution of a significant number of new entrants in the two periods of school (19/20 and 20/21), which before the entry into force of the *Technical 2 1 2 2*.

Operation of the powers of an "Admissions Office" and the change of the proceedings and the date of the candidates in the 2nd stage: It is suggested that the terms and conditions, in connection with the operacionalize the skills of a data structure of type "Admissions Office" (p.ex. restructuring of the Area of a Degree so as to improve their skills), which provides: (i) improving the dissemination of the training is available in the context, and (ii) follow-up and advice to potential applicant, and (iii) the initiation of the informal processes of the application, giving you the proper follow-up and monitoring of the expression of interest to the implementation of the application. It is also necessary to

keep under review the procedures, time-limits and methods of assessment, and the selection of the candidates in the 2nd stage, bringing them in line with those of the other schools of the world (e.g., the time limits are to be prepaid), in order to increase the company's ability to attract students, and external, national and international level. Be sure to take advantage of this phase is to simplify, automate and rationalize processes, such as the application of the guidelines and of the issuance of the document. **Marketing and communications:** One of the current trends among the Educational institutions of the world has been significant consolidation in the communications, marketing and branding. It is important that the School should develop a strategy that the marketing is directed in particular to the online space, and a digital professional in the medium to long term in order to: (i) to strengthen the brand of the institutional, Technical, and (ii) to attract students (domestic and international) for the course in general Science and Engineering courses for 2 people.No loop. The GP is expected to strengthen in a major way in the Area of Communication, Image and Marketing, in order to invest significant financial resources (e.g., hiring a chief marketing officer, holding recruitment events that involve direct interaction with other potential candidates), which would allow for a fact to strengthen and enhance the international recognition of the brand in the Coach.

The formation of Innovation in Education, Engineering and Technology The success of the model *Technical 2 1 2 2* it passes through a stake in a serious and continuous training of human resources (teachers, TAs, broker-dealers, researchers and students) in the teaching techniques of active learning, and collaborative (*flipped classrooms, case studies, peer review, research/problem-based learning*) projects are interdisciplinary, discussion, demonstration, and discussion. With these actions, the training will be coordinated by the CP, and implemented by the NDA-Objectives, properly coordinated with the other Departments, in order to ensure the mobilization of a significant number of faculty members. In this context, it seems to be important to communicate and disclose and make use of the many educational initiatives, innovative, existing in the School, many of which are addressed by CP, in the framework of the program 'PIP-Project of educational Innovation'. The School must also invest in the tools that support new ways of teaching. NDA-Objectives should be to continue to provide training that will enable the different stakeholders to improve the performance of teaching.

The renovation of the spaces: The change in the approach to teaching the Technical means to renew, re-structuring and organizing the different areas of the School (classrooms, laboratories, LTI, libraries, etc.) in order to make them more eye-catching, functional, safe, secure, affordable, and easy-to-manage, and adapted in the methods of active teaching. The CG should be gizar, a plan of interventions are feasible in view of the current budget constraints, and leverage initiatives, fund-raising, in the context of the innovation proposed in the present model. Some of the interventions are simple to do, and what they require financial resources are low, it can boot from now on. We suggest that, for example, in one set of rooms (e.g. in the stadium of the Civil law) are to be changed (the more frames, the change in the arrangement of the tables/chairs, round tables, etc.). in order to eliminate the centrality of making them more suitable for the classes of problems/ practical (P), active learning, in which students work in small groups. These areas will be able to be up and running already in the academic year 1 9 / 2 0, and to be made available to the UC, which has an interest in testing classroom practices that encourage collaboration among students.

Monitoring

Entry into force and implementation of the new model is expected to be accompanied by a monitor-by-continuous, medium-and long-term (5 / 1 0 years), in order to evaluate the impact and feasibility of the changes you made, and then enter the corrections deemed necessary. For example, it is important to check for as long as soon the academic achievement of the students in the different CU and, in particular, the CU-based in order to see if the new model is the fact that improving the quality of education in this indicator. The monitoring of the effectiveness of training is also important, as it is imperative to significantly increase the current rate of 6 0 % (8), and to reduce the drop-out rate to the external. It is also important to benchmark to test the degree of satisfaction of the students and their teachers, and employers, with the new model, as to make the experience the

- learning at the Technical, unique, and excellence, you must be one of the purposes, principal of the School. The School is expected to keep track of the activity of the first graduates of the *Technical 2 1 2 2* in order to check the change in your professional profile in regard to the activities of the innovation, disruptive technology, and entrepreneurship, etc. The t & c, CP, and CC will need to create ad hoc committees of the follow-up of the model, in conjunction with the AEPQ, they should have an in-depth look, including the **key performance indicators** to be relevant, the impact of the model at the School.

7 . Final thoughts

A summary of the Chapter. In this final chapter, we present a concise summary of the general line of the it adoption, which leads to the need for reform of the teaching of the Technical staff. We discussed a summary of the changes proposed, and the challenge is to engage the school for the opportunity to change that, you can use it to position itself competitively in the Technical and in the European context.

In the past, and the changes in the nursing profession, and the education of the engineer were followed, the changes in technology and society. New **management** and classes have been created to respond to the social challenges, and to train professionals who will be able to integrate the latest technological developments in the economy. . In the current environment of volatility, uncertainty, complexity and ambiguity (VUCA), it is not possible to have an attitude of merely reactive to changes in technology, the needs of economic and social challenges. The training of a new generation of engineers that there must be a reform of the learning and teaching practices that promote greater efficiency in training and will prepare the students to be in an environment of uncertainty and high complexity in the course of their lives. In the times of heavy disruption to the technological, social and economic benefits that are characterized by a large *desafasamentos* others, and the expectations from the present to be dominated by the **status quo** and in the future, the point of view of the new generation.

In a recent report by the World Economic Forum⁶⁹ on employment trends for the year 2022, points out that the "s" series we are facing a "perfect storm" of changes in the business models, leading to a fourth revolution in the industrial sector. For the first time in history, we're going beyond the border, in which more than 50% of all jobs in the parents of economic activities that will be performed by machines and algorithms. The report points out that the tasks that are performed by humans will go to 71% in 2018 to 58% in 2022 to 48% by the year 2025. This profound impacts on the nature of the skills of the workforce, and it is estimated that more than half of the employees, you will need to review your skills by 2022. One of the main conclusions that emerge from the report is that the future of work is not to build a career that is based on the formation of the basis of the rigid, but in many microcarreiras professions distinct from each other. Several prospective studies cited in the above-mentioned report, it suggests that the professional of the future will be for the map of competences that include each and every time, most of the analytical thinking skills, an entrepreneurial spirit, and innovation, the creativity, the skills, the use of computational, social, and emotional intelligence, and the ability to solve complex problems.

This report summarizes the key evidence and references in the international process of reform that has been requested by the governing bodies of the Technical terms of reference. Multiple schools have been re-positioned to shape the competitive landscape of the academic master. Lots of references to the international emerging from initiatives to food in a geographic area, unexpected, and without large financial resources, and materials. How to master the school of engineering in the UK, the Coach has a responsibility at the forefront of this process of change, in the context of the national. Model *Technical 2122* proposed in this paper is based on a set of principles, respecting the tradition of the School, and they intend to release their full potential for a much more international and modern education in the school of engineering. The resistance and reticence to change, they are all natural and are important in the process of this complete xidade, and it is expected to have a major impact on all levels, in high School, and in the Country. The implementation of the new model is based on a comprehensive set of measures, which are supported and justified on the evidence, that they have been adequately considered and supported in the context of the Desk. The *Technical 2122* this is a model of intentional with the

69

and 70, The Future of Jobs Report 2018, World Economic Forum, 2018, <https://www.weforum.org/reports/the-future-of-jobs-report-2018>.

The engineer of 2020: Visions of Engineering in the New Century, National Academy of Sciences, 2007.

goals, challenging, new, and challenging, but it is weighted so as not to put at risk all that is great in the tradition of the Desk. Its implementation is a major challenge that can only be a success is to stimulate and encourage the whole School in the process, change management, but the safe, and certain. The reactions of both internal and external to the work of the CAMEPP expressed in various forums for discussion, and in many favourable opinions received to show that the climate there that can be called in a positive way. The work of the CAMEPP took place at a time when it was a necessity, legally, for the transformation, the sea, and the current courses, a master degree in a two-cycle independent. This law, which the School has already tapped into it in some specialties, resulting in the need to restructure, but it is also an opportunity to reflect on, and adjusting the process starts with the Bologna (italy). In addition, the discussion in the School, that shows that a large majority of the interlocutors with different levels of qualifications according to the need for the change, and re- crevem of the principles and measures of the model *Technical 2 1 2 2*. Do not use it in this the moment, would be to lose you a second opportunity to relocate to a school in the face of a highly competitive environment and ever-changing. Intermediate solutions are likely to be permanent, and you are a little bit (s) to the wider community. The time period for the suitability of two years, who now comes to us by way of the law is very demanding, but it is feasible to further examine the structural changes in Bologna (italy). Regardless of the model adopted, it is essential that there is an open and positive dialogue between the different sensitivities, scientific disciplines, and, even, generations of teachers, students and ex-students that are on the Desk. In this dialog, you have to be open to entities outside, from the individual personalities of the organizations that is absolutely critical in the process of fit- ting, as the employer, by the A 3 Es, and the Order of decision-making. It is necessary, we work with this model (or any other), but one that responds to the challenges of today, which is always refuse to not see it all around us, it is not a continuum breakdown *status quo*. Any amendments to the success of it will result from a process of transformation of the cultural and emotional , that a mere change in the **management** and content. The work of the CAMEP we sought to explore the cultural values and emotional), and it will allow the students and faculty of the Técnico and are able to develop their ambitions and achieve exceptional results, which are part of the tradition of the School. The model proposed in this paper aims to create the conditions for the release of the enormous potential that lies in the very best students in the Uk for the Technician to attract a matter of course. They are the students who represent the main capital of the Coach, and the model proposed in this paper only aims to create the conditions for change emanating organically from their talent, and not just for the **sweat** but above all, to **inspire** and will lead to a new generation of leaders. As was the case with the CAMEPP, the most important thing is to be able to create an atmosphere of cultural exchange and respect for the differences in the subject's opinions and interests, but it never lost the ambition to achieve excellence.

71 David Goldberg, Mark Somerville, on The Whole the New Engineering contract: The Coming Revolution in Engineering Education, 2014.



Committee on Review of Education, and
Pedagogical Practices of the IST.
CAMEPP

ATTACHMENTS

September 2018

Appendix A

The terms of Reference of the CAMEPP

For more than ten years after the implementation of the Bologna Process, the Technician, it is important to do a critical analysis of the results, and making changes that allow it to update and adapt to the model of education to the society with the challenges that are qualitatively different from those of the underlying model of education in the present. This is reflecting on and updating of the model of university-level education is in progress in many leading universities and the Technical response curve to it. The changes that can be observed in the approach to teaching, which include, among other things, the adoption of alternative models to the traditional model of teaching, the flexibility of the curriculum, allowing students to anything customized training in related areas, including for the recognition of the curriculum, internships, research, and/or the company; the greater mobility of the courses, in the transition from the first to the second phase; the strengthening of education in computational thinking as part of a training essential, the philosophy adopted for the training of the base, the expansion of the education of the students in innovation and entrepreneurship, and the transfer of technology, and the integration of content and digital tools, etc., In order to respond to these challenges is to create a working committee that would draw up a set of recommendations for changes to the model for education in the Technical and considers a set of ideas, and the measures that are responsive, but will not be attached to the following questions:

- * * How to adapt to the current one for the Technician to prepare the graduates to anticipate, identify, intervene and respond to the future challenges of the society as a whole?
- * * How to reflect on the teaching and the importance of developing the critical thinking, innovative thinking, and the cross-disciplinary science and what should be the model for the training of the team, both from the point of view of training, practice, and research, both from the point of view that the answer to this vision, and the challenges of the twenty-first century?
- * * How to improve the teaching and learning Coach, and how to adapt them to the context of the twenty-first century?

How should it be implemented, the recommendations of this committee?

Goals and time schedule:

- The Commission should submit a proposal for the review and update of the model in the education of a Coach as of July 2018, which includes all the points listed above, and you will then be presented, discussed, and agreed upon by the competent authorities, GC, CC, and CP), during the month of September.

Appendix B

Approach And Methodology

In this appendix, we describe the methodological approach, and some of the tools that are used to support the development of a new model of education, and pedagogical practices of a Tech.

B 1 . A model of the development of

The new model is developed according to a socio-technical approach, and focusing on the value of Intuitive user-interface, and the development of the model, followed by a structured process in which all members of the CAMEPP have looked at the set of measures with the potential to achieve the goals and objectives of learning, taking into account the evidence of the engineering education, the environment, and the characteristics of the School, and in the point of view of the actors themselves.

As a basis for the development of a new model, it has gathered the information shown in the Figure 2 . (Chapter 1). From a technical point of view, the choice of the approach that took into account not only the goals of education are linked together, but it's also a potential measurements in a model of teaching will only make sense if accompanied by other measures. In this way, we used the following instruments:

- The network of means-ends" (**mean-end networks**):
 - to map out the goals and objectives of continuing with the current model of education, and the areas of significance of achieving these goals (which are areas the means to achieve the goals;
 - to report on the characterization of the diagnosis/"**business as usual**" education and pedagogical practices in the To the light of the objectives to be achieved;
 - in order to inform the analysis of how the measures proposed in the model that have the potential to achieve the goals and objectives for the school.
- The table of the generation of strategies (**the strategic generation, table**):
 - as a tool to generate a first and a wide range of measures that may be relevant in the context of Technical expertise in all areas of the business;
 - in order to define the combination of the measures that make up the model, and that is the best allow it to bridge the gap between the diagnosis and the goals to be achieved in the choice of the measures, which have been used the principles to Eliminate-Reduce-Raise-Create
- it. A strategy discussion is based on the concept of thinking-convergent (**convergent thinking**):
 - to do, in a structured and iterative, and if I create a table of the generation of strategies, with a wide range of possible actions to take in light of the literature in the field, and to reflect upon the school of reference on the diagnosis of the Services:

- and, in order to ensure that the convergence about the new model of teaching and practice teaching as a coherent set of measures to be taken by the Coach.

The process of the social construction of the model: all the members of the CAMEPP together once a week from march to July, and in September of the year 2018, we have represented a variety of perspectives and points of view of the School, it is not working, however, as the representative of the department; the new model has been developed iteratively, based on the context of the Coach, and the evidence relating to education, engineering, and literature in the field, and the discussion period, so as to bring about the convergence and consensus and decision-making at the meetings of the committee were selected based on a vote by a majority, and the president has the casting vote. In addition, the consultation process, the School has enabled the reporting of the CAMEPP the model *Technical 2122* they were informed by the view and the view of a large number of key players from outside the School. The work of the CAMEPP were followed-up periodically by the Presidents of the Management Board, the Scientific advisory Board and the academic Board. On the other hand, work-mid CAMEPP has been presented and discussed in various forums.

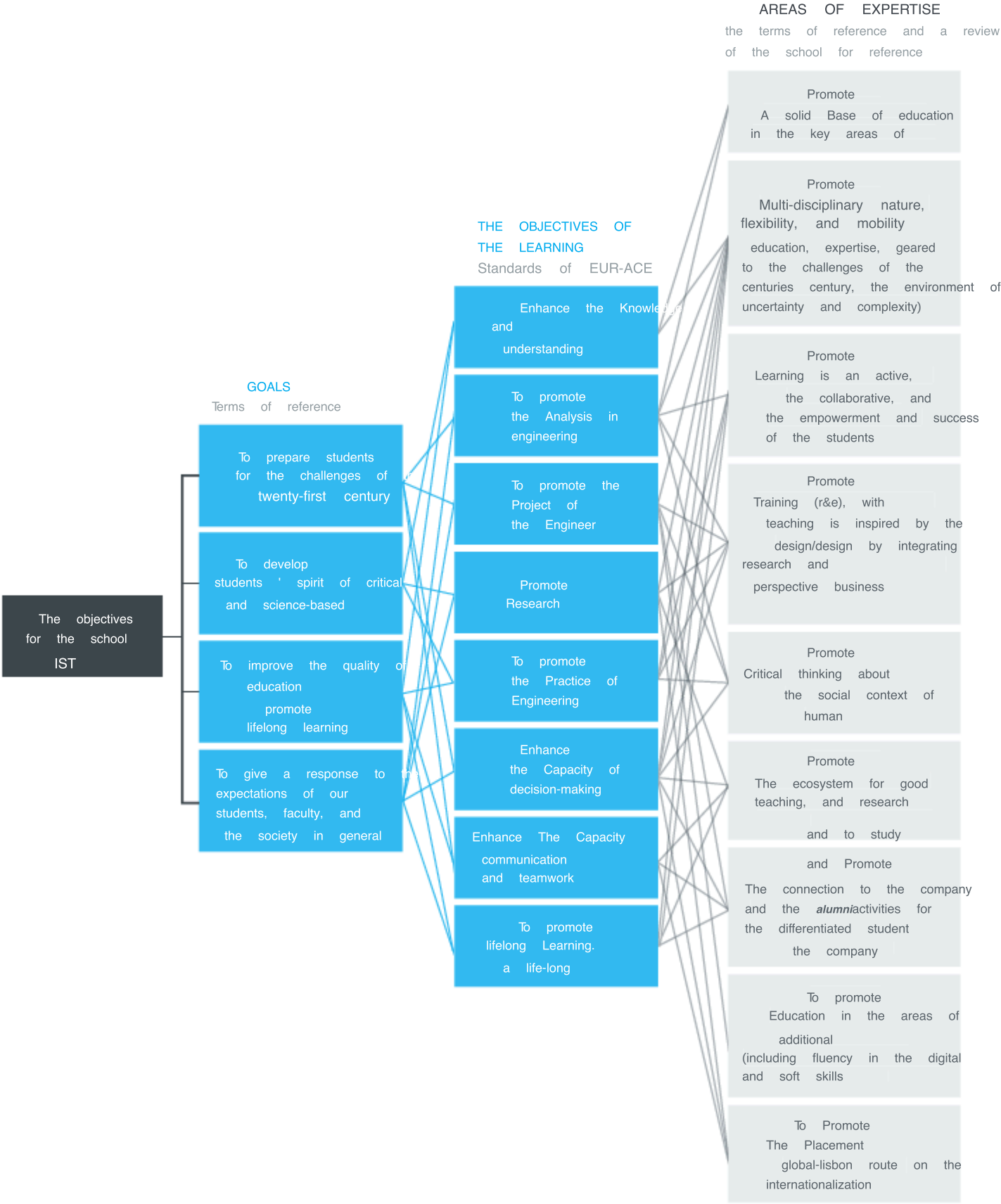
The network-media-for-created by CAMEPP, as well as the mapping of the actions of the *Technical 2122* you can contribute to the goals and objectives of learning are presented in the next section.

