Guidelines for the presentation of the Bachelor's Thesis in Agricultural and Biological Engineering

Content

1. Introduction

Article 2 of the Universitat Politècnica de València (hereinafter, the Regulations) states that the Bachelor's Thesis (TFG) shall consist of the completion of an original work or project in which the knowledge, skills, and competencies acquired by students throughout their studies are demonstrated.

The Bachelor's thesis is an autonomous activity of the student, carried out with the support of one or more tutors during the last stage of the graduate's training and where the final result is presented and defended before a university board by the student.

For students of the Bachelor's Degree in Agricultural and Biological Engineering (GIAMR), and in accordance with **ORDER 323/2009**, of February 9, 2009, which establishes the requirements for the verification of official university degrees that enable the exercise of the profession of Agricultural Engineer, the Bachelor's thesis must consist of a project in the field of specific technologies of Agricultural Engineering of a professional nature in which the competencies acquired in the courses are synthesized and integrated (ANNEX I).

Without prejudice to these guidelines, the Regulation is available on the UPV website and the school's web page. In addition, students can consult additional documentation that complements these guidelines on the website of their degree program.

2. Mandatory content of the Bachelor's thesis at the GIAMR

The Bachelor's thesis should constitute a complete design experience and include an engineering design that allows the student to incorporate engineering standards according to existing constraints (technological, social, environmental, economic, etc.) and builds on the knowledge and skills acquired during the degree. Whatever the proposed content, the Bachelor's thesis must conform to the spirit of the Regulation and apply to a practical case in the degree field.

Engineering design is a process of conceptual development of a system, component, or process to meet desired needs and specifications within constraints. It is an iterative, creative decision-making process in which the basic sciences, mathematics, and engineering sciences are applied to turn resources into solutions. Engineering design involves identifying opportunities, developing requirements, performing analysis and synthesis, generating multiple solutions, evaluating solutions against requirements, considering risks, and making trade-offs for the purpose of obtaining a high-quality solution under the given circumstances. For illustrative purposes only, possible constraints include accessibility, aesthetics, codes, constructability, cost, ergonomics, extensibility, functionality, interoperability, legal considerations, maintainability, manufacturability, marketability, policy, regulations, schedule, standards, sustainability, or usability.

In the **executive summary of the Bachelor's thesis** (ANNEX II), mandatory for GIAMR students, the concepts to be included in the work will be stated, which must be duly justified and discussed throughout the work, focused on the specific field of Agri-Food Engineering. **The Rubric of evaluation** by the board of the fulfillment of the contents can be found in ANNEX VI.

According to the Agreement, when submitting the Bachelor's thesis, students must include information on the **degree to which their work is related to the Sustainable Development Goals** of the 2030 Agenda (hereinafter, SDGs). A template to describe the alignment of the work with the SDGs is provided in ANNEX III, which is mandatory for students to complete.

3. Bachelor's Thesis Procedure

3.1. Modality of the Bachelor's thesis and Tutor assignment

The student will be assigned at least one academic tutor (TA) from the UPV. Any active academic staff of the UPV or any teaching collaborator can perform the function of TA or co-tutor, regardless of their center of assignment (article 3 of the Regulation). The Bachelor's thesis may be carried out in the following modalities:

- **Arranged.** This is the most common model: the student contacts the faculty staff directly with whom they wish to complete the Bachelor's thesis.
- **Search in a Bachelor's thesis catalog,** which is the minority type of assignment. The interested party contacts the potential tutor.
- **Company.** Through the Company Internship Unit of the ETSEAMN, when the internship agreement includes the development of the Bachelor's thesis in relation to the company.
- **Mobility.** The Bachelor's thesis can be completed during the mobility period with the support of the ETSEAMN International Office.

The Bachelor's thesis carried out in collaboration with companies or institutions must be formalized through an educational cooperation agreement, in which there must be an external co-supervisor with a contractual relationship with the company or institution in which the work is carried out and a TA.

The ETSEAMN must guarantee that every student enrolled in the subject **Final Degree Project** has a Bachelor's thesis and a TA assigned.

3.2. Bachelor's thesis proposal to CAT

The student must be enrolled in the subject to register for the Bachelor's thesis proposal. The Bachelor's thesis proposal can be written either by the TA or the student, with the TA's approval, through the Ebrón application. The proposals will be studied by the department of the TA and, after validation by the latter, by the Academic Committee of the Degree (CAT). According to Art. 8 of the Regulation, the proposals may be approved, rejected, or rejected with the possibility of correction. Once the CAT has approved the proposal, the status of the Bachelor's thesis is "Assigned to a student," and the student can see it through their virtual secretary.