B 2 . A survey of the goals and areas of operation

To 1 6 it features a network of means-end that is used for the CAMEPP to inspire the creation of a new model. The figure shows that the development of a new model, it was considered the goals and objectives of the school served in the terms of reference and focus on the goals set out in the guidelines on the EUR-ACE", and that they are specified in the *Table 2 7* (the Portuguese version is defined by the association of Engineers). The choice of targets was guided by the use of the international, in multiple contexts, and to be a reference point that is used by the Order of Engineers and demand that the school is dedicated to promoting the knowledge and understanding of the analysis, in the engineering, project engineering, research, engineering practice, the decision-making process, the ability of communication and teamwork, and lifelong learning (as set out in the *Table 2 7*).

On the basis of the network of means-end are to be found in the area of intervention (see the methods in the base of the model of teaching and teaching practices must be considered in order to achieve those objectives, and, in particular, have been considered in the following areas:

- solid foundation in the fields of STEM;
- multi-disciplinary nature, flexibility, mobility, and specialized instruction geared to the challenges of the XXI century the environment of uncertainty and complexity);
- learning is an active, collaborative, and accountable, and the success of the students.
- built-in I&E), with teaching inspired by the *design*'s design, incorporating the research and insight business
- think critically about the social and human context;
- the ecosystem for good teaching, research, and study, and
- connection to the company and the *alumni* with the different activities of students in the society;
- built-in related areas (including fluency in the digital and *soft skills*;
- positioning of your Coach route from globalization.



(Figure 16). The areas of operation in the model of education up to the age of the objectives of the teaching and learning of Technical network (means-end).

Table 2 7. Learning objectives are used in the evaluation of the quality of teaching and learning for the award of the seal of the EUR-ACE, and should be considered as targets for the new model.

KNOWLEDGE AND UNDERSTANDING	The knowledge and understanding of the principles of science and mathematics that underpin the branch of engineering to the level necessary to achieve the results of the teaching / learning process on a systematic understanding of the aspects and concepts of their field of engineering, a knowledge which is coherent with the advances in the research in their field of engineering; awareness of the multidisciplinary context of engineering.
THE ANALYSIS IN ENGINEERING	The ability to apply their knowledge and understanding to identify, formulate , and solve engineering problems using established methods; and the ability to apply their knowledge and understanding to analyse and interpret the results, and the processes and methods; ability to select and implement analytical methods and modelling relevant to the recognition of the importance of the restrictions on non-technical (and social-related aspects of health and safety, environmental, economic, and industrial).
PROJECT ENGINEER	The ability to apply their knowledge and understanding in order to develop and carry out projects, taking account of the specifications and requirements, and which may include non - technical, social, and related aspects of health and safety, environmental, and economic industry in the understanding of the methodologies to be used for the realization of the project and the ability to use it.
RESEARCH	The ability to do research, and to use data bases and other sources of information, to carry out research and in-depth research in their field of engineering, with the ability to design and conduct experiments as it deems appropriate to interpret the data and draw conclusions; the capacity and the ability of practice for working in the laboratory.
THE PRACTICE OF ENGINEERING	With the ability to select and apply the tools, equipment, and methods are appropriate; - the ability to combine theory and practice to solve problems in engineering, a knowledge of the techniques and methods, and their limitations, the self-awareness of the implications of non-technology in the practice of engineering; awareness of the economic, organizational, and management in the context of business and industry.
THE ABILITY OF THE DECISION-MAKING	A demonstration of the awareness of and ability to manage the project and the practices of corporate risk-taking and change, and an understanding of the limitations of taking responsibility, and the sensitivity of the economic and trade that make it easier to in your performance in activities that are the responsibility of the highest level, the ability to collect and interpret relevant data, and to cope with the complexity in its field of engineering, so as to communicate with the assessments and decisions, which will also include a reflection on aspects of the social and ethical knowledge of the impacts on the health, safety, security, legal issues and responsibilities of engineering practice, the impact of engineering solutions in a societal context, and the environment.
THE CAPACITY OF THE COMMUNICATION AND THE WORK OF THE TEAM	The ability to be effective on an individual basis and as part of a team, in the context of the national and international level, and the ability to use a variety of methods to communicate effectively with the community, for the engineer and society as a whole.
LEARNING THROUGHOUT LIFE	The awareness of the importance of every activity in life-long learning, with the aim of improving knowledge, skills and competences from the perspective of personal, civic, social, and / or in connection with your job, the ability to keep up with all the developments in science and technology.

B 3 . Contributions for the purposes of the education of a Coach

To Table 2 8 summarizes the measures of the members of the new model has the potential to reach a greater or lesser extent different targets in education in the EUR-ACE. As a side note, the measures that have been included in the core area of business where you are located, and it can also be linked to other areas of the business. You can get the Table 2 8 the new model contributes to the goals of education, the EUR-ACE.

Table 2 8 . The mapping of the potential contribution of the measures of the new model for the purposes of the EUR-ACE (dailymotion, it must be read, such only to be expected that the measures in this area will contribute to the objectives of the EUR-ACE).

AREAS OF EXPERTISE	EXAMPLES OF MEASURES	Enhance the KNOWLEDGE AND UNDERSTANDING of	To promote the ANALYSIS ENGINEERING	To promote the RESEARCH PROJECT ENGINEERING	Boost	To promote the PRACTICE OF ENGINEERING	Enhance THE CAPACITY IS DECISION-making	THE ESTABLISHING OF A COMMUNICATION TEAM	To promote in LEARNING course OF the AND WORKING
Promote a SOLID foundation FOR learning IN the AREAS of KEY	ECOF 4 , ECOF 5 , PP 1	✓	✓	✓		✓			
To promote MULTIDISCIPLINARIDA- THE FLEXIBILITY THE MOBILITY AND EDUCATION EXPERTISE, GEARED TO THE CHALLENGES OF TWENTY-FIRST CENTURY THE ENVIRONMENT OF UNCERTAINTY AND COMPLEXITY)	ECOF 2 , ECOF 3 , ECOF 6 , ECOF 1 5		✓	✓		✓	✓	✓	✓
To promote THE LEARNING process, TO BE ACTIVE, COLLABORATIVE, AND ACCOUNTABLE AND THE SUCCESS OF THE STUDENTS	ECOF 1 6 , PP 4	✓	✓	✓	✓	✓	✓	✓	✓
To promote the FORMATION of I&E EDUCATION INSPIRED BY THE DESIGN DESIGN BY INTEGRATING RESEARCH AND PERSPECTIVE ON THE BUSINESS	ECOF 9 , ECOF 1 0		✓	✓	✓	✓	✓	✓	✓
Promote CRITICAL THINKING ON THE CONTEXT OF THE SOCIAL AND HUMAN	ECOF 7 , ECOF 8 , PP 2 , PP 3		✓	✓		✓	✓	✓	✓
Boost THE ECOSYSTEM FOR GOOD TEACHING, WE WILL INVESTIGATE TION, AND THE STUDY	RGE 1 , RGE 2 , RGE 3 , RGE 5 , RGE 6 , RGE 7	✓	✓		✓	✓	✓	✓	✓
Promote THE CONNECTION TO THE COMPANY AND THE TO THE ALUMNI, WITH ACTIVITIES TO DIFFERENTIATE THE STUDENTS IN THE COMPANY	ECOF 1 2 , ECOF 1 3			✓	✓	✓	✓	✓	✓
Promote TRAINING ADDITIONAL (INCLUDING FLUENCY IN THE DIGITAL AND SOFT SKILLS	ECOF 1 4 , PP 5 , PP 6			✓		✓	✓	✓	✓
To promote the POSITIONING OF the GLOBAL STI VIA INTERNATIONALIZATION	ECOF 1 , ECOF 1 1 , RGE 4 , RGE 8 , RGE 9	✓					✓		

Appendix C

The adaptation of the recommendations to Bologna by Coach

C 1. The Bologna Process on the Coach

The Bologna process is a process of convergence in the European Higher Education system started in 1999⁷², it aims to facilitate the exchange of graduates, and to adapt the content of university education to the demands of social, improving the quality and competitiveness through increased transparency, and the learning that is student-centered, as quantified by the ECTS credits. The implementation of the principles guiding of Bologna, led to a reorganization of the training and Technical service in 2005⁷³. This one was drawn on the basis of a discussion paper prepared by a working group (WG) Bologna, who is appointed by the President of STI, and approved by the steering Committee of the Scientific advisory Board (SAB) of the STI, on the 9th of November 2005⁷³. Listed below, in summary form, the key recommendations made in this document and is being implemented from the academic year of 2006/2007.

A model for the formation of mixed

The case Design has proposed a model for the formation of mixed (17), with the coexistence of cycles of the islands of the azores, which led to a master's degree in engineering (300 ECTS credits), and two-cycle, in order to reach the degree of a bachelor's degree in science of engineering-1.No cycle is 180 ECTS credits) and a master's in engineering, 2.Th cycle of 120 ECTS credits). It was recommended also in higher education, 3.No course with a curriculum (which is part of the school's I- toramento) with 60 ECTS credits.

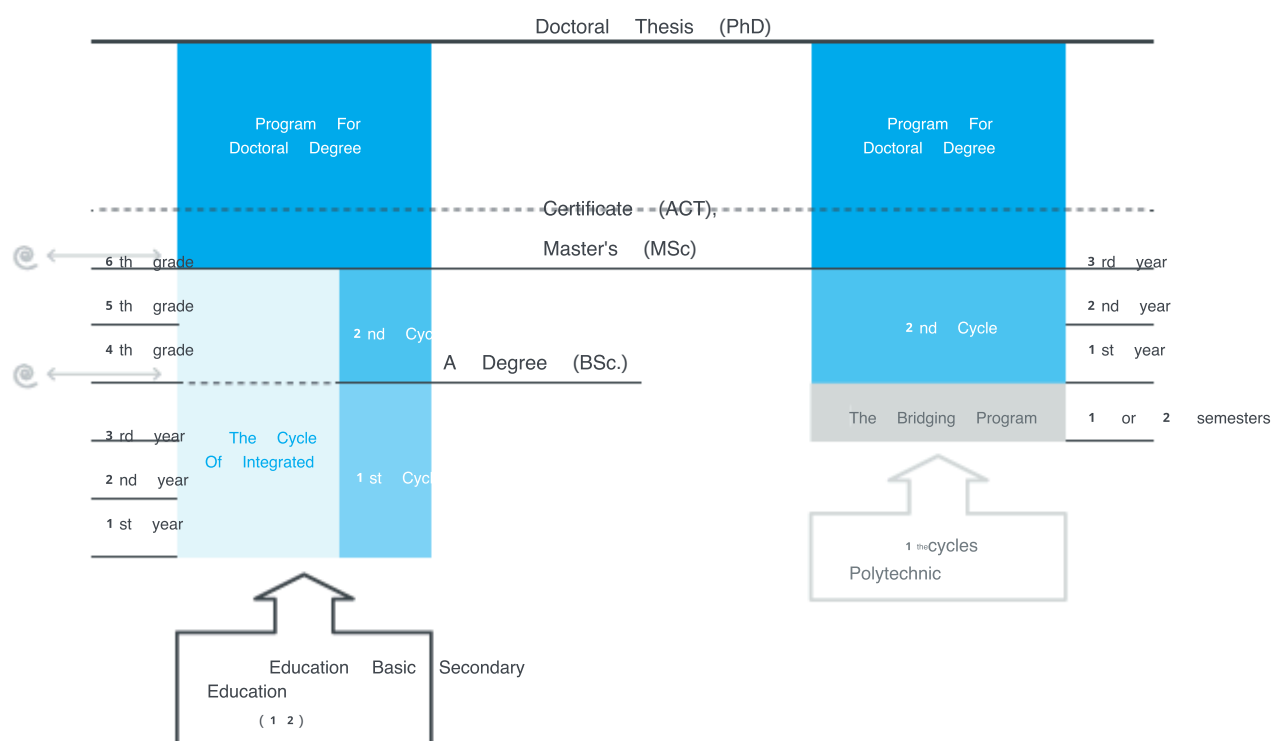


Figure 17. The organisation of higher education in the Technical effect of the adoption of the Bologna Process in 2006. Courses in nuclear pre-Design in existence at the time the Tech has adopted the model of a master's degree.

⁷² The Bologna Declaration of 19 June 1999, a Joint declaration of the European Ministers of Education.

⁷³ In the Process of the design and the Organisation of Higher Education in the IST, IST, lisbon, in 2005.

The model is pointed out very clearly that the adoption of the programme of studies-integrated (10 semesters) for all courses in engineering, design, Technical, rather than the formation of two loops (3 + 2). Some of the reasons for the choice of the model of the master's degree include the need to have time to make way for a consolidated engineers to design and separate the training of engineers for the design of the training of a more applied or vocational/functional. In this manner, for the majority of undergraduate studies, pre- Design in existence at the time the Tech has adopted the model of a master's degree.

The Major fields of Engineering

Another one of the anchor points of the proposed model has the structure of the training, the Technician of 11 broad fields of engineering (GAE) - at the level of the first 6 terms of the curriculum, so that the areas of engineering related to share-the same as in the course of the whole, or nearly the whole of the 4 in the first semester of the curriculum (Table 29). The concept was introduced in order to facilitate the mobility of students and among the specialties of engineering and the like, *i.e.* belonging to the same GAE, giving them more time and knowledge to fix it in the options of the training early, for others, more in conformity with their vocation, and desire. In this context, the GT-Bologna is recommended that a reset of the curriculum to ensure that the training needs of the specific expertise of engineering's belong to the GAE, only to begin to take place after the fifth semester of the curriculum of work." In particular, it was established that the teaching of the basic sciences in the Coach should be, ***"carried out on the basis of a set of subjects that the mainstream with a tell -of the program static identicos for all of the courses selected to meet the requirements of the form on the basis of the courses that are grouped under each of the GAE"***. In the words of the GT Design:

"The organization of training in the GAE come to a meeting of the un guiding principles in the process of Bologna, in that it allows us to design the initial stages of the broad band, and a general list of engineering disciplines and related, reinforcing the interdisciplinary approach and is adaptable to the mobility of the domestic students and between the areas of engineering related areas. The definition of areas in engineering allows you to make a better use of human resources, the classroom, and the media lab that exist in the school. The organization in the broad fields of engineering, it is possible to also design-second cycles of the formation (7, 8, 9, and 10 in terms of the training as part of the cycle, single) devoted to the areas of specialization are the characteristics of each area of engineering and construction."