The proposals of the work should include an outline of the key aspects established in the executive summary of the Bachelor's thesis (ANNEX II), in particular, approach, objectives, and method (including key elements in which the design process is expected to be applied - approach, analysis, evaluation and justified selection of alternatives taking into account current regulations and other multiple constraints). In addition, it must be included in the summary in which area of

the specific technologies of Agricultural Engineering (**ORDEN 323/2009**) it is aligned.

Dates for registering (recording) new proposals: The ETSEAMN establishes the start and end dates for recording proposals for the course at the beginning of the academic year. It is advisable to do so when there is an agreement between the student and a TA. Proposals must be registered at the beginning of the work so that the Academic Committee can review, accept, or reject them and propose improvements if necessary.
Confidential proposals: When the proposal is created, it may be requested that the Bachelor's thesis be confidential due to the possible existence of agreements with companies or the possibility of generating patents. It is up to the CAT to grant this request. If the Bachelor's thesis is confidential, the defense procedure (behind closed doors and signing of a confidentiality agreement by the board members) and the publication of the work in the database will be restricted.
Withdrawal of the approved Bachelor's thesis proposal: To withdraw from a Bachelor's thesis, the student must email the ETSEAMN secretary's office, with a copy to the TA, explaining the reasons for the withdrawal. The request will be resolved by the CAT after studying the case.
Minor changes in the title or abstract of the approved Bachelor's thesis proposal: If, during the work, it is considered that a change in the title or abstract should be made, the student must request it through the intranet. The request will be resolved by the CAT after studying the case.

Once the Bachelor's thesis proposal is approved, the student must develop their work under the supervision of the TA. The work will be ready for presentation when the required contents are completed and when the annexes described in these guidelines are fulfilled.

4. Bachelor's thesis presentation and defense process

4.1. Filing and defense deadlines

In accordance with the Regulations, the ETSEAMN establishes at the beginning of the academic year the calls for the defense of the Bachelor's thesis previously approved by the School Board and published on the website of the degree and the center. Each call establishes the deadline for submission of the student's work to Ebrón. It also shows the defense period for each call.

During the dates provided in each call, and the conditions established in Art. 11 of the Rule are met, the student will request the defense of their Bachelor's thesis through Ebrón.

4.2. Bachelor's thesis documents

The documents to be submitted by the student body through the application are:

1. Complete Bachelor's thesis or main document - Report (document 1) to which Ebrón adds an automatically generated cover page. After the table of contents, the main document will include the **executive summary** of mandatory completion for GIAMR students (see ANNEX II) and the alignment document with the SDGs (see ANNEX III).
2. Annexes that go with the main document (document 2) include calculations, drawings, etc.

ANNEX IV describes in detail the minimum structure and content of the Bachelor's thesis documents. ANNEX V contains the recommendations for text editing.
After passing the defense phase, the documents corresponding to the Bachelor's thesis become part of the institutional repository (currently Riunet), as established in the regulations for archiving and disseminating academic work of the UPV. In the case of Bachelor's theses with a confidential nature, they will not be available in the public repository. They will remain under the custody of the ETSIAMN within the application.

When the student signs the defense application, Ebrón asks them to complete a competency and employability assessment survey and a series of questions related to the SDGs.

4.3. Confidentiality request

When the confidentiality of the project has been requested in the Bachelor's thesis proposal, the defense becomes on camera (without the public), and the board members sign a confidentiality commitment through the application.

4.4. Mode of defense (face-to-face or virtual).

For justified reasons, the student may request defense by videoconference (virtual) (email to the center's secretary). The CAT must approve the defense by videoconference and will communicate this to the board members.

4.5. Defense procedure

Once it has been verified that the student meets the conditions for the presentation of the Bachelor's thesis and that the documents submitted are correct, the board will be assigned. Once the board has been assigned, it will not be possible to request the cancellation of the defense.

The student will be informed by email of the institutional address of the UPV of the assigned defense and session, as well as the location (face-to-face or virtual) where the defense of the work will take place. It is the student's responsibility to make sure that the email address is operative.

The TA is responsible for preparing a report on the student's work for consultation by the board.

4.6. Defense before the board

It is recommended that the student attends the call with sufficient time in advance. The defense call has the same official character as any other act of academic evaluation. The student is responsible for ensuring their physical or virtual presence and having the necessary means to carry it out.

The defense will last a maximum of 45 minutes. The student will have 15 minutes to present the

most relevant aspects of the work. After the presentation, the board may ask any questions it deems appropriate about the presentation and the document.

The evaluation of the Bachelor's thesis will include the quality of the document (content and form) and the oral presentation and defense of the same. The ERT will ensure fairness in the evaluation of all Bachelor's theses; on the one hand, considering the composition of the different boards and the assignment of the same to the Bachelor's thesis, and on the other hand, for which it has developed a rubric (ANNEX VI) in which the quality of the same in terms of content (particularly the magnitude of work done) and form, and the evaluation of the oral presentation and defense of the same is evident.