It was established also that each and every one of the courses listed on the GAE of the Table 29 it should be structured according to the following distribution of weights for the training:

Basic science = 20% (Table 30)

The science of engineering and 30% in the Disciplines of the specialty, the 34 - 38%

Thesis for a masters degree in 6 to 10% cross-disciplinary Skills = 6%

[illegible]

The course for the	Technician	Disciplines are fundamental to the basic sciences
Eng. Mechanical Eng. Aerospace Eng. Industrial Management Eng. Naval Architecture and marine		Math: calculus I, calculus II, calculus III, Algebra , Linear Probability, and Statistics, Mathematical and Computational Physics: Mechanics, Waves, Electromagnetism and Optics , Chemistry: Chemistry, Materials Science, Materials Management, Management, Computer science: Programming,
Eng., Physical, Technological Eng. Biomedical		Math: calculus I, calculus II, calculus III, Algebra , Linear Probability, and Statistics, Mathematical and Computational Physics: Mechanics, Waves, Electromagnetism and Optics, Thermodynamics, and Structure of Matter, Chemistry, Chemistry, Management, Management and information technology: Programming for Biology (I Eng. (Biomedical): the Molecular Biology of Mathematics: Mathematical Analysis I, Sec ise, Mathematics II, calculus III, Algebra , Linear Probability, and Statistics, Mathematical and Computational Physics: Electromagnetism and Optics The thermodynamics and the Structure of Matter, Chemistry, Chemistry, Management, Management and information technology: Programming and Geology: Mineralogy and Geology, and Geography (only for Eng. Area): Physical
Eng. Civil Eng. Territory		Geography, Human Geography Mathematics: calculus I, calculus II, calculus III, Algebra , Linear Probability, and Statistics, Mathematical and Computational Physics: Mechanics, Waves, Electromagnetism and Optics, The thermodynamics and the Structure of Matter, Chemistry, Chemistry, Management, Management and Computer science: Programming, Mathematics: calculus I, calculus II, calculus III, Algebra , Linear Probability, and Statistics, Mathematical and Computational Physics: Mechanics, Waves, Electromagnetism and Optics, Thermodynamics, and Structure of Matter, Chemistry, Chemistry, Management, Management and Computer science: Programming,
Eng. Electrical and Computers Eng. Electronics		Math: calculus I, calculus II, calculus III, Linear Algebra, Probability and Statistics, Mathematical and Computational Physics: Mechanics, Waves, Electromagnetism and Optics , Chemistry: a Chemical Management, Management, information technology: Programming for Biology: Molecular Biology.
Eng. Chemical Eng. Organic Eng. Kill any of the foregoing		Math: calculus I, calculus II, calculus III, Algebra , Linear Probability, and Statistics, Mathematics, the Discrete Theory of Computing, Physics: Mechanics, Waves, Electromagnetism and Optics Control, Management and Computer science: Programming,
Eng. Computer engineering		Math: calculus I, calculus II, calculus III, Algebra , Linear Probability, and Statistics, Mathematics of Computing, Theory of Computation Physics: Mechanics, Waves, Electromagnetism and Optics Control, Management and Computer science: Programming,
Eng. of Networks, Communication and Information		Math: calculus I, calculus II, calculus III, Algebra , Linear Probability, and Statistics, Mathematics of Computing, Theory of Computation Physics: Mechanics, Waves, Electromagnetism and Optics Control, Management and Computer science: Programming,

Eng. Materials	Management: The Management Computer Science: Programming For Biology: Molecular Biology.
Committee on Review of Education, and Pedagogical Practices of the IS Eng. Computer engineering	Math: calculus I, calculus II, calculus III, Algebra , Linear Probability, and Statistics, Mathematics, the Discrete Theory of Computing, Physics: Mechanics, Waves, Electromagnetism and Optics Control, Management and Computer science: Programming,
Eng. of Networks, Communication and Information	Math: calculus I, calculus II, calculus III, Algebra
Eng. Environment	, Linear Probability, and Statistics, Mathematics of Computing, Theory of Computation The Linear Probability and Statistics, Computational Mathematics Physics: Mechanics, Waves, Electromagnetism and Optics Management, Management,
Eng. Geology and Mining	Management, GestãoMatemática: calculus I, calculus II, calculus III, Algebra - in Mathematics: calculus I, calculus II, calculus III, ÁlgebraFísica: Mechanics and Waves, Electromagnetism and
Applied mathematics and Computation	Optics, Thermodynamics, and Structure of daMatériaQuímica: QuímicaMateriais: the Science of MateriaisGestão: GestãoInformática: ProgramaçãoBiologia: Biology MolecularMatemática: calculus I, calculus II, calculus III, Algebra
Architecture	, Linear Probability, and Statistics Mathematical and Computational Physics: Mechanics, Waves, Electromagnetism and Optics, Thermodynamics, and Structure of the MatériaQuímica: Chemistry, Management, Management Computer Science: Programming, Information ProgramaçãoMatemática: calculus I, calculus II, calculus III, Algebra , Linear Probability, and Statistics Mathematics of Computing, Theory of ComputaçãoFísica: Mechanics and Waves, Electromagnetism and Optics, Thermodynamics, and Structure of the MatériaGestão Management Information ProgramaçãoMatemática: Mathematics-I, Mathematics-II, Probability, and EstatísticaGeografia: Physical Geography, Human Geography Term: GestãoMateriais: Materials science, Management, Management and Computer science: Programming, Biology, Biology MolecularMatemática: calculus I, calculus II, calculus III, Algebra , Linear Probability, and Statistics, Mathematical and Computational

Table 3 0 . The distribution of CREDITS for the Training Base for the subject area in the current state of Mathematics (3 0) Physics (1 2), Mathematics
-/ Physics/Chemistry/Biology (1 2) Science (6) the CITIZENS (including the Management, and 9). (All the CREDITS of current is rounded up in a way that each
Engineering.

COURSE	M (3 0)	F (1 2)	(M/F/T/B (1 2)	(C) (6)	HAAS (9)	Specific options in Addition to the Training
Eng. Aerospace Eng. Mechanical Eng. Marine & offshore Eng. Industrial Management	3 0	1 2	6 (M + 6 Q	6	3	6 F *
Eng. Physics, Technology	3 0	1 2	6 (M + 6 Q	6	3	
Eng. Biomedical	3 0	1 2	6 W + 6 A, B	6	3	6 (M + 6 , F + 6 , C
Eng. Civil	3 0	1 2	6 (M + 6 Q	6	3	6 F *
Eng. in Electrical and computer	3 0	1 2	6 (M + 6 F	6	3	6 Q
Eng. Electronics	3 0	1 2	6 (M + 6 F	6	3	6 Q
Eng. Chemical Eng. Organic	3 0	1 2	6 W + 6 A, B	6	3	6 (F * + 6 M
Eng. Materials	3 0	1 2	6 (M + 6 Q	6	3	6 F *
Eng. Computer engineering	3 0	1 2	6 M	6	3	
Eng. The telecommunications and information technology	3 0	1 2	1 2 M	6	3	
Eng. Environment	3 0	1 2	6 (M + 6 (Q or or 6 W + 6 A, B		3	(6 (B) or 6 H) + 6 F *
Eng. Geological survey and Mines	3 0	1 2	6 (M + 6 F	6	3	6 Q
Applied mathematics and Computation	3 0	1 2	6 (M + 6 F	6	3	

The learning is student-centered

Model-centered learning student-approved by the Bologna declaration is based on the obtain- ing
of skills on the part of the students, and not on the mere statement of the understanding of knowledge,
teaching of. The adoption of this new model is required that the student should drop the attitude, the traditionally
passive spectators of an exhibition-of-knowledge on the part of the teacher, to become the actors
that are central to the development of their skills. Recognizing that the achievement of this goal would
immediately change the deep, the case Design has proposed a reduction in the number of hours of con-
tact in order to make room for the work of its own. Specifically, it called for the need to spend 4 2 hours a
week at the activity in the study during the two semesters annually for more than 2 0 weeks eachTable 3 1),
propon- of-an-organization of pedagogical, based on a maximum of 2 5 hours in the first two years of the

2 2 . 5 hours over the years. In accordance with these values, guiding, almost 4 0 % of the total number of hours of work in the first half should be dedicated, in the classroom, and in 6 0 % of the work is self-contained.

Table 3 1 . The organization of the first half of the academic and Technical. The distribution of hours is presented that is based on a commitment to 4 2 . h/week, up to a maximum of 2 5 hours of contact per week. For the calculation of ECTS credits, have admitted that it is 1 ECTS is equivalent to 2 8 . The effort of a semester corresponds to 3 0 ECTS credits, i.e., up to 8 4 0 h of contact, and research.

	The period of the Classroom		The period of Assessment		Semester	
Weeks	1 4		6		2 0	
The Dedication	Hours	ETC's	Hours	ETC's	Hours	ETC's
Of Contact	3 5 0	to 1 2 . 5	0	0	3 5 0	to 1 2 . 5
Study	2 3 8	8 . 5 in	2 5 2	0	4 9 0	1 7 , 5
Total	5 8 8	2 1 , 0	2 5 2	9	8 4 0	3 0

The case Design also explicit on the need to structure the curriculum of the courses in a way that each of the UC to adopt the organization of teaching that is best-suited to those goals, and that it could co-exist with the development of interpersonal skills (*i.e.*, **soft skills**), and recommended that they not be taught in this course units.

C 2 . An analysis of the implementation and impact of the recommendations of the Bologna on the Coach

The review of the implementation and impact of the recommendations of the Bologna on the Coach that you have in your hands is the result of the assessment carried out for the individual courses Chapter 5), and the perception that the CAMEPP it has today, the model of the teaching force of the School.

The structure of the model to the training

The choice of a model of the flow of the the majority of your courses in the Technical and saw to the right the way to the Bologna Declaration, which is explicitly proposed the adoption of a system essentially based on two cycles of the principal of (3 + 2). Supported by the arguments above, the School has chosen a solution to implement the easiest, and the least impact on the culture of the School. The critical point in the process of transformation of the undergraduate and pre-science in integrated master's programmes, which is made in many designs of the curriculum was the introduction of a thesis for a master's degree (*i.e.*, 1 semester, 3 0 ECTS credits). This development led to the release of the space is in the curriculum of higher education, which has been achieved at the cost of the disposal unit and the transfer and disposal of the contents. The perception among staff that the new design of the curriculum were to be accompanied by a decrease in the amplitu- of-the training of basic and engineering, and a relaxation in the rigor of training followed at the initial stage of the process of change. However, in the past twelve years, for the accommodation of the new model is, in general, a community of Tech shares in the belief that their courses to maintain the quality and accuracy characteristic of the image of the Coach. The implementation of ECTS has, which is aimed at promoting the mobility of students, there was no fear. The

the numbers show that the students in the Technical, adhered to the idea of mobility in the space of higher education in the European (and not only), and used them with enthusiasm for the opportunity to exchange it for the School to re-proposition. The only thing to deserve any repair that might be of UC, with values of CREDITS, very different (1,5; 3; 4,5; 6; 7,5), which sometimes makes it difficult for the mobility-restricting your range of choice in the scope of the optional and it gets in the way of the construction of the curriculum.

Finally, the way in which the master's thesis has been implemented in the integrated master's programmes should be a reflection further, in particular, due to the fact that the average time it takes for your conclusion be for a standard, well in excess of the specified Table 17, Chapter 5). This fact seems to indicate that the logic that is necessary at School, maybe you are not aware of, was to implement what has been the philosophy and practice/requirement of the thesis in the master's and pre-Bologna i.e., writing a dissertation in 1 year) with in the thesis of the master- of-integrated-of-Bologna (Italy). In practice, the amount of work and effort that is required on the part of the students is much larger than the age of 30 CREDITS set forth, and, therefore, is hardly attainable within a period of 1 and half year. On the whole, the School accepted this inconsistency by not impose a deadline for the delivery of this thesis in the first semester of implementation. This practice satisfies the coaches, but the dissertations and theses that are carried out internally and externally because of the length of time for the students to ultimately carry out the work more complete, and consistent. The *sobrexigência* of the essay is well illustrated by the idea that many of the students have to be on a good note, it takes a level of effort, in addition to the 30 CREDITS set forth.

The structure of the training in the broad Areas of Engineering

The concept of GAE is explained by the GT's Design could have been better served by defining a small number of large areas. In fact, it is not clear why certain courses are not integrated of the same GAE, since the choice of subjects and the structuring of the basic science that is almost complete in many cases. (p. ex., Eng. Chemistry, Eng. Organic Eng. Materials, Eng. and Biomedical Eng. Environment, Eng. Civil Eng. Territory, and Eng. the Geological and Mining; Eng. Networks of Communication and exchange of Information, and Eng. technology and Computers Table 29). In addition, it seems to us that, as defined, is the concept of GAE it would have perhaps been more effective if it is associated with a model in 3 + 2 centered at 1. No cycles are compared with the GAE, and that there is less of a *minors* it would allow some specialization in the run-up to the 2. No specific cycle. This option would also solve a problem with the current of the integrated master's programmes of the Coach as a result of the fact that, in the words of the GT-Bologna, Italy **"the need the specific will you stay in each area of engineering that belong to a GAE, only to begin to take place after the fifth semester of the curriculum for the job"**. This fact causes some kind of disappointment and impatience on the students, because, even though you have selected is a master of mobile- inclined, well-specific, they are faced with a 2-year training almost exclusively on the basis of. The complaints that it is only 3. No time for the students to have a glimpse of the entrance, so the applicants. If to this we add the harshness of the early years of education, and the lack of links between the content of the courses that structure the object, in this area, and it is not surprising that the drop-out rates are particularly high during the first two years (as discussed in section 5.1).

The learning is student-centered

With the introduction of a new model of learning, such as that promoted by the Bologna Process has been implemented completely by the Technical *sui generis* and largely ineffective. In the first place, and that the School does not set a clear way to a new vision of learning centered on the student, not communicated explicitly to the different actors involved (students, teachers, non-teaching staff) in what way are intended to support and make use of for this purpose. For example, the governing bodies of the School failed to take concrete action in order to provide you with the all of the members of the faculty, a minimum level of training that will help them to grasp the concept of

"e-learning on the student, and notice that the methodologies and strategies of teaching should be adopted to the way we implement it in a cost effective manner. It is true that in the context of Core Academic Development (Objectives) - Core of the Academic Development has emerged progressively the supply of training are valuable for the improvement of the practice of teaching and the effectiveness of the training. In fact, in today's day and they are offered at a 40 structures in the areas of guidance and counselling, **Soft Skills** Pedagogy and Teaching Techniques, Innovative Methods, and Workshops, and Practical. However, because of the frequency of these features is left to the discretion of each individual, their impact on the whole of the teaching staff of a Technical has been reduced. In fact, the adoption of a model of learning based on the student," it was left to the discretion of the individual for each of the academic staff, based on the assumption that they will, and his own, would have all the necessary skills and find a better way to do it. Even though it may have been, in many cases, it's only to be expected, averse to change, led to the fact that many teachers simply do not have changes in the practices and beliefs of many years, with the entry into force of the Bologna Process. In addition to that they have not been set out specific measures, there were also a set of metrics that clear the way for the monitor to shift to a model of learning and student-centered. In fact, it is very difficult to co- and about the specific a manner as possible the extent to which the Technical and wrapped his arms around the new paradigm of teaching recommended by the Bologna; the opinions on this point are based more on the perception of the personnel who will be on the subject, and not on objective data. In the midst of the CAMEPP, the general perception is that, at the present time, the education, the Coach is not centered on the pupil. This was probably the only instrument connected to this point, we have reduced the number of lessons in practical problem solving. In the idealized version, such lessons should be useful for students to solve, under the advice of a minimum of a teacher, the problems of the application of the material learned in the classroom teóri- ca. The reduction of hands-on classes had been based on the simple assumption that the students are embedded in the knowledge- cement gained in the lectures and self-study, would be to resolve these issues outside of the classroom. The reality show, which is this idea that it was no more than an illusion. This is because the pre-Bologna and has always shown us that the majority of the students were demitia to be present at the lectures, and attend classes and practices, which form the benevolent, the teacher came to the matter and resolve the issues on the table. The classes, the practices were those that actually, "it was worth it to go," if you want to be successful in the exam. It is not, therefore, no wonder that so many of the classic, "the lessons of the issues", in addition to the high-impact lessons, theory, has failed those students who are unable to apply on their own, in so doing i.e. via the resolution of a problem), and the concepts that are discussed in the various UNITS. The end of the classic "the lessons of the issues introduced as the difficulties in the process of learning, and as soon as they became aware of many teachers. With regard to the classroom in the laboratory, it is worth pointing out, also, that, in many cases, the practice, the Coach continues to be a run-on classes and laboratory protocols are pre-defined by those in charge of the CU corresponding. Thus, even though the students are to assume a central role to play in the classroom, they do it only as mere players, not to intervene in the formulation and experimental design. In some courses, students often end up just looking at the tests carried out by the teacher or by the technicians in the laboratory. In a statement, a set of students from the Technical point to another aspect worthy of reflection: **"Perhaps because of a lack of resources, all of our projects Technical they are limited to projects in the computer runwe, nothing, no, we tested it in a mothe machine is made by nos"**. Even though the situation may not be the genera- lizável the whole of the universe is Technical, it does illustrate very well the lack of opportunities for the practical application in that it, in fact, is in the process of learning on the Desk. Even more so, it is surprising that the project of learning to the practice of engineering and to the great success of the **Formula Student** or **Solar Boat** and they require focus and effort, and does not give any sort of credit to the students involved.

It is therefore clear that the School has lost a great opportunity to change the fact that it is the center of the learning or- the gem of the teacher to the student. On the back, this cultural change that would have occurred without the program of the training (in the strict and mandatory) for all staff members, the team, which had entered in a consistent manner at the School of the ideas, methods, and underlying processes in this model, learning is student-centered. The consequences of the loss of the opportunity, they jumped at the sight, during the process of analysis of learning in a TechnicalChapter 5 that made it possible to identify the reality of the school, with some of features way too far away from the ideals of BolognaTable 3 2).

Table 3 2 . The characteristics of the model for education in the Technical and in the year 2 0 1 8 .
Note: some features mentioned may not be representative of all the courses provided by the Technician.

The weak backdrop of a specialty in the first 2 years because of the strong tendency for the formation of the basis of
The prevalence of theoretical recitativas
Classes in the laboratory are focused on the implementation of the pre-set by the teacher
Impact of high classes of the theoretical
Many opportunities for learning (<i>hands-on</i>)
Reduced flexibility in a wide range of courses
The inability of the students to cope with the uncertainty
The concentration of the study subjects at the time of the examination, as opposed to a continuous study
Strategies for the study of teaching designed for the resolution of the scans
The system of assessment is heavily focused on the exams
General lack of opportunities to fund extra-curricular activities
Contact is reduced through entities, and external reality in the context of learning

The reading is part of an interview with a student of the technology, which is shown in the 1 8 it illustrates the way to blunt some of the weaknesses in the approach to teaching at the Desk.

"One thing that annoys me a lot with the Technical methods of teaching. Or rather, is not much of this, because many of the teachers to stimulate students' thinking and critical activity of the same. I was even a teacher who once said that at the end of the year - "This is not to do it in such a hurry, they have time to do the test. This is a workout to your mind, and make good use of it." And no, it not I was being tongue-in-cheek. It is not by chance that this person is in all of the years, and one of the teachers of excellence, although it does not have the university with the highest scores. However, I am quite sure that the students will learn more, in this course with a 14, which is in many others where you are 18.

What annoyed me is the way in which students learn, or better yet, don't learning from them. I feel that in the Technical and in many, many Areas of learning is to learn. At the time, we can learn, make mistakes and the

teachers. We are all one great band of the 10,000 illusionist, who are experts at deceiving the teacher. Easy! Many of them will not try to cheat, if they are of the same type to take several years, then you know that we have all of the exams from previous years, and that it is at this point that the

we do not learn. We all have a great illusionist, and our tricks and, in some cases, yes, it is against the teachers, but for the most part, it's you against the whole system of evaluation that exist in the

time. Because it is to pass the exam with the best score as possible, and in a great the percentage of cases actually learn it's not the easiest way to do it before you opt for the replay. Over and over again in a row, so that our reflections suggest the answer is right. Learning-by-doing all the tests in the previous years. Learn the most? I went back to them and to me, this is not the it's not to learn. In a school with an ideal that does not exist.

I don't want this to put students to the test, and I am one of them. I long for the tests in the previous years. Dool-I have a test with higher resolution. The Technician will not work. In Technical work, many of the don't even have to learn from, but rather move on to the protected area. Most of the students are before,

a machine for making CREDITS. And proud of it, we have it. But at a school where the students do not have to live and not to breathe, the other methods to move the chairs are almost nonexistent.

Here's another choice, and that the use of this type of methods, which is almost non-existent. But it's fine, because if you don't have time to breathe, we shall take the time to learn it?

Because a good school, the students have time to breathe, to live, because not everything in life is a school.

A good school will not be attending classes with a duration of 2 hours. Who is it that is able to concentrate for 2 hours? In an ideal school, the classes of problems that would not have 50 students.

The professor would rather to provide an education that is more detailed to the difficulties of the students, the contents of which he, himself, wants to explore, and I would know the names of the students. An ideal school students take the time to learn it, without setting the part to the requirement that it should be.

Once you have prepared the students for the job market, but at a good school that the bridge would be present throughout the school. In an ideal school, the students are encouraged to

to have extra-curricular activities, where they can apply their knowledge of, or a supplement in other areas, and that would be the time to do so. Students will have a better the opportunity to choose the loan that you want to do, and you don't have to do subjects that you actually don't like it. It would be a choice, but of course that is supported with the support of mentors, who guide the students."

Quality assurance

The guarantee of high quality, both within the institutions and externally, is one of the cornerstones of the Bologna Declaration⁷⁴. Although it has not been the subject of a recommendation on the part of the GT Design, for the Tech has invested in a serious way, at this point, to implementing systems, such as THAT by submitting voluntarily to the al-guns courses and the assessment by external entities, such as in the EUR-ACE, and ensuring the accreditation of all of its training on the part of the A 3 ES. This has been extremely well received, allowing you to establish a School culture of high quality. This is, arguably, one of the areas where the Bologna Process has had the greatest impact on the Tech.

Conclusion

The implementation of the recommendations of the Bologna on the Coach and had a lot of positive aspects (Table 3.3). However, in the past twelve years, it is clear that the adaptation of the model proposed by Bologna and the Technical consisted of a change in the form, and not in the actual adoption of a new model of education, and pedagogical practices based on the attainment of the knowledge and skills to be independent on the part of the students.

Table 3.3. A summary of the impact of the implementation of the recommendations of the Bologna on the Desk.

Aspects of well-done	Aspects are a little raised
• The implementation of ECTS Implementation at the School for a culture of quality assurance • the Mobility of students in the system of the European	• Student centered learning • GAE and mobility in the internal Integration of a thesis for a Masters in education

⁷⁴ 4 The Bologna Declaration of 19 June 1999, a Joint declaration of the European Ministers of Education

Appendix D

Explanation of the proposed new model

The structure of the Curriculum, Organization, and Philosophy (ECOF)

As ECOF 1	The end of the integrated master's programmes the adoption of the model 3 to + 2 , in accordance with the decree 6 5 / 2 keeps up with the concept of training for a minimum of 5 years in the eng
What a way to the measure also contributes to the pursuit of the objective	It increases the mobility of 1.the cycles of non-professional and 2.in the cycle, in response to the interests of the students. Increase the probability of capture into the 2.in the cycle, the students who have successfully completed the 1.the loops off of the Desk.
The consequences to be expected, and the risk	The design of the 2.the loops are independent, with a greater outward visibility and the perception by the applicants that there's a new-port-of-entry into the system, leading to the creation of competitive bidding at the national level, and especially at the international level. To change the cycle, and provides students with the opportunity to choose alternative routes, and training with the most complementary and multi-disciplinary nature, without any major restrictions. There is a risk that students of Technical expertise, including the best of the best to compete in the 2.the loops off of the Desk. The decrease in the number of graduates in certain fields of engineering (professional), in some cases, less attractive, it may also take place. The existence of obstacles to the normal pursuit of their studies, particularly in the transition from 1 to.No to the 2.No loop, you can increase the time required for the completion of the course.
The changes in the School, as required by the measure (including the features and operation	Distribution (marketing) of the courses in a Technical or 1.No want for 2 people.No cycle; the system of the stock exchanges to attract/attract the best students from other schools (domestic and international), as is the case in other leading universities (e.g., EPFL), increase the attractiveness of courses and Technical expertise in the areas of cutting edge; change in the timing of the application. It should not be allowed to sign-in 2 .Th cycle of the students, with a significant number of (a set) of the CREDITS for 1.No cycle is complete. Students will not be expected to be able to make more than 5 0 % of a 2.No cycle until they have completed the 1.No loop. The School should be able to establish the ground rules for the transition from the 1.No to the 2 .No cycle,a well-defined and communicated clearly and in advance to the students. The Coordinators of the course, they should have the edge in order to adapt to these rules 2 .Th cycle, and to be able to select the most suitable candidates.
Rational	The increase in the mobility of the courses are not professional, in response to the interests of the students, and the greater the possibility of the capture of so 2.the cycle of the Coach, the students who have successfully completed the 1.the loops off of the Desk.

Connection with other measures	The measure is coordinated with the ECOF 1 6 and RGE 8 .
Measures of contingency	This measure is the result of a change in the law that could not be defeated. In the School, either explicitly, or through the nature and content of the curriculum of the courses, you should re-emphasise the need for the 2.No cycle in the education of the students, making it clear that the study of 1.Th cycle of the STIS are not a professional, and that can serve as the basis for the continuation of studies for the 2 nd.No loop.

As ECOF 2	6 , or 3 CREDITS in any of the UC's School the elimination of restrictions on the flexibility of the curriculum
What a way to the measure also contributes to the pursuit of the objective	The modular design of the CU allows for the construction of the courses of the curriculum, and adjusted to the specific interests of the students in terms of increased specialization or technical). It eliminates the restrictions on the participation of the offerings and curriculum of all departments in all of the courses. It promotes flexibility and mobility of the courses, and it's compatible with the model of two periods of 1 5 CREDITS per semester. It offers you the opportunity to review the contents of each of the protected area, thus increasing the efficiency of the education systems of the offer, in particular in the UC badly scaled (i.e., having "fat").
The consequences to be expected, and the risk	A significant increase in the supply of UC that are available for each course. The greatest difficulty in the construction of the schedules of study, due to the flexibility of the acquired company. In need of a redesign and rearrangement of the CU, which currently has a value of ' DEVELOPING a distinct proposition. The loss of coherence, if you choose to opt for a re-arrangement of the minimalist of the content of the university or by a reduction in the blind of the content on the UC-nowadays, well-scaled (that is, not "fat"), in which the number of ECTS will suffer a reduction in (7 . 5 - 6 and, in particular, up from 4 . 5 " to 3 ECTS credits). The reformulation of these, the CU should be given to the concept of global in the scope of the area of science.
The changes in the School, as required by the measure (including the features and operation	The comprehensive review of the objectives and programs of the applications to conform to the dimensions of a 3 or 6 ECTS credits.
Rational	This is as it comes to standardize the volume of learning, and the work required at various CU's Coach, while at the same time, and the versatility needed for the construction of the curriculum of various classes. CU 3 (ECTS) are typically associated with the curriculum of the CITIZENS, a portfolio, personal, design, and, in some cases, the CU-specific science and engineering. This system allows you to reduce the barriers to flexibility in the curriculum between courses, and to encourage the provision of a service, e.g. minors) for multiple courses.

Connection with other measures	Connection with ECOF 3 , ECOF 4 , ECOF 5 : the success of the implementation of the new Model, a Technical 2 1 2 2 is based on the CU scale, specifically in(6) and (3 ECTS credits), to the model for periods of time, and with the formation of a solid foundation, and, simultaneously, adapting to the course.
Measures of contingency	All Departments should have an integrated approach to the transition of the supply current of the protected Areas, the new model of UC in 3 or 6 ECTS credits, in order to ensure the best possible outcomes in terms of consistency, science, and the intensity of the effort of UC, and the combination of the UNITS.
As ECOF 3	The introduction of the model for the calendar year in the 2 years (8 + 2 weeks) for the half year was 1 7 . 5 and 2 0 hours of contact hours per week of teaching, with a reduction in the number of applications, simultaneous 3 -or 4 -UC), and possibly 2 CU 6 ECTS + 1 CU 3 ECTS), or 1, the CU 6 ECTS) + 3 CU 3 (ECTS period of time, taking into account that: •UC- 6 CREDITS to work on a single period. you may have running on modular in situations of emergency (3 + 3 ECTS credits in two consecutive periods in the same period), for example, in the case of the limitations of existing infrastructure and/or human resources. • CU 3 ECTS): this, HASS, a laboratory, a mini-project, portfolio, and more.
What a way to the measure also contributes to the pursuit of the objective	It reinforces the learning is active, the increase in the actual number of hours of self-directed work that is available for each student as a result of the reduction of the burden of weekly entertainment. It enables the academic staff are engaged in activities that are not teaching in one-half of the period. It is intended that during this time, the teacher will put a greater commitment to, and effort in the preparation of the elements of the teaching and the work and effort. On the other hand, the focus and dedication of the research, it will be much greater in periods when not busy with school. The lowest number of applications running at the same time allows the student to develop a more continuous and deeper, with less dispersion. To acquire a knowledge of the way of the sequence and with.

The consequences to be expected, and the risk

The increase in the hours you are available to learn at the academic term in a more than 80 hours/semester, and a corresponding reduction in the period of the exams. The maintenance of a semester calendar ensures the highest compatibility with the universities and the person with whom the Coach maintains a high exchange students. The division of the first half, with the two periods of time that is compatible with your registration every six months and it does not increase the paperwork. The greatest achievement is driven by learning to be more efficient. The opportunity for training in complementary, multi-disciplinary, co-curricular, etc. The greatest difficulty of ensuring the recovery of students, who, for a variety of reasons (including health care), it is not able to attend school for a certain period of time. the difficulty of the operation, the 2nd period, due to the break between Christmas and New Year's eve; the paradigm shift in the evaluation of the school with a significant reduction in the time of the evaluation, and the disappearance of trend tests in the middle of the term and the possibility of the difficulty of students to master more complex, is important in the CU, basic, and CU, with the lightest load, conceptual); and the departments, with a deficit of teachers, there is a risk that the teachers have to teach at more than 2 times.

The changes in the School, as required by the measure (including the features and operation

Materials, resources, infrastructure, and logistics (very important in the UC laboratory); a greater commitment to the teaching activities, teaching during the periods in which they are teaching. Need more actors in the education system (TAs, tool offsets, etc.). The DIRECTOR, in co-operation with other cores in the core, you should plan ahead and scheduling the required changes to the implementation, at the time of the ban. The organ of the School, and in particular to the terms and conditions, shall ensure that the DIRECTOR of the media are required.

Rational

It increases to more than twice the number of hours of independent work by the UC on the period and the school in relation to the semester system to the current, which makes it compatible with a real system of active learning and continuous assessment. With the addition of a two-week number of the current model makes it possible to reduce the number of lessons per week, without decreasing significantly the number of semester hours of contact, which is essential for a model of the educational outreach. The number of hours of instruction in the current model would be the new model for about 19.5 hours per week. The interval was 17.5 (h-20 hours of lessons per week, corresponding to a reduction in the marginal (10%) and a marginal increase (about 2%) of those hours of contact, depending on whether there is a protected area of 6 CREDITS 7 per week or 8 hours a week. The distribution of teaching hours in each of the UC for the various types of classes of the theoretical/practical/ practical/lab) must be adapted to the nature of the protected area. Reduces the dispersion of science, during the term, allowing for a greater focus on, and deep learning. The teachers have taught 2 times per year, allowing for the strengthening of the time, which is exclusively dedicated to research into more than 20 weeks per year. Create periods of faculty dedication to teaching, with the highest demand in the follow-up learning in your projects and designs are innovative and challenging, the elimination of the set-out, repetitive, and, on the other hand, for long periods of time with the total liberation of activities and teaching that enhance the school with the most dynamic research and best quality possible.

Connection with other measures	Connection with ECOF 2, ECOF 4, ECOF 5: the success of the implementation of the new model is based on the change in the weekly student activities, active learning, service projects, and multi-disciplinary nature. It is argued that the organisation of the academic year in the times, with the UC that are sized specifically for the organization, it is a pragmatic solution that is less impact it has on the tradition of teaching in the school, allowing the formation of a solid foundation, and, simultaneously, adapting to the course.
Measures of contingency	Especially after the 2nd year, the co-ordinator of the course are to promote the CU in the 4th period and they choose rather to methods of evaluation that are compatible with a schedule of the actual 8 + 1 or 8 + 0 weeks, so as to avoid any conflict with the mobility of the learners " (p.ex. As Erasmus), and to promote initiatives and extra-curricular " (p.ex. a Summer internship).
As ECOF 4	The training of the base, and ≥ 6.9 (ECTS) with a geometry that varies depending on the course and ensures that the programs are in basic training, appropriate, in accordance with the following distribution (for all courses except Architecture): Mathematics (3.0 CREDITS), Physics (1.2 ECTS credits), computer science (6 CREDITS), Math/Physics/Chemistry/Biology (1.2 ECTS credits), CITIZENS (including 3 CREDITS Economics, Management (9 CREDITS).
In that way, to the extent it contributes to pursue your goals	The maintenance of a training base, a strong feature of the matrix on the Técnico, but it can be adapted to any course.
The consequences to be expected, and the risk	A formation of strong base ensures that the perceived credibility of the diploma Técnico. Even though it is not always a common feature of all the courses on Tech, it retains a high degree of similarity, and, in particular, will guarantee you always on the complexity of the training in the basic sciences, in all of the courses (which must also be considered in the CREDITS for the subject area, and not by the APPLICATION. The new design of the training base, it ensures a more in-depth areas that are currently not covered at all (e.g., in the CITIZENS). You can create any obstacles to the choice of a number of specific options for the students in the new scenario, the flexibility of the curriculum is increased, and the higher mobility of 1 and 2 all the chains. The maintenance of a large part of the UC's early years, is dedicated to training you can create with the students' disappointment with the course, and discouragement, for reduced contact with the experiences of engineering, and the appearance of the collage at the school who knew each other from school (by promoting the pursuit of the bad habits of learning. You can apply for, in some cases, an individual effort and training to keep up with the flexibility of the curriculum and, in particular, to varying degrees of depth and demand. It requires great care in the design of the curriculum of the course.

The changes in the School, as required by the measure (including the features and operation

The loss factors of the scale, it may require additional resources, faculty, and the greater the constraint on the construction of the schedules and the distribution of the rooms. It is desirable for a better connection to the content of the CU-based and the reality of the expertise of the course. The DIRECTOR, along with other central authorities must plan and the scheduling of the changes that are required for the implementation, on a timely basis, the measure, in particular with regard to the creation of conditions that allow for the adaptation of the training for each course, or, in the case of the CU from the CITIZENS, the possibility of this being done at other schools. The organ of the School, and in particular to the terms and conditions, shall provide the DIRECTOR with the necessary means.

Rational

The training is a component of pivotal to the origins of the Coach, and it has to be ensured in the future. In accordance with the guidelines in the document "The Bologna Process and the Organisation of Higher Education in the Technical, the basic training shall be subject to the UC and dedicated faculty members are assigned to with this training, you must have the power of scientific training is internationally recognized in the areas of their. In the proposed model, it is proposed that a greater adaptation to the education foundation of all progress, in accordance with the distribution of the CREDITS mentioned above. We suggest that the EPFL, with its headquarters close to the team, such as the model code and awe-inspiring from the design of the profiles of the basic training in various courses of engineering. The existence of unit-of-choice in the HAAS, including a compulsory component of the 3 ECTS) in Economics, Management), which is common in the RH, which is intended to "world" to the students and to provide a framework for your training, science and technology. This training may include, by way of example, a CU of the Challenges of a Global (in-line with the current CU and inter-departmental Seminars, Innovation, and Development to Sustainable; concrete aspects of the professional engineer's (such as Ethics, the relevance of which is pointed out by stakeholders in the sector of Engineering); the UC in the fields of History and Political Science, and Public Policy. Aims to enable learners to display the "ways of thinking about and doing different," as soon as possible with staff from other areas of knowledge. While the students have access to a wide range of training in these areas that already exists in the University of Lisbon, it is recommended that the Coach can create an offer (the control), the high - quality of CITIZENS, including the CU in the areas of History, Science, and the History of Engineering.

Connection with other measures

This will depend on the implementation of the ECOF 2 and ECOF 3, it is not possible to develop a new model of UC, with a variable geometry, and they do not acknowledge the work of the asset. Depends on the ECOF 5, the new model is intended to promote the teaching of basic and oriented to each course, taking the best of the training in the basic sciences with a background in electrical Engineering. In addition, cross-linked with the PP 7 in terms of the formation in the CITIZENS.

Contingency measures

The School shall ensure the consistency of the design of the UC to the Basic Training, depending on the course, as evidenced by the extent to ensuring the maintenance of the high stability of the training on sexually transmitted infections.