At the end of the defense, the board will deliberate and grade the Bachelor's thesis; after the board's secretary signs the minutes, the student will receive the grade in their mail.

The board may grade the Bachelor's thesis:

- As PASS (with a grade between 5 and 10),
- As PASS, with minor modifications, in this case, the minutes will be signed when the student makes the modifications indicated by the board, uploads the new version of their Bachelor's thesis, and the board secretary verifies that the requested modifications have been included.
- As NOT PASSED. The board will generate a report for the student explaining the grade. The student will be able to defend their improved Bachelor's thesis again in another call of the same academic year. If the Bachelor's thesis is graded as NOT PASSED in the last academic year exam, the student must re-enroll in the subject if they want to defend it in the following academic year.

4.7. Bachelor's thesis submission for awards

Several awards are announced by degree or subject for TFGs, both ETSEAMN's and external (company chairs, official schools, etc.). Students are advised to consult with the TA and find out about these awards since many of the TFGs presented at the ETSEAMN have a reasonable chance of winning one of these awards.

Annex I. Specific Technologies of the Bachelor's thesis of the GIAMR according to CIN ORDER

In Agreement with ORDER 323/2009 of February 9, establishing the requirements for the verification of official university degrees that enable the exercise of the profession of Agricultural Engineer, the Bachelor's thesis will be an original exercise carried out individually, which must be presented and defended before a university board, consisting of a project in the field of specific technologies of Agricultural Engineering of a professional nature in which the competences acquired in the courses are synthesized and integrated.

- **Agricultural and Food Industries:** Food engineering and technology. Basic food engineering and operations. Food technology. Processes in agri-food industries. Modeling and optimization. Quality and food safety management. Food analysis. Traceability. Engineering of the agri-food industries. Auxiliary equipment and machinery for the agri-food industry. Automation and process control. Engineering of works and installations. Agro-industrial constructions. Waste management and utilization.
- **Agricultural and livestock farms**: Animal production technologies. Animal anatomy. Animal physiology. Animal production, protection, and exploitation systems. Animal production techniques. Animal genetics and breeding. Plant production technologies. Production and exploitation systems. Crop protection against pests and diseases. Technology and cultivation systems of herbaceous species. Agroenergetics. Agricultural and livestock farm engineering. Electrification of agricultural and livestock farms. Agricultural Machinery. Irrigation systems and technology. Agricultural constructions. Animal health and welfare facilities.
- **Horticulture and Gardening.** Technology of horticultural production. Bases and technology of horticultural, fruit, and ornamental propagation and production. Quality control of horticultural products. Marketing. Genetics and plant breeding. Engineering of green areas, sports facilities, and fruit and vegetable farms. Civil works, installations, and infrastructures of protected areas. Electrification. Irrigation and drainage. Machinery for horticulture and gardening. Environmental and landscape engineering. Environmental legislation and management; Principles of sustainable development; Market and professional practice strategies; Valuation of environmental assets. Hydrology. Erosion. Plant material: production, use, and maintenance; Ecosystems and biodiversity; Physical environment and climate change. Analysis, management, and land management plans. Landscaping principles. Specific tools for design and graphic expression; Practical development of environmental impact studies; Environmental and landscape restoration projects; Green area maintenance projects and plans; Development projects. Instruments for land and landscape planning; Management and planning of projects and works.
- **Mechanization and Rural Constructions:** Plant and animal production technologies. Phytotechnology; Biotechnology and Plant Breeding; Crops; Crop Protection; Gardening and Landscaping. Sports areas. Nutrition. Hygiene and animal production systems. Biotechnology and animal breeding. Animal products. Bases and technology of rural constructions. Soil Mechanics. Materials. Strength of materials. Design and calculation of structures. Agricultural constructions. Infrastructures and rural roads. Agricultural mechanization. Agricultural engines and machines. Characteristics and design of machinery for agricultural installations. Agricultural automation. Engineering of installations. Rural electrification. Irrigation and drainage technology. Hydraulic works and installations. Animal health and welfare facilities.

http://www.boe.es/boe/dia s/2009/02/19/pdfs/BOE-A-2009-2803.pdf

Annex II. Proposed Bachelor's thesis Executive Summary

EXECUTIVE SUMMARY:

To comply with ABET student outcomes 1 (complex engineering problems) and 2 (engineering design), the B.Sc. Thesis in Agricultural Engineering must include the following concepts in the text, properly justified and discussed, focused on the field of Agricultural Engineering.

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CONCEPT (ABET)	**CONCEPT (ABET)**	**Complies (Y/N)**	**Where (page/s)**
1. IDENTIFY:	1. IDENTIFY:		
1.1. Problem statement and opportunity	1.1. Problem statement and opportunity		
1.2. Constraints (standards, codes, needs, requirements, and specifications)	1.2. Constraints (standards, codes, needs, requirements, and specifications)		
1.3. Setting of goals	1.3. Setting of goals		
2. FORMULATE:	2. FORMULATE:		
2.1. Creative solution generation (analysis)	2.1. Creative solution generation (analysis)		
2.2. Evaluation of multiple solutions and decision-making (synthesis)	2.2. Evaluation of multiple solutions and decision-making (synthesis)		
3. SOLVE:	3. SOLVE:		
3.1. Fulfillment of goals	3.1. Fulfillment of goals		
3.2. Overall impact and significance (contributions and practical recommendations)	3.2. Overall impact and significance (contributions and practical recommendations)		

The text included in the right column should include references to the most significant sections of the report in which these aspects of the Bachelor's thesis are developed.

Annex III. Relation of the work with the Sustainable Development Goals of the 2030 Agenda Annex to the Bachelor's thesis.

A. Indicate the extent to which the work relates to the Sustainable Development Goals (SDGs).

	High	Medium	Low	Not applicable
SDG 1. No Poverty				
SDG 2. Zero hunger				
SDG 3. Good Health and well-being				
SDG 4. Quality education				
SDG 5. Gender equality				
SDG 6. Clean water and sanitation				
SDG 7. Affordable and clean energy				
SDG 8. Decent work and economic growth				
SDG 9. Industry, innovation, and infrastructure				
SDG 10. Reduced Inequalities				
SDG 11. Sustainable cities and communities				
SDG 12. Responsible production and consumption				
SDG 13. Climate action				
SDG 14. Life below water				
SDG 15. Life on land				
SDG 16. Peace, justice, and strong institutions				
SDG 17. Partnerships for the goals.				

B. Briefly describe the alignment of the Bachelor's thesis with the SDGs, marked in the table above, with a high grade.

***use as many pages as necessary.

Annex IV. Structure and formal content of the Bachelor's thesis

The Bachelor's thesis is fundamentally an academic exercise that confirms that students have acquired some of the competencies established in the degree's verification report. Therefore, it must clearly reflect both the justification and development of the solutions adopted. In the work, students must reason the solution adopted from a set of possible alternatives in accordance with the applicable regulations and the most important restrictions in the specific scope of the problem so that they can be evaluated for their ability to apply the knowledge acquired in their studies.

The **minimum** structure and **contents of the Bachelor's thesis** must be:

1. ***Bachelor's thesis cover page***
   The Ebrón platform automatically generates the cover page of the work. The cover page includes precise information about the author and tutor(s), the institution, degree, and academic year in which the Bachelor's thesis is presented. The cover page of the document will coincide with the first page of the document.
2. ***Bachelor's thesis summary***
   The summary of the Bachelor's thesis will constitute the second page of the document; it will be related to the starting date of the degree proposal approved by the CAT.
3. ***Dedications or acknowledgments***
   Optionally, a page may be included in which dedications, acknowledgments, quotations, or information related to participation worthy of mention in the elaboration of the work are expressed. Acknowledgments may include persons, institutions, or companies participating in collaborations.
4. ***Bachelor's thesis document indexes.***
   The work will include an index of the entire document and thematic indexes of tables and figures according to the forms and contents recommended in the following sections of this annex.
5. ***Executive Summary***
   Described in Annex II.
6. ***Relation of the Bachelor's thesis with the Sustainable Development Goals of the 2030 agenda.***
   Described in Annex III.
7. ***Bachelor's thesis descriptive report (no more than 40 pages)***
8. ***Annexes (if applicable).***

The format of the Bachelor's thesis descriptive report may have the structure of an **engineering project (section IV.2)** or a professional work that includes an **engineering design (section IV.3).**

The student, with the advice of their TA, may adapt the structure and documentary content of the Bachelor's thesis according to its particular characteristics and its time limitation (12 ECTS) as long as it covers the minimum content recognized in the field or area of knowledge in which it is developed.

IV.1. Contents and structure of engineering projects

The TFGs that have as object the development of engineering projects will be adjusted to the regulatory legal contents and formats of these typologies. The classic structure of a professional project consists of the following four documents: Project Memory, Plans, Specifications, and Budget. A Bachelor's thesis may adopt a similar structure.

The **Project Memory** is the document that includes the most relevant aspects of the Bachelor's thesis, from the background and object of the same to the study of the needs to be satisfied, the proposed solutions, and all the factors considered to carry it out. It is usually the last document to be elaborated since it gathers the most relevant aspects taken into account to solve the problem posed, highlighting the alternatives, the solutions adopted, and the result. The report comprises two differentiated parts: the Descriptive Memory or Memory itself and its Annexes.

The **Plans** are the graphic representation of the work. They will be of set and detail, as