As ECOF 5	The adaptation of the training The UC education more adapted to the course of UC in the training base, with levels, with different depth and complexity. This CU can be assignments are different, the p. ex., type A and type B.
In that way, to the extent it contributes to pursue your goals	The improvement of the understanding on the part of the students to the fundamental role of the basic training. Integrating students with a range of expertise in the very first year of their respective course. It promotes greater transparency in the curriculum of the students, and taking on the role of differences in the content and some of the CU in the training database.
The consequences to be expected, and the risk	The greater the adaptation of the training for each course, with a consequent increase in the motivation of the students.
The changes in the School, as required by the measure (including the features and operation	A small change in the level of bureaucracy. Loss factors of the scale, at the level of the allocation of resources for teachers. A major effort of the faculty members in the areas concerned, and in particular on the "design" of the new UC-and in its relationship with the reality of the expertise of the course. The increase of the cooperation of the faculty of the UC on the basis of the Coordinators of the courses and the teachers of the speciality. In the case of students who transfer between the two courses: 1.No cycle should be given to equity for the CREDITS in the field of science, so as not to require a student who has already carried out a "CU in the" say it "on B", for example). In some cases, due to the scale and content of the CU can be arranged into classes or groups of classes.
Rational	In the CU-based, ensuring the relevance, scientific, and should be taken advantage of to the maximum the opportunities for the introduction and adaptation of the courses are taught either in the content, or for examples. At present, some of the UC's are, of course, given the number of courses and with a high level of demand and the highest content is in-depth. This should be made transparent in the curriculum of the course. This measure is proposed to recognize how different the UC that are working now on the IST so different, but they have the same name.
Connection with other measures	The measure is coordinated with the ECOF 4
Measures of contingency	At the School, the department and the Coordinator must ensure that this provision does not imply a decrease in the level of demand of the CU present, but only one is explicitly recognized in accordance with the description, applications that work with a level of depth that is different.

As ECOF 6	To increase the flexibility of the curriculum due to the following UC-options: • 30 ECTS credits at 1.No loop, out of which 6 CREDITS unit of the CITIZENS, chosen by the students, and 12 CREDITS for the CU to the Basic chosen for the co-ordination, 12 CREDITS for the CU to the Pre-Major chosen by the student in a range of applications, as defined by the co-ordination. • ≥ 36 ECTS) 2.No cycle, 30 CREDITS for the CU-choice completely free (except of course with restrictions "imposed" by the Associations, the Professional, and possibly the courses, with the current involvement of other Institutions of Higher Education).
In that way, to the extent it contributes to pursue your goals	It provides a wider exposure to the students of the Technical assistance to the CITIZENS. Ensure the training of the base, is adjusted to the needs and requirements of each course. It provides a better match of 1.No cycle 2.No cycle in the non-aligned through the use of 12 ECTS credits, pre-series. It promotes some of the competition among the UC to the area of your choice. The options on the free-of-2.No cycle and provide opportunities for training in related areas, or in specific topics in the area of specialty for which the student is interested in (e.g. by means of the choice of (i) a minors consistent and 18 ECTS credits in related areas, (ii), CU expertise in the area of formation, or (iii), CU multiple selected reasonably by the students in the context of a personal training plan that is discussed with the team in the mentoring and co-ordination).
The consequences to be expected, and the risk	Exposure to other locations in addition to the closed-in Desk. An opportunity to strengthen further training on most of the courses of study. The change in the profile of the training in the specialty with greater depth that a set is the smallest of ways. The risk for the students to make their own choices based on the ease of right of UC, and the risk of a decrease in the formation of the expertise of the course. The difficulty increased with the construction of the schedule. Wasting time on the free movement of students during the academic term, in particular if they include the UC carried out in other schools of the university or at other universities.
The changes in the School, as required by the measure (including the features and operation	The contents of CU and its requirements of training, should be described in a clear way. The CU are to be provided by the School, through the Department, they're not necessarily associated with a course of study, as opposed to what happens now. The School must ensure that there is a website on the internet is centralized with all the information related to the CU on the operation of each term/ semester. You should be able to get access to this information through the use of various filters, such as, for example, name, subject area, department, relevant keywords, year-to - school/the first half, period, etc. You should be allowed to the students of + 2.No cycle can go to the UC of choice of courses in 1.No cycle-non-aligned. It should be given to students with a portfolio of applications of CITIZENS, at the desk or at the University of Lisbon, Portugal. It will also be necessary to proceed with the redesign of the CU - based, to take into account the restructuring process, and the specific needs of the different classes of the Desk.

Rational	The school of engineering for the twenty-first century, and the requirements of increasing innovation, and professional ethics require that the liability of the students in the construction of the paths of variables, the multi-disciplinary nature and the in-depth expertise in all areas of knowledge. Such requirements can only be achieved through the provision of training in the engineering and robust, but at the same time flexible, so as to provide the student with the opportunity to tailor their education to their personal profile and to trends from the offering of the workplace. The flexibility of the curriculum proposed in this sense it occurs in both the cycles of the survey, and in- 1.No cycle, it is flexible and is controlled, in which the student will be able to choose the only UC that are defined in advance by the course of which it is part, at 2.No loop, for flexibility, without limitation, where all the choices in the curriculum of the student, they are, in almost all, actually free (with the exception of the courses, with the constraints that are imposed by the relevant trade Associations or other, with the current involvement of other Institutions of Higher Education, where more than 3 0 CREDITS of free choice in the 2.No cycle can be shortened). This measure is expected to have a positive impact on the reduction of the number of students highly successful academic, who will leave early for the Coach to be transferred to other colleges and universities (usually at the international, the most prestigious).
Connection with other measures	This measure is dependent on the ECOF 2 (and, consequently, the ECOF 3 , ECOF 4 and ECOF 5), without structure, and normalization of the weights of the protected area, it will be very difficult to implement with a high degree of flexibility in the curriculum. In the respect of the CITIZENS, in cooperation with the PP 7 .
Contingency measures	The student must have to clear information about the requirements, best practices for each of the UC option. The imposition of external Professional associations, or other HEIS are involved today in some of the courses on the Technical requirements that limit the number of ECTS credits in the option, should be established and taken into account in the case of exceptional and trying to make the most flexibility in the curriculum as possible, such as that recommended in the Technical model 2 1 2 2 .

As ECOF 7	Minors (up to 1 8 CREDITS) to access the 2 -cycle in the areas of cross-functional , strategic, and/or disciplinary
What a way to the measure also contributes to the pursuit of the objectives	It allows for the students of different courses to gain an education in the area of cross-which they have an interest. It enables you to align the courses with the designs and the needs of the present, rooted in much across the board.
The consequences to be expected, and the risk	The chance of training, divided into areas and complementary to each other. Employability increased due to the more targeted to the needs of the business. The decrease in the formation of a type of "encyclopedic" of the course in favor of the in-depth expertise in specific or complementary to each other. - Risk of academic courses with less expertise. The risk of an excess of the minors in case the offer is not being tracked.

The changes in the School, as required by the measure (including the features and operation	The supply of minors engaging and involving different scientific disciplines, and linking the efforts of different departments. The development of minors shall be controlled so as to avoid overlap and fragmentation, and to promote areas, and emerging market strategies. For example, minors are typical in the school of engineering include expertise in Big Data and Computational Science and Engineering, and Management. Some of the deals you can get on the logic of the teaching is in the areas of innovation and research, Technical, and you have the capacity to raise the students ' 2.No loop. In the minors, should not be part of the curriculum of the courses, being independent of them, and it is a way for students to be able to, because of your choice to arrange with the most coherent part of an optional component of its curriculum. The School must ensure an adequate dimensioning of the CU that makes the minors, and, if necessary, to study the means of selecting the students to access to this protected area. All minors must be given in the award of a degree. The DIRECTOR shall plan and the scheduling of the changes that are required to implement, at that time, this measurement. The organ of the School, and in particular to the terms and conditions, shall provide the DIRECTOR with the necessary means.
Rational	To promote the emergence of high-Tech with a background in interdisciplinary Science and technology, without sacrificing any of the hardcore training. To give a response to academic interests that are specific to the students. To enhance the creation of concepts, products and businesses, with a focus on innovation and scientific and technological intensive.
Connection with other measures	Based on the ECOF 6 (and, consequently, the ECOF 2 , ECOF 3 , ECOF 4 and ECOF 5), allowing you to arrange the UC option sets are consistent, and that will enable training in their areas of specialization, well-defined, in the interest of the student.
Contingency measures	The School is in, for example, through a committee appointed for that purpose, you should monitor the quantity, quality, coverage of the minors offered, encouraging interdisciplinary collaboration and cross-functional expertise, and preventing redundancies, that the commission should also encourage the creation of minors in the areas of strategy, emerging, and innovative.
As ECOF 8	Recognition of curricular and extra-curricular activities
What a way to the measure also contributes to the pursuit of the objective	Opens up the opportunity to recognize and extra-curricular activities (e.g. activities and science in a laboratory setting in the UI, in-company training courses, schools, summer schools and short-term international involvement in meetings, scientific, engineering, became the national co-ordination of the project, the development of tools and prototypes, activities, membership, and volunteer work, etc.). in the CU from the portfolio or from the choice of (t 3 ECTS). It contributes to the education of innovation and entrepreneurship.

The consequences to be expected, and the risk	The promotion of pro-activity, creativity, and a spirit of entrepreneurship among the students. Promotion of e-learning, differentiated for the different levels and that it's not just the technical and the scientific. The risk of having a negative (distrust) of the Response compared to the recognition of certain types of extra-curricular activities.
The changes in the School, as required by the measure (including the features and operation	Awareness-raising on the part of the teachers, the teachers of the benefits of the experiences of extra-curricular school students. The need to define a clear set of rules for your children what kinds of activities could/should be acknowledged. In the Face of the diversity is to be expected from the activities and co-curricular offerings presented to the accreditation to be made for the use of a classification of the types of pass/fail in UC from here. The need to review the programs of the portfolio or of a choice, ensuring exploring the possibility of participating in this type of activities in these UNITS.
Rational	To promote the spirit of entrepreneurship, creativity and problem solving of students to promote integration and to increase the understanding of the role of the students and future engineers in the company.
Connection with other measures	Connection with ECOF 2 and ECOF 6, as it requires a structure, and normalization of the weight of the CU and requires a strong flexibility in the curriculum.
Contingency measures	The measure is recommended for a minimum of 3 CREDITS, but that the Response may be, as is already the case today, in some cases, recommend a 6 ECTS credits for this measure. The general rules to be applied in the IST within the scope of this provision must be subject to regulation by the governing bodies of the School.

As ECOF 9	UC to Develop, Design, and innovation," in 1.No stage (1 2 ECTS credits) driven to continue their studies with work starting on the team. It includes 3 CREDITS of training in Management, Innovation/Entrepreneurship, in matters that are based on the challenges and real-world problems, innovation, entrepreneurship, and development in the business environment.
In that way, to the extent it contributes to pursue your goals	It offers the opportunity to integrate the material learned from working in a team, to explore the themes of science and technology of the nature of inter - and/or intra- disciplinary, respond to challenges, and real-world problems, and to look forward to in 2.Nd cycle of studies. Allows you to enhance the (re)getting to know the impact of economic, social, and industrial applications. This measure also contributes to the education of innovation and entrepreneurship.

The consequences to be expected, and the risk	The enrichment of the curriculum of the students, the exposure to cross-disciplinary and/or the environment, business, and/or the environment of the WEBSITES. The gain on the experience of the students, with a view to select and profile 2.No course of study and to the incidence of UC in option 2.No loop. Difficulty in practice is to ensure the provision of regular, more interesting, and in the number of subjects to all the students of the Technical staff. The difficulty in eliciting the cooperation between the departments in the organisation of the university of coimbra, being that this co-operation is essential to a proper education, and the promotion of synergies in education.
The changes in the School, as required by the measure (including the features and operation	It requires more human resources in the school, that is supplemental to the teaching of his career (for example, employees, faculty members of the business community, or the CONCEPT, the students of doctoral studies, a good final year undergraduate students in the 2.No cycle), as well as offering content management, innovation/entrepreneurship, that are relevant to the students, who carry out the work in multiple topics. The effectiveness of the programme as it would benefit a lot from the existence of a platform for businesses and agencies of the government, through agreements with the head Coach, to be a source of issues for the concrete work of a high interest in science and technology. The format of Capstone (ex. "Formula Student"), in the case of issues in the environment of the business, in the case of the themes that are based/inspired by the challenges and problems of the real, the university comprises of 3 CREDITS of training in management, innovation/entrepreneurship (to cover all the facets of management that are relevant to the execution of the work in inter-disciplinary and innovation). The course unit can be carried out in the UI, involving 3 + 9 ECTS in the case of scientific papers with a focus on innovation, and (3 ECTS) in the innovation), and 1 2 CREDITS for the work of the scientific and/or are of a technical nature and technology. This is the CU requires, in multiple cases, cooperation, organizational skills, between the courses, and collaboration in the teaching sector. The DIRECTOR shall plan and the scheduling of the changes that are required to implement, at that time, this measurement. The organ of the School, and in particular to the terms and conditions, shall provide the DIRECTOR with the necessary means.
Rational	To promote the work, with a focus on an integrative and multidisciplinary approach; to strengthen the training of students and help to consolidate the material learned; and promote the work of the team and for the development of a variety of soft skills; to encourage in students an understanding of the world and the challenges, and real-world problems; to encourage innovation, and critical thinking skills.
Connection with other measures	Connection with ECOF 3 (and, consequently, with the ECOF 2, ECOF 4 and ECOF 5 and RGE 1, it requires periods of time faculty members, with a greater commitment to teaching, higher demand in the follow-up of learning and the development of the project, innovative, and challenging, as well as human resource development in education. Connection to the RGE 7 with regard to the cooperation between the departments. Connection to the ECOF 1 2 in regards to the articulation of the UI, and businesses.

Contingency measures

As A transitional measure, in the case of the provision of the themes in "the UC to Develop, Plan, and Innovate," it is not enough for all of the students, this CU can be replaced with 1 2 CREDITS for the CU option 1.No cycle is completely free. The imposition of external Professional associations, or other HEIS are involved today in some of the courses on the Technical requirements that would limit the number of CREDITS in the option, should be considered on an exceptional basis, and justified, by adapting the number of CREDITS of optional ones suggested so far.

As ECOF 1 0

Design Capstone at 2.No cycle (4 2 CREDITS)

with a report by an individual, as an alternative, optional on the dissertation of nature of science or the project in an enterprise environment. The possibility of a breakdown of all 4 2 ECTS credits 3 0 ECTS credits for the dissertation or along with the 1 2 CREDITS for the CU-specific area of that part of the dissertation or project.

What a way to the measure also contributes to the pursuit of the objective

It enriches the variety of the formats and of the completion of the 2.No cycle and, in order to ensure the quality, we have to add the value of the herd. It increases your opportunity of a vision for integration of the materials, working in a team of inter-disciplinary work, the connection to the business. The measure will contribute to the education innovation and entrepreneurship. This leaves room for a further degree wide; Master's degrees, with the Stage Business versus Specialization in the sciences.

The consequences to be expected, and the risk

In some courses, it can help to combat the withdrawal of students from the 2.No loop. Without compromising the academic requirements, provides a better fit to the phase of the end-of-2.No cycle to the profile of the student, which is very changeable, in the school, the size of the Desk.

The changes in the School, as required by the measure (including the features and operation

It requires rigorous monitoring of the quality of the projects in the enterprise (which, in any way, since they occur in the Coach). It requires additional human resources at the support for the development and management of the project (Capstone) with a cross-disciplinary and/or inter-departmental developed by the who collaborative cross-functional expertise that is required for the implementation of this measure. To the extent this is also enhanced by the effective relationship with the development of a platform for companies outside of the CONTEXT such as the one described in the ECOF 9 . Design Capstone must provide public discussions, and reports on individuals, working in the current legal framework. The DIRECTOR shall plan and the scheduling of the changes that are required to implement, at that time, this measurement. The organ of the School, and in particular to the terms and conditions, shall provide the DIRECTOR with the necessary means.

Rational

The body of the student in the desk is far from being uniform in size. With the current level of academic requirements, so it makes sense to have a number of different profiles for the completion of the 2.Th cycle, which may contribute, in particular, to the reduction of early school leaving in the loop. To promote projects, Capstone, with a focus on an integrative and multi-disciplinary catalyzes the creation of concepts, goods and ideas, the new value for the scientific and technological development increased.

Connection with other measures	Connection with ECOF 3 (and, consequently, with the ECOF 2, ECOF 4 and ECOF 5 and RGE 1, it requires periods of time faculty members, with a greater commitment to teaching, higher demand in the follow-up of learning and the development of the project, innovative, and challenging, as well as any additional resources into the classroom. Connection to the ECOF 9 at the level of the relationship and coordination with companies and organizations that are external to the Instituto Superior Técnico. Connection to the RGE 7 with regard to the cooperation between the departments. Connection to the ECOF 1 2 in regards to the articulation of the UI, and businesses.
Contingency measures	This can be implemented in stages. If there isn't a gift enough of the projects and capstone, students are able to choose an essay from the traditional model in the UI or in the business environment.

As ECOF 1 1	The creation of a general course in Science and Engineering 1.No cycle is in both English and Portuguese (the latter is aimed at Countries where the Official Language is Portuguese, and allows access to all of the 2.the cycle of the Coach, without recourse to the programs in the bridging.
What a way to the measure also contributes to the pursuit of the objectives	It increases funding for international students, and gives you a chance to create a root of 1.No cycle is the truly innovative, and to respond better to challenges posed by the future of education is in engineering.
The consequences to be expected, and the risk	The increase in the number of international students in the 1.Th cycle, and, eventually, on- 2.No loop. To increase the international visibility of the Coach. The increase of the financial resources by way of the registration fees. There is a risk that the courses are not able to attract the students ' enough, particularly in the early years. It is necessary the design of the curriculum carefully to ensure that graduate students with the preparation of a quality that is compatible with the access to the multiple of 2.all the chains.
The changes in the School, as required by the measure (including the features and operation	The actions for the promotion of the training on the target markets. Central management with the coordination is provided by a scientific committee, composed of faculty members from various departments. The promotion of cooperation among colleagues from different Departments and/or expertise in the coordination of the CU and on the establishment of the CU, with the content to be open. The School should be set up carefully to his / her profile, the number of jobs and the structure of the curriculum of the programme, before moving forward with the decision to build it. The DIRECTOR shall plan and the scheduling of the changes that are required to implement, at that time, this measurement. The organ of the School, and in particular to the terms & conditions they must provide the DIRECTOR with the necessary means.

Rational	It is intended that the Technical design of a new cycle of training in Science and Engineering that can be used to increase the uptake of the students are international, as well as to diversify the sources of funding for the School. The opportunity is ideal for designing a curriculum for a truly innovative, without the restrictions imposed by the assets of the history of the traditional courses and you will still be able to serve, to experiment with new models of curriculum and teaching practices, etc. The course should enable the students to keep their options of specialization in the open, while most of its route (i.e., by studying the topics in the various fields of engineering and to continue the studies at all (or most) of the 2 .the cycle of the Desk. Students will benefit as well from the knowledge of the various sub-areas, preparing them for the situations, challenges, and projects that are complex, that it requires the collaboration of multiple specialists. Opens up the space for a school of excellence, which will be subject to the guidelines to be clear in order to stimulate innovation, for the projection of an international collaboration and cross-functional expertise (see Appendix E).
Connection with other measures	Connection with ECOF 1 (at the end of the integrated master's programmes), ECOF 1 4 (Career Planning) , and ECO 1 5 to all of the tables in the consistency of the curriculum),
Contingency measures	Enhance your marketing and communications for the School-as a way to increase the recruitment of students to a foreign (and domestic) to and from the 2 .the cycles of STI's, and to continue to focus on teaching in English.

As ECOF 1 2	Design/for UC, in conjunction with the firms and the Research Units (IU)
What a way to the measure also contributes to the pursuit of the objective	It stimulates creativity, and the empowerment of students through its integration in the environment of the research, or business. It exposes students to the challenges and problems of the real, open-ended, and often ill-defined, and motivate them to his background in Engineering as soon as possible with the activities of your dreams for the future. It increases the diversity of the curriculum, delivering projects of various geometries, business-oriented, or of the nature of the research is embedded in the UI, and UC-optional areas-innovative-where the Technician does the research state of the art. The measure also contributes to the education of innovation and entrepreneurship.
The consequences to be expected, and the risk	The increase of the academic achievement. Learning is the most complete and current issues. The reduction of the dropout to the external driven by the weakening of that is driven by a sense of the course to be too academic, somewhat challenging, and requires a little creativity. Upgrade, and in the context of the themes of the project/dissertation, and the contents of the protected area. The implementation of this measure requires the stimulation of the articulation of the protected Areas and businesses.

The changes in the School, as required by the measure (including the features and operation	The creation and implementation of the thematic platforms of the company/ideas/ societal challenges, for example, at the level of the Coordinators of the Course and/or at the level of the School. Developing applications with links to the companies, the accreditation of the initiatives in connection with the business, and the training that is appropriate to the students' to develop projects in the business. Integration of the teaching of the actions in the UI. The introduction of CU, optional on innovative areas (including those in which, in many cases, it is leading-edge research and Technical). The cooperation with the companies, and the UI is managed globally by the response, and with the collaboration of courses and departments. The involvement of the regular businesses should be encouraged by the School, enhancing the factors of a scale, visibility, and, locally, by the department, and is a Response, and when this is the most effective way.
Rational	It is intended to encourage the co-operation between the School and the business, the UI, and the government institutions in the context of the formation of a 1 .Article 2 .No cycle, thereby increasing the exposure of the students to the challenges of the demanding nature of scientific, technological, industrial, and business, and by promoting its interaction with other health care professionals who are not teachers of the subject. In contact with these specific characteristics will also help students to get a guide, to organize and to plan for your professional career.
Connection with other measures	Connectivity is strong and the measures ECOF 6 and ECOF 1 4 , since it is based on the principle of a high level of flexibility and the ability for Career Planning. Connectivity measures ECOF 9 and ECOF 1 0 in terms of the synergies at the interface with the companies and WEBSITES. Connection with the measures RGE 6 and RGE 7 with regard to the creation of incentives for teachers, and to the collaboration of cross-functional expertise.
Contingency measures	While more and more of the UI, and businesses are involved more directly in the learning is not enough, and the teaching should be done on the job, university of coimbra, and projects in formats that are more traditional.
As ECOF 1 3	Creation of the week "Project" in the spirit of the program "Projeter Ensemble of the EPFL, in the interval between the 1 st and the 2 nd half of the year.
What a way to the measure also contributes to the pursuit of the objectives	Ensures that the logo in the middle of the 1 st year, and the contact of the students with the practical problems in Engineering and Science, and in the interaction with the older students and teachers.
The consequences to be expected, and the risk	To increase the motivation of students of the 1 st year, and its connection to the course, and at the Desk. The main danger is that the idea is to be deployed, without the means that make it an effective and of high quality.

The changes in the School, as required by the measure (including the features and operation	It requires the resources and efforts of the organization on the part of the School, and the involvement of the human resources of the additional students from the 2 .Article 3 .Th year- 1 .of the cycles, and the student of the 2 .in the cycle) and must be, the involvement of business entities of the Public Administration and civil society. This week, it's not mandatory, but it does not correspond to the ECTS credits.
Rational	The goal is to fight against the abandonment of the (very) early detection of students, enhancing their connection to the course and the atmosphere in the Coach, through the involvement of the week, "Project", as they are faced with problems with stimulants, and the experience of the Engineer-in collaboration with the senior students and the teachers. Want to make it clear to the students, and from an early age, and the central role of the training and of the CU-specific course, and the ways in which they are articulated.
Connection with other measures	Connection with ECOF 3 (and, consequently, with the ECOF 2 , ECOF 4 and ECOF 5 and RGE 1 , because it requires the teacher with a greater commitment to teaching and to a greater demand in the follow-up of learning and the development of the project, as well as the additional resources into the classroom.
Contingency measures	To this extent, in the case of a lack of resources, may be deployed in one stage, or later to be initiated in the way of a pilot project, initially involving only a fraction of all the students at the School.

As ECOF 1 4	The introduction of the concept of Career Planning. autonomy and corresponsabilização of the students ' choice of courses.
What a way to the measure also contributes to the pursuit of the objective	It identifies the capabilities and interests of the students in the medium-term and long-term in order to allow you to plan your career, and outline the business objectives, as well as to consider alternative routes. Allows you to make an informed choice and to be responsible of the different paths available to you and other solutions.
The consequences to be expected, and the risk	Reduction of drop-out of the changes, of course. A longer-lasting, corresponsabilização of the students. The promotion of pro-activity and initiative of the students.
The changes in the School, as required by the measure (including the features and operation	The implementation of the sessions (face-to-face or digital) of the Development Planning, taking into account the need for students to develop in a progressive manner, the background of the individual. There must be a connection with the program, and the relevant structures that already exist in the School, e.g., the Program of the Program for the NDA-Objectives, and the Program for the Discovery of the Career of the Students in the Technical and TT@IST.

Rational	It is important to involve the student in the planning of your career, allowing you to build up your academic studies through a process of reflection, which is supported in an effective advice on the part of the tutors and experts, which takes into account the goals and interests, and it respects the autonomy of the individual. In addition, in the context of Development Planning, in the school , in conjunction with the co-ordinations, you may also provide information in a structured, on the other training that exist in the School or on the outside are considered as the determinants of success in academic and professional life of the college graduates in the STI-use tools for organizing, analyzing, and storing data, e.g. spreadsheets, management, referrals, and other tools in the point of view of the user, language, etc.). This training can be applied in the context of the UC from Here.
Connection with other measures	Closely connected to all of the measures that involve the flexibility of the curriculum, ECOF 6 , ECOF 7 , ECOF 1 0 , ECOF 1 2 , and RGE 5 in the sense that it allows the student to assess their interest in the short-to-medium-to-long term, and to make choices in an informed and responsible way.
Contingency measures	While this is not fully implemented, there should be a strengthening of the role of the advice given to you by the co-chairs.

As ECOF 1 5	The change in the model, the application of the 2 .No cycle the elimination of the tables in the consistency of the curriculum from 1 .and 2 .in the cycle (the guarantee of the continuity of only 1 .No loop match
What a way to the measure also contributes to the pursuit of the objectives	This avoids the creation of a block in the progression, allowing for the entry and accumulation later in the UC- 2 .No loop, for example, provided that the student has completed a minimum number of CREDITS from 1 to.No loop. It increases the mobility of as a stimulus to the onset of the students with information and interdisciplinary studies.

The consequences to be expected, and the risk	The possibility for students to be able to choose a training course that is most suited to their interests, and with a background cross/ multi-disciplinary. The possibility of admission to the 2nd cycle of the students, with the continuing education and training is insufficient. Risk is the potential for students to complete with a 1st in the cycle is not to be placed in the 2nd cycle, the corresponding case is not to be taken in mitigation measures. The risk of admission to the 2nd cycle, which would require an effort of self-directed work raised and to which the student is not aware of. Their involvement in the education of students, 2nd No looping, and the students of the 3rd year- 1st No loop may contribute to a decrease in the tendency for students to drop out of studies of at the end of the 1st No loop.
The changes in the School, as required by the measure (including the features and operation	It should be adopted as a system for the management of the applications of the 2nd No cycle efficiently, with the support of appropriate administrative, and take out of the hands of the leaders of the administration tasks that are trivial in the selection process. The School should be able to this, lay down ground rules and a well-defined transition from the 1st No to the 2nd No loop, which must be communicated clearly to the students. Engineers must be able to adapt to the rules of the 2nd cycle, and to select the most suitable candidates. It is necessary to ensure that the selection criteria for the access of the students who have completed (1st) the cycle accordingly.
Rational	In light of the acquisition of the skills for life-long learning, and the tables in the consistency will become redundant. In the placing of restrictions on access to 2nd in the education is also clearly contrary to the spirit of the law, and is limited to the choices of the students.
Connection with other measures	Key to the ECOF 1st, which includes the end of the integrated master's programmes, and an increase in the mobility of chains. It should be combined with the RGE 8.
Contingency measures	The model is a 3 + 2 is the result of a change in the law, and cannot be by-passed. The School should always reinforce the idea that it (1st) the cycles of STI are not a professional, seeking to continue their education at a 2nd No loop.

As ECOF 1 st 6	Elimination of trend of running applications in the first half, alternative
What a way to the measure also contributes to the pursuit of the objectives	It normalizes the functioning of the system and increases the efficiency in the use of time of the students and resources for teachers.
The consequences to be expected, and the risk	A decrease in the number of students who successfully complete the UC, which will work on this system. An increase in the retention of students in these UNITS. The decrease in significant rates of failure.

The changes in the School, as required by the measure (including the features and operation	This measure requires the abandonment of the system of precedence.
Rational	The term alternative was introduced in Tech as a way to combat the low academic achievement in a particular protected area. It is reasonable to expect that many of the measures proposed in the model of the Technical 2 1 2 2 expected to lead to an improvement in the quality of education, which is expected to lead to a decrease in the rates of restraint on the majority of the protected area, making it unnecessary for the half turn. On the other hand, and in the absence of such a solution, the students will be encouraged to meet with the success of the CU at the right time.
Connection with other measures	The normalization of the functioning of the system, as proposed in the ECOF 3 and ECOF 4 , greater efficiency in the use of the students and resources for teachers.
Contingency measures	In UC, which have a repetition rate high, it must remain a possibility of operation in the two periods of the year. The elimination of these cases, as well as the removal of the regime of the dependencies present, they should be subject to monitoring, and decision-making in the School since the implementation of the Model. The School will be able to study for the establishment of a rehabilitation program for students with poor academic performance, in particular directed to the UC on the basis of format is self-contained, and will take place during the month of July, after the end of the 2 nd half of the year (take it- if by way of example, the mise-à-niveau" EPFL). The level that is required in the evaluation of the students enrolled in this program must be the same as the one that takes place during the periods of study as usual. It may be helpful to you, if this idea is implemented,the consider some additional incentive for teachers that are involved.

Regarding The Development Of

As PP 1	A change in the operation of the lectures should be to provide a framework for the material, and samples. When it makes sense to do so, the lectures should include demonstrations of experimental or computational.
How does the measure contribute to the process and goals	Increase to leverage face-to-face students in the lectures. Motivate your students to the subject, and promoting the greatest preparation for stand-alone, to the practical lessons, the better the learning of the material and an understanding of the context of the scientific/technological one, in which they are located. The improvement in the pit of your knowledge.
Consequences of expectancy, and scratches	An increase in the presence and active participation of the students in the lectures. Learning is more self-contained, and the most solid. The possibility of an excessive increase in the workload of the teaching staff. The risk of resistance to change on the part of the students were not as strong.
The changes in the School, as required by the measure (including the features and operation	The widening of the educational system to the new players that you can bring to the classroom a case study, the experience of life and its challenges. The creation of a collaborative teams, for the preparation of classes, and maximize the use of experiments, demonstrations, prototypes, or models of computation. It would be very important for some of the protected area, you have maps, equipment and experimental computer that is suitable. Consider the increase in the use of MOOCS in some of the CU/modules. It should be provided to train teachers to adapt their practices in teaching to the new paradigm of education in the theory classes. It should be introduced in the first two weeks of classes in an add-on module, provided by the Core of the Development of the Academic Objectives in which all the pupils in year 1 are expected to be trained in the importance of the theoretical courses in the framework of a model of teaching and active, so that it is reasonable to expect that the lessons in the IST work for the new paradigm, and, for the benefits to take an active role in the group.
Rational	At present, in many instances, students do not attend all the classes of the theoretical and do not understand their fundamental importance. Many times, the students have a role to play too passive in the classroom. It is urgent to reverse this situation by resetting the lectures as a key element in the process of teaching and learning.
Connection with other measures	The implementation in conjunction with PP 2, and PP 3. Connection with ECOF 3 (and, consequently, with the ECOF 2, ECOF 4 and ECOF 5). Connection to the RGE 2 be given to the need for the training of the teaching staff.

Contingency measures

If it will not be accompanied by a desirable increase in the frequency of attendance of the student, the coordinator of the study and the control point, in conjunction with students and faculty, they need to identify additional strategies to enhance the presence of the students in the classroom (e.g. enter in times of trial (pop quiz) on-course instruction, to include, examples, etc.).

As PP 2

A change in the operation of hands-on classes

dedicated to the work by the students, and the rooms where the classes processed-rem, which are equipped with the most pictures on all the walls, tables, round, etc. in order to facilitate collaborative work among the students between the teacher(s) know-how and you have more than one teacher in

What a way to the measure also contributes to the pursuit of the objectives

Increase in the independent work of the students in the protected area. It promotes a pro-active role of the student in the resolution of the chip for the exercises/examples of (work-groups, which can, for example, by the use of one of the tables to foster collaboration, participation, and discussion, as far as the ones with the issues, and examples of the classes of the theoretical. The workshops are instances that work together as a team.

The consequences to be expected, and the risk

Improving the learning motivation and academic performance of the students. An increase in the sedimentation of knowledge, which enables students to better connectivity and continuity of learning in the wake of the various UNITS. The risk of resistance to change on the part of the teacher and the students. Students with a passive position to be less exposed to the contents of CU, than in the traditional classroom.

The changes in the School, as required by the measure (including the features and operation

The possible need for training of the teaching staff. The classes are empty and the role of the teacher. The proposed model of the operation of the practice that is best enjoyed in the presence of more than one teacher in classroom practice, making it easier to contact you with group work. Whatever the approach, in this sense, requires the involvement of a greater number of actors in the educational process. The re-organization of the rooms you should start to be implemented from now on, adapted to the means of the already existing ones, and renew it in the medium term, in the spirit of the proposals. Like mentioned in the PP 1, and the students of 1st year to receive training on the operation of the practice, and the extent to which these are linked to the new paradigm of academic study.

Rational

It is intended to enhance the teaching, learning, and understanding of the materials, and not the resolution of the scans, leading gains on the autonomy of intellectual/ functional class. Another objective is to enhance the relationship between the active work of the students and the lectures. The all-new model for the operation of hands-on classes will also help to increase the use of the contact face-to-face, students, and teachers alike.

Interaction with others measurements	The implementation in conjunction with PP 1 and PP 3. Connection with ECOF 3 (and, consequently, with the ECOF 2, ECOF 4 and ECOF 5). The skills acquired by the students during the practical sessions will be used in the projects, Capstone of 1.Article 2.No cycle ECOF 9 and ECOF 10), and the project, in conjunction with a UI, or in the companies (ECOF 12).
Contingency measures	If it will not be accompanied by a desirable increase in the involvement of the students in the class, the coordination of the study and the control point, in conjunction with the students, officers and staff, are required to identify additional strategies and mechanisms that will encourage the students to participate in hands-on classes, and to discuss ways to increase your attractiveness.
As PP 3	Enhancement/overhaul of the training, the experimental ensuring a pro-active role of the students in a more in-depth and ongoing throughout the course.
What a way to the measure also contributes to the pursuit of the objective	It increases the active role of the students in the design, installation and management of demonstration experiments in the laboratory, at the expense of a number of over-reporting "repeating" for the motivation of the students, and the greater the stimulus to the understanding of the material. Develop your scientific thinking and create more opportunities to work collaboratively in a team.
The consequences to be expected, and the risk	The improvement of the learning process. The lower the weight of the evaluation process, repeating for the benefit of the more challenging. They can be freed up resources, teaching is guaranteed by the presence in the laboratories of the technical superior to the non-teaching staff. The risk of resistance to change on the part of the teacher (e.g. fear of ill-usage of certain types of equipment on the part of the students. Lack of resources-human, physical and financial resources to implement the new vision for training on an experimental basis.
The changes in the School, as required by the measure (including the features and operation	The enhancement and revision of the training, the trial may require the allocation of additional human resources non-academic staff (senior staff non-teaching staff) in the teaching and laboratory renovation and re-programming equipment on the same. The organization, the location and the design of the laboratories should be re-thought (as in, for example, the experience of the University of Oxford, or in the Laboratory for Control and Automation systems and Industrial Informatics DEM) in order to focus on the activities of the laboratory in small spaces, to larger dimensions and a more easy-to-manage (e.g. safety, security, surveillance, access control). It is necessary to build the labs, open access, where students will be able to work without any pre-set time. The program of the CU are to be reformed in order to increase the component of the training, the experimental, and the co-ordinators should ensure the continuity of learning in the course. To identify external agents (e.g. firms), are available to assist in the re-equipment of the laboratory.

Rational	In addition to his involvement in practice, students must also take a more active role in the work of the laboratory. It is hoped that also in the laboratory, the students' work will be less repetitive and more creative. With a depth and continuity of the training, the trial of the curriculum will improve the aim of the training on an experimental basis. Thus, the activities of the laboratory are expected to include creativity, thus reducing the concept of the protocol is closed, in which the student is involved only in the implementation, which has evolved the course of the strict protocols to a situation in which the activities are designed from the ground up, and then executed by the students themselves.
Connection with other measures	The implementation in conjunction with PP 1 and PP 2. Connection with ECOF 3 (and, consequently, with the ECOF 2, ECOF 4 and ECOF 5). The skills acquired by the students during the laboratory classes will be used in the projects, Capstone 1. Article 2. No cycle ECOF 9 and ECOF 10), and the project, in conjunction with a UI, or in the companies (ECOF 12).
Contingency measures	It is not possible to boost/redesign of the experimental training in the short term, it should be carried out in the strategy for the improvement of step-by-step course on sexually transmitted infections. In keeping with the design and the framework of current will be increased with the decrease of the teaching resources allocated to the laboratory, the expansion of the hour, and the flexibility to access them.

As PP 4	To promote the learning <i>the project, research</i> and <i>problem-based learning</i>
What a way to the measure also contributes to the pursuit of the objectives	It increases the efficiency of learning and the motivation of the students, and in the stimulation to the understanding of the material. This enhances the development of the creative and scientific thinking. It creates opportunities to work collaboratively in a team. This measure also contributes to the education of innovation and entrepreneurship.
The consequences to be expected, and the risk	Improving and increasing the effectiveness of the learning process. It stimulates the creation of a network of students, as a response to the challenges. It promotes a spirit of peace. Academic recognition of these skills are important and different to the new ones. The risk of a class of weak and/or individual are not able to keep up with this most demanding of the learning process. The risk of the initiatives we implement them specifically for this type of approach - p.and. design Capstone, university of coimbra to "Develop, Design, and Innovation" - to move forward at a slow pace.

The changes in the School, as required by the measure (including the features and operation	It should be made available to all teachers in the formation of what it is and how to implement it-based learning project, research, and problem-based learning. It requires the allocation of additional resources to the supervision of the children. The theoretical and practical lessons should be adapted to this way of learning. In some cases, it may be advantageous to promote the synergy between the CU ones.
Rational	The e-learning challenges, and projects, including projects with the business sector, research and academic character is intended to give students the skills they need to purchase in a particular area of knowledge through concrete real-world problems. This type of learning has its advantages with respect to other forms of more conventional, since it requires the use of multiple techniques in the learning approach to the problem, to stimulate as well, due to the importance of the work team, and an active role (and motivated) on the part of the students.
Connection with other measures	This has a direct impact on the measures of PP 1 , PP 2 , and PP 3 . Connection with ECOF 3 (and, consequently, with the ECOF 2 , ECOF 4 and ECOF 5). The skills acquired by the students in this teaching practice will be used in your projects, Capstone 1 .Article 2 .No cycle ECOF 9 and ECOF 1 0), and the project, in conjunction with a UI, or in the companies (ECOF 1 2).
Contingency measures	In the case in which the measure of the show are not to be effective, the Response should be to promote a shift gradually from the traditional model of learning through the project, the research, and problem-based learning.

As PP 5	Of training at the <i>the " soft-skills; soft skills</i> incorporated in the CU (and not at the CU-dedicated)
What a way to the measure also contributes to the pursuit of the objective	Cover, and properly plan for the training of different skills in a <i>soft skills</i> (presentation, written and oral, in a clear and compelling information science, the identification of objectives, planning the work, collaboration, leadership, and interaction with a diverse group; and the application of the methods of the research, the evaluation of the quality of the data, an assessment of the quality of the results, the critical spirit, the phrase in the English language, etc.). in the context of the CU ones. In addition, it is reasonable to expect that skills such as the ability to communicate and work with each other, are strengthened by the frequency of the switches in the CITIZENS. It provides a process of teaching and learning, the most comprehensive in the UC-existent, allowing the student to the exercise of the <i>soft skills</i> in the context of science. This measure also contributes to the education of innovation and entrepreneurship.

The consequences to be expected, and the risk	Best value for money in the learning and use of the soft skills. The formation globally of the most complete in the UC Science and Engineering. Academic recognition and assessment of these skills are important and different to the new ones.
The changes in the School, as required by the measure (including the features and operation	The training of the teaching staff. In each of the time periods, they should be covered in the different fields of soft skills (e.g., written, verbal communication skills, team work, etc.), in the context of applications in the existing ensuring that the students ' feedback in their performance in these areas. The identification of the CU in the course of the curriculum in which these skills should be taught, as well as the requirements for the minimum extent of the content, shall be carried out by the coordinators of the course, in conjunction with the CP. All pages and the UC will spell out the skills soft skills to be developed. It should also be considered to be (and it is duly released), the inclusion of measures for the training of students for the workshops offered by the center for Academic Development (Objectives), the Library of IST (are currently in) and the Area of Technology Transfer (TT,@ACT).
Rational	In today's world, it is imperative to establish a strong training within the different soft skills should such work be properly scheduled and coordinated between the various UC this course.
Connection with other measures	Closely connected with the PP 1-PP 4, as it is heavily dependent on the modification of the model to the teaching of the class and type of school. Connection with ECOF 9 and ECOF 10 due to the nature of these things.
Contingency measures	The enhancement of education in the soft skills through their incorporation into the CU-existing does not prove sufficient for the provision of this training should be completed through the unit for optional dedicated to you.
As PP 6	To increase skills in computer science and Programming. The integration of the fields of computer science and Programming at UC existing on-1.No cycle
What a way to the measure also contributes to the pursuit of the objectives	To increase and improve the training of students in computer science and Programming, in the context of applications that already exist.
The consequences to be expected, and the risk	The consolidation of the practical training of the students in computer science and Programming, showing (on a rolling basis, its importance and utility in the resolution of practical problems in the field of courses for each student. Enhancement of the curriculum of the training is in computer science and Programming, students of the Technical staff.

The changes in the School, as required by the measure (including the features and operation	The coordinator of the course are to promote the integration of the fields of computer science and Programming at UC- 1.No-cycle and re-evaluate the curriculum of the CU in order to enter the main aspects of the Theory of Computation and Computational Thinking. All pages and the programs of these UC's are expected to explain the advantages of a computer and Programming development. It should be taken into account in the distribution of the teaching ability of the teachers to the inclusion of computer science and programming of the UNITS. It should also be fostered with the collaboration of cross-functional expertise in teaching. They should also be offered to you for UC units in computer science and Programming, that can be chosen by students from a variety of courses within the framework of the free options/minors. You can apply for the strengthening of the equipment in the classroom. To assign a weight to a minimum of 1,5 ECTS), and 25 % of the assessment for the first half of this component, resulting in all of the 1's.No cycle for at least 6 CREDITS as a complement to the 6 CREDITS of basic training.
Rational	It is of paramount importance to increase the education in computer science and Programming, highlighting its importance and usefulness in solving problems in the areas of a number of courses at the helm.
Connection with other measures	Closely connected with the PP 1-PP 4 , as it is heavily dependent on the modification of the model to the teaching of the class and type of school. In connection with the RGE 7 in relation to the collaboration of cross-functional expertise.
Contingency measures	The enhancement of the skills of Computing and Programming, through its integration into the CU are to show it was effective, the response should be to reflect on other ways to cover the content and skills.

As PP 7	Training HASS (Humanities, Arts, and Social Sciences)
What a way to the measure also contributes to the pursuit of the objectives	It exposes the students to different topics and situations beyond the walls of the Coach. It increases the accountability of each and every student by his or her choices. It stimulates the generation of solutions, techniques for responding to the challenges and problems of the real ones), taking into account the non-technical.
The consequences to be expected, and the risk	Awareness-raising on the part of the students to the realities and concepts, ethical, political, economic, etc.). the society to which it belongs, and that you are the key to your life. The risk of a Coach does not guarantee you an offer the attractive and high quality product. The risk of an appreciation of the importance of the CITIZENS, for apparently not being directly involved in the engineering course. There may be potential difficulties in the implementation of the measure associated to the potential difference between the calendars for the academic lisbon, and of the other schools of the University of Lisbon, portugal.

The changes in the School, as required by the measure (including the features and operation	The central authorities they appoint a Committee with the mission of planning and organizing with the introduction of the training CITIZENS in the courses of the CONTEXT, considering the offerings of the internal and the external. It should also be considered for the opportunity to explore a wide range of the University of lisbon, Lisbon, within this framework, what it does, however,require a line at the level of the school calendars. It must be carried out by a survey of the CU are to research complementary to the existing STIS that are outside of the scope of the training on the CITIZENS. This may require the creation of a limited number of applications in the CITIZENS on the desk to ensure the completeness of the offer and to promote the accessibility of the class members in these UNITS. In the STI you should consider to submit proposals for the Erasmus+ (or others) within the scope of the training to CITIZENS (e.g., mobility of academic staff, projects and funding for the creation of a new protected area, the creation of the content, MOOCS, etc.).
Rational	All the students are somewhat prepared to deal with a situation that involves phenomena, properties, values, and people who cannot, or should not, be reduced to a quantitative measure. It is acknowledged as to the importance of investing in the development of civic responsibilities, and cultural rights, the ability to understand the impact of science and technology on the nature of the human and society, and in the dialogue between Engineering and other disciplines, and the ability to communicate with each other, and in the knowledge of the creative ideas coming from the non-STEM. It is intended, therefore, to provide an education on the CITIZENS as early as the 1.No cycle is in the form of a protected area based on the area of economic and Management, 3 ECTS credits and the unit of choice in a total of 6 CREDITS. Examples of skills for CITIZENS that are relevant to the context of the History of Science, History, Engineering, Economics and Global Challenges, International Relations,and major Texts, Ethical, Political, and Public Diplomacy, Environmental, etc.
Connection with other measures	This is a general form of the model, through which it is intended to provide the Engineer with a formation of a humanist, and a vision of the overall and all-encompassing. It is important that the measures that ECOF 9 and ECOF 1 0 , as the design Capstone requires a comprehensive, interdisciplinary, and inclusive, and also for the ECOF 1 4 , with the introduction of the concept of Career Planning.
Contingency measures	It is not possible to connect to the University of lisbon, Lisbon, CP, and CC, they should think about the demand for this kind of training is exclusive to the STI.

The extent PP 8	The restructuring of the internal model
In that way, to the extent it contributes to pursue your goals	You create a template that is compatible with the reduction in the average-significant (< 5 0 %) of the weight of the assessment, examination and the duration of the examination period, and the disappearance of trend tests during the term, incorporating elements of continuous assessment in the context of active learning (e.g., projects, a hands-on, homework assignments, etc.).

The consequences to be expected, and the risk	Improving and increasing the effectiveness of the learning process. The risk of non-implementation, due to lack of human resources. Risk of a range of students with a decline in performance, you will not be able to keep track of this model is the most demanding (and where academic success was heavily dependent on the evidence from the evaluation problems of the kind, and the multiple instances of the review).
The changes in the School, as required by the measure (including the features and operation	The control point should be to design a new model of evaluation, engaging with the GOP for this plan, and calendarize of the changes that are required to implement, at that time, this measurement. It is essential to increase the capabilities of human activities in support of education in order to implement the learning that is active, it is essential for on-going assessment. The teacher should take into consideration, in which the components of the assessment, it is appropriate to deploy in the rating <i>pass/fail</i> similar to the practice in other schools and colleges. You will need to adjust to the new model from the brand new calendar for a 2-week trial for a period of time), thereby ensuring the existence of the two phases of the trial in the case of the CU with the exam. It is essential that the school and the students to internalize the code of ethics, fostering collaboration, but in preventing and penalizing properly, the copy, and the prevention of fraud, in particular the on-going evaluation. In the response, and the pb will have to analyze the way in which the different types of evaluation (such as oral exams, projects, and work from home) if you reconcile it with the new template, and ensure that they comply with the rules for the trial on the effect on the School.
Rational	The new teaching model assumes that an increase in work, and in the evaluation of the long-term, with the expectation of a higher academic achievement (the result of a learning process more effective.
Connection with other measures	ECOF 3 , PP 1 , PP 2 , PP 3 , PP 4 , and RGE 1 .
Contingency measures	As long as there is the human resources that are necessary for the implementation of continuous assessment and evaluation methods that are inherent in the model of learning to play an important role in the CP must admit, alternative models, which enable us to keep this method of evaluation.

Resources, and the Management of the School

As RGE 1	Importance of human activities in support of the school there is a tendency for the installed capacity of the current must be multiplied by 2 -to 3 -fold.
In that way, to the extent it contributes to pursue your goals	Allows you to keep track of the active work on the part of the students, and the establishment of the CU, with a major component of the project, the projects are interdisciplinary, and cross-department, the greater the involvement of the students in the UI, the Coach, the transfer of the weight of the evaluation of the tests for the chips out of the work of the projects. The capability of the students to 1 .Article 2 .Th cycle of monitoring will increase their motivation for academic excellence, which may contribute to the maintenance of the School, while students from the 2 .Article 3 .No cycle), respectively. This measure will also be very helpful for the students of 3 -.No cycle is recruited as an Invited Assistants (Teaching Assistants, TAs). In general, this measure will contribute to reducing the gap between generations, between the students and the resources that humans are involved in education, and the significant increase of the esprit de corps of the School.
The consequences to be expected, and the risk	Overall improvement of the education system, in terms of form and content, and use effectively the number of hours of contact, pupils and teachers alike. The risk of the implementation of the model in case the number of human resources available to you if you come on the show for a premium, either globally or in a certain area. The recovery of the good practice of engagement, and for professionals in the engineering and in the school, with major success in high school and lost it recently.

The changes in the School, as required by the measure (including the features and operation

The increase of the human resources involved in the education of, for example, by giving the role in education, researchers, employees, faculty members from the UI to the business, guest lecturers, phd students and good students from the 2.No loop. With the introduction of a large number of new actors in the area of education, probably with a little experience, and even at a very young age, it will require effective co-ordination of their activities, a careful monitoring of the quality of teaching, the instances of the training, tutoring, etc.

For each Department, you should consider what type of human resources that are available that are better suited to their needs of departments and courses of study with the largest number of phd students will be able to use more of the Plants that have the largest number of post-doctoral researchers on units of the investigation will be able to engage them in the activities of the school, while in the departments and courses of study with a greater toll on the industry will be able to get the most out of these collaborations). The solutions are based on the students of + 2.No looping, and the 3 rd year of the 1.No loop, while the graders, and monitors are generally available in all of your classes.

The need to increase awareness of the School, there are activities that can be carried out with the advantage of non-teaching careers.

The need for teachers to recognize the interest and the contribution which the different actors are able to give to support the educational improvement of the quality of the education of a Coach.

The need for top managers to mobilize the necessary resources for the hiring of additional staff (academic and technical) to the extent that they are not necessarily paid. This action will take into account the fact that the hiring of faculty members with permanent, must be kept at a level that will ensure a renewal of the teaching staff. The need for further education in the trial, and the paradigm shift in the functioning of the areas of the laboratory, and offices implies that the increase in the recruitment of technicians in the laboratory, and for the Cas (for the replacement of teachers in the framework of the standing), and the enhancement of their own learning. The DIRECTOR shall plan and the scheduling of the changes that are required to implement, at that time, this measurement. The organ of the School, and in particular to the terms and conditions, shall provide the DIRECTOR with the necessary means..

Rational

Operation of hands-on classes, with active work on the part of the students, and the creation of additional CU in the design of a more or less developed, and, in general, it's the best use of the contact hours between teachers and students and requires more and more stakeholders in the area of education. These add-ons are also essential in the creation and management of the logistics of the projects are multi-disciplinary, inter-departmental, are able to stimulate the creative potential of the students and to focus on the problems that science and technology become more complex, and state of the art. Many of the tasks currently carried out by the faculty members of the profession, for example, to fix, to work from home, monitoring, and patch tests) may be performed by the TAs, or the students of doctoral studies, thus allowing the faculty to a greater focus on the preparation of the lecture/ work/ projects/links with the UI. Beware the reasonableness of the burden of teaching them that they are assigned to, there will be an impact on the formation of new entrants in the teaching, in particular, in the case of the student of the 2.No cycle that, in teaching the folks from the 1.No cycle will improve the understanding of their own material that they are teaching, and exercitação skills such as leadership, communication, team work, etc. It also seems natural and is a very good opportunity for all the students of the phd in order to follow closely the work of the students from 1 to.Article 2.No-cycle of projects, including those related to their fields of research.

It is recognized, it is evident that, under certain circumstances, students are able to learn quickly when learning is performed by the actors in them are more close to each other (for example, students in the MSc to teach the students in the BSc, students, PhD students, MSc, etc.). Of course, this is the kind of agents are, by definition, is the most volatile, requiring an effort to regulate the coordination, organization, and training. The involvement of students in the PhD in education, such as Tapes, it must be properly framed in the formation of the doctoral programmes at the helm.

This measure is particularly beneficial in the departments, with a view to the systematic teaching of the table.

Connection
with other measures

Vital and indispensable to the implementation of the measure, PP 4 , and, in consequence of the measures, PP 1 , PP 2 , and PP 3 , as well as all dependent on them.

Contingency measures

The implementation of a number of measures related to learning is to be more active, and in particular to the measures for ECOF 9 APPLICATION you Develop, Design, and innovation), ECOF 1 0 Project (Capstone 2.No cycle), ECOF 1 2 projects/CU in the joint), ECOF 1 6 (with no trend of running applications in the first half alternate), PP 2 (a change in the operation of hands-on classes), PP 3 (enhancement/overhaul of the training of the trial), PP 4 (reinforcement learning *the project. research* and *problem-based learning* and PP 8 restructuring of the model-you will need to be made compatible, in his timing, extent, and depth. In fact, the feasibility and success of these measures depends on the availability of human resources, and additional; in the absence of these features, it should be kept temporarily in the current so as not to compromise the quality of the training that is currently offered.

As RGE 2	The formation of Innovation in the Education Technology & Engineering
What a way to the measure also contributes to the pursuit of the objective	Changes in the education system through the training of human resources (teachers, TAs, broker-dealers, researchers and students) in the use of learning strategies, active and collaborative teaching techniques, and excellence in teaching. It provides training in soft skills, design, and the project is interdisciplinary and in English language.
The consequences to be expected, and the risk	The improvement of the whole system of teaching and learning, at the level of form and content. One of the risks that are most relevant is that the length and breadth of the training of the teaching staff and the timeframe in which this is achieved is less than the requirements for the implementation of the new model.
The changes in the School, as required by the measure (including the features and operation	Human and material resources in order to ensure the training of all those involved in the education system, and in particular on the new teaching methods and technologies of education. The effectiveness of this measure is to be mobilized to the Departments, and the regular follow-up and training of your staff.
Rational	The best way to implement the education system is active, that is, through the training of actors and stakeholders in the education system. The training of the teaching staff at the English language allows you to tend to to teach is 2.No loop in the English language and is, therefore, open to the 2.No cycle with a range of new international students.
Connection with other measures	Vital and indispensable to the implementation of the measure, PP 4 , and, in consequence of the measures, PP 1 , PP 2 , and PP 3 , as well as all dependent on them.
Contingency measures	While the faculty members are engaged, prepared, and comfortable for a new way of teaching, the CU may be a temporary period and for the outstanding work on the model of the current so as not to compromise the quality of the training that is currently offered
As RGE 3	To renew, re-equip and open spaces, in the laboratory, LTIs and the c
What a way to the measure also contributes to the pursuit of the objective	Allows access to the education and research since its early years, through the execution of the work in the lab today, on the basis of free facilities for access to 2 4 hours a day), and in the scheme of the project. It allows for the active, collaborative, student-oriented, especially in the hands-on classes, and CU in the project.

The consequences to be expected, and the risk

The improvement of the whole system of teaching and learning, at the level of form and content, and use effectively the number of hours of contact, pupils and teachers alike. The risk of the implementation of the model (in particular, the measures ECOF 9 , ECOF 1 0 , ECOF 1 2 , ECOF 1 6 , PP 2 , PP 3 , PP 4 , PP 5 , PP 8) in the event the renovation and re-equipment of the spaces that will not be deployed.

The changes in the School, as required by the measure (including the features and operation

The renovation of the infrastructure, increasing the funding allocated by the School to this effect, and by taking advantage of the partnership's business and connections with alumni in the framework of the strategy for the renovation of infrastructure for teaching and learning (e.g., the co-financing of investments, donations of equipment, the naming of places, such as contrast, etc.). A review of the conditions and time of access to the laboratories, and the conditions under which , and the associated security. Enhancement of the library as a frame of reference to support the work of the individual and cooperation of the students in the paradigm of active learning, by taking advantage of these spaces and of their human resources, in coordination with the Coordinator of the Course. The appreciation of the spaces in the laboratory of the research facilities in support of the education experience of the students, in conjunction with these units. The changes in the physical space should be carried out in conjunction with (i) the mobilization of the human resources available for the support of education, and (ii) the preparation of teachers for the new paradigm of teaching. The implementation of this measure should be aware of the concept of "design for all" and "design for inclusion, ensuring accessibility to all users, regardless of their level of mobility.

Rational

The renovation and re-equipping of classrooms, allows for the active (excluding central to the teaching staff, and improving the supply of technology in the classroom), the collaborative, accountable, focused on the students during the practical classes, and in the UC project. The renovation and re-equipment of laboratories, and LTI allows you to access to higher education and research since its early years, through the execution of the work in the lab today, in a problem-based learning, or project-and-under free. Develop a true scientific thinking, and the ability to solve problems. It promotes collaborative work outside of the protected area.

Connection with other measures	Vital and indispensable to the implementation of the measure, PP 4, and, in consequence of the measures, PP 1, PP 2, and PP 3, as well as all dependent on them.
Contingency measures	The implementation of some of the proposed measures is closely related to the renovation and re-equipment of the space. This is the case, the measures of PP 1 (a change in the operation of the lectures), PP 2 (a change in the functioning of the classes, practice), PP 3 (enhancement/overhaul of the training, the experimental and PP 4 (promoting a learn-by-project, research, and problem-based learning. The measures, PP 2 and PP 4, since it provided the necessary human resources, may be deployed temporarily, and with the rearrumação the classroom the classroom is a great deal of investment on its renovation. The measure of PP 3 is expected to be implemented in accordance with all the features you will be able to mobilize to ensure that the access is open to the students, it is always done in terms of safety, security, for their own equipment, and sustainability. Apart from these features, the laboratories are expected to maintain the current regime is in operation, so as not to compromise the quality of the training is now offered to you. Nevertheless, it is considered that, even in the conditions of today there is no room to increase significantly in the experimental training of the students of the Technical staff.

As RGE 4	The improvement of the Marketing and Communications at the
In that way, to the extent it contributes to pursue your goals	The most high-profile community Services (teaching and research), his offer of training, and research to promote an increase in the number of applicants to the following courses from the School, and in particular in the course of general Science in Engineering, 1.St stage (English and Spanish) and also for the different classes of the 2.No cycle, while ensuring a true increase in mobility at the level of 2.No loop.
The consequences to be expected, and the risk	The strengthening of the brand's Technical support. The greater number of the students, candidates, both domestic and foreign, in the general course in Engineering Science at 1.Th cycle, and the course of the 2.No loop.
The changes in the School, as required by the measure (including the features and operation	The improvement of the marketing and communications at the School, with professionals in those areas), with the Interior and the Exterior, by releasing more effectively with the skills and training is available from the School and interacting with those who are potentially interested in (by removing this burden, one of the coordinators of the course). The development of a strategy that is specific to the distribution (in the markets of the target population) of the general course in Engineering Science, based on the innovative design of the course and the faculty, the excellence of which it is built. It is very important in this context to re-structure page of 1.Article 2.No loops, to the personal home pages of faculty members and researchers, making it easier to navigate, more active, attractive and up to date.

Rational	The aim is to develop a strategy for marketing (traditional and digital) with a professional in a medium-to-long term, with the financial support is appropriate, so as to attract students (domestic and international) for the course in general Science and Engineering courses for 2 people.No cycle, as well as the strength of the brand new Coach.
Connection with other measures	Essential to the ECOF 1, due to the increase of the mobility, which is motivated by the breakdown of the 1.Article 2.No looping, and the need to attract students outside of the Coach. Which is essential to the success of the ECOF 1 1. The close linkages with the RGE 8 and RGE 9.
Contingency measures	The implementation of the measure ECOF 1 1 Course of General Science in Engineering, it will depend on the success of this programme. In particular, the 1st edition of the course, you should only be opened after an intensive distribution of this offering and the impact of potential users. This is essential for the recruitment of a good student for 2.the cycle of the Desk.

As RGE 5	Experience the university on-campus residential development, improvement in the areas of education and the study (one-to-one or group), that of the living, and recreational activities, cultural and sports activities.
What a way to the measure also contributes to the pursuit of the objectives	It offers a college-educated, full life, not only from the point of view of the intellectual, but also from the point of view of the human and the social. It allows for a total immersion in the academic environment, fostering connections, unpredictable, and humanising the experience of the university.
The consequences to be expected, and the risk	The improvement of the conditions in the episode " the university will allow students to improve their academic performance and to complete his training in the engineering and development personnel in the areas of sport, arts and culture. In particular, the increase in the number of halls of residence, it minimizes the time spent by the students in the movement (often excessive).
The changes in the School, as required by the measure (including the features and operation	The creation of a single campus of the Technical University of Lisbon, portugal. The creation of the residence halls on campus, or nearby locations, which will allow your students to live in university-creation-of-area, multi-purpose support to the formation of extra-curriculum in terms of culture, the arts and sport, in close cooperation with the University of Lisbon, portugal). The implementation of this measure is expected to have in mind the concept of "design for all" and "design for inclusion, and ensuring accessibility to all users, regardless of their level of mobility. The need of the organs of the company (the Technical University) to mobilize all the resources needed by taking advantage of business partnerships, grants , and links to the alumni. The need to improve communication with the community, Technical, promoting all the activities that are most relevant, the nature of education, but it is also a recreational, cultural and sporting.

Rational	The training of the engineer, from the point of view of human rights is without a doubt the most solid, and if you live in a university, to the contrary, that the acts of the company that provides the conditions for the formation of complete and integrated.
Connection with other measures	The measure is linked to the ECOF 1 4 , as it allows us to give the students the different types of training offered. This measure also includes the improvement of the communication from the school, and they are well connected to the RGE 4 .
Contingency measures	During the period, the improvement of the campus, the proposed model allows you to mitigate some of the limitations of the lives of the students in the Technical space, and in particular, by an increase of the area of the rooms that are available for off-line work (due to the reduction in the number of hours of instruction per week), the role of the integration of the spaces, such as libraries, the learning, and the reduction of contact time a week, freeing up time for the students to develop themselves in other activities.
As RGE 6	The system of incentives for a change in the teaching and activities, worth of credits in the study
What a way to the measure also contributes to the pursuit of the objective	It allows teachers to join and commit to a new model of education , and pedagogical practices. Discourage the maintenance of the teaching practices are historically rooted in the School, but they are not conducive to learning that is active and effective.
The consequences to be expected, and the risk	It encourages teachers to implement the new model of education, and the new ways in teaching the language.
The changes in the School, as required by the measure (including the features and operation	The need for a change in the Assessment of the Performance of the academic staff of the IST (RADIST), and the Regulation of the Provision of the Service of the Staff, in particular with regard to the valuation, almost exclusively, to the time that is spent in the classroom at the expense of time devoted to planning. Re-equação of the criteria for the granting of credit in school for teacher.

Rational	The School must have a vision of a more flexible, comprehensive, and what is the role of teaching, valuing, and in full recognition of working as a lecturer in the activities for the improvement of the curriculum, and the design and engineering of the university of coimbra work, exercises, and projects, and delegating routine tasks (e.g., monitoring, and correction of the exam) from other teachers that need to be entered into the system. An evaluation of a truly continuous, and giving to the work of the house, and it presupposes an ethical attitude on the part of the students, but of course, the formulation of problems and listed the different year-to-year.
Connection with other measures	Essential to the implementation of all the measures of teaching practices (PP 1 -PP 6).
Contingency measures	As the organ of the School to regulate the enhancement of the activity of the pedagogical and non-free time in school so that the teachers are able to implement the measures recommended by the CAMEPP, the Coordinator of the Course are to assess the feasibility of putting in place the measures (in terms of length and depth, semi-annual, and CU in the CU. Until this be granted, it may be desirable to have a UC, which will keep the system in actual operation.

As RGE 7	Identification and removal of potential obstacles to the promotion of an interdisciplinary approach in education
What a way to the measure also contributes to the pursuit of the objective	It allows, in practice, that is, a scale is reasonable, and significantly higher than that of the present, and the students of the course is on the department to be able to take advantage of the UC to other departments, and interdisciplinary projects involving multiple departments.
The consequences to be expected, and the risk	A substantial increase in the interaction of teaching and research activities are interdisciplinary. Rise of the collaborative effort between the departments. The risk of a perception, on the part of government departments, the risk of a loss of size due to the reduction in Ftes. The risk to the maintenance of the poor collaboration of cross-functional expertise, which raises efficiency, and no power, and the gains to be expected from the model Técnico 2 1 2 2 .

The changes in the School, as required by the measure (including the features and operation	The Board of Management will have to implement a method for managing resources in a more flexible, and in the spirit of the incentive, and that is not punitive, it guarantees continuous departments, and that free up (more), get the features, thus giving them the opportunity to focus on collaboration instead of competition. It must be re-solved with the use of the calculation of Ftes as a model for the development of the School, which inhibits the collaboration between the departments of the change, and the implementation of designs, curricular flexibility, mobility, and inter-disciplinary skills. On the other hand, the Scientific Committees and of the managers of the courses are expected to have greater autonomy than the departments. We propose the creation of ad hoc Committees, which are comprised of the members of the CC of the CP, to come up with a better way of implementing the proposed changes.
Rational	Many of the measures proposed in this report (e.g., greater coordination between the UC and expertise, access to all of the students of + 2.No cycle at all minors, projects, Capstone interdisciplinary studies, an increase in the flexibility of the curriculum, the creation of a general course in engineering, 1.No looping, etc.). they are based in the collaboration of the inter-agency and enforcement. It is therefore a fundamental, on the one hand, to create the conditions that allow, encourage, and enhance collaboration among the departments, and, on the other, to remove the obstacles to that cooperation. Only in this way, the students will be able to make full use of the new models of flexible learning, and enriches them with the interdisciplinary activities connected at the same time, the number of Departments.
Connection with other measures	This measure is closely related to the measures of ECOF 1 , ECOF 2 , ECOF 6 , ECOF 7 , ECOF 9 , ECO 1 0 , and ECOF 1 3 .
Contingency measures	Regardless of the level of implementation of the model, the CAMEPP believes that law School should be to ensure that the curriculum of all the courses to be revised in order to guarantee a substantial increase in flexibility, in particular by means of the CU option 2.No cycle, as well as to encourage the collaboration of cross-functional expertise.

As RGE 8	Operation of the expertise of the one Admissions Office and the change of the proceedings and the date of the application to the 2 nd cycle in the dates of the call for applications to the 2.No cycle is consistent with the other schools, with international and 2.No cycle tend to be in the English language.
How does the measure contribute to pursuit of the objectives	Allows you to increase the enrollment of international students.
The consequences to be expected, and the risk	The increase in the number of international students at the Desk. The difficulty of some of the teachers teach effectively in the English language

The changes in the School, as required by the measure (including the features and operation	It is necessary to keep under review the procedures, time-limits and methods of evaluation and selection of applications. You must be clear, the allocation of equivalence. Changes are required in connection with the marketing of the School. The likely need for the training of teachers in relation to teaching in the English language. It is vital that we continue to ensure that the courses for 2 people.No looping, and the presence of other international students, the classes will be taught in the English language and the elements of the study is available in German and English, in an operation that is integrated with the student from Portugal (forming the classes are separated from the students, even when the number of students in the summer. The CG should be the implementation of a data structure of type "the Admissions Office, which will ensure that(i) improving the dissemination of the training is available in the context, and (ii) follow-up and advice to potential applicant, and (iii) the initiation of the informal processes of the application, giving you the proper follow-up and monitoring of the expression of interest no later than the effective implementation of the application. Taking into account the legislation in force and the terms and conditions, via the Directorate of higher education will have to evaluate the best way to implement this measure.
Rational	The globalization is a factor of great importance to the School, and, in this context, the potential of the 2.the cycle to attract international students is enormous. It is, therefore, imperative to make an adjustment to the time periods for the application in order to ensure that these students will enroll in courses at the desired time, thus facilitating the entry into the Coach, and the adaptation of the Country.
Connection with other measures	Vital to the ECOF 1 .
Contingency measures	During the period, the improvement of the campus, the proposed model allows you to mitigate some of the limitations of the lives of the students in the Technical space, and in particular, by an increase of the area of the rooms that are available for off-line work (due to the reduction in the number of hours of instruction per week), the role of the integration of the spaces, such as libraries, the learning, and the reduction of contact time a week, freeing up the time for the students to develop themselves in other activities.

As RGE 9	The Re-design of the web pages (the courses, university of Coimbra and
What a way to the measure also contributes to the pursuit of the objective	It enables students, prospective students and the general public, the national and international levels, to obtain complete and current information about all the courses, and improving the image of the Coach.
The consequences to be expected, and the risk	The good pages, and up to date, from 1 to.and 2.the cycle of the academic staff, in Portuguese and in English, to create a more attractive of the courses at the Tech. The bad pages with a bad design, and information is insufficient or out-of-date), have the opposite effect.



Committee on Review of Education, and Pedagogical Practices of the IS - CAMEPP

Version Of The Magazine Feb 2 0 1 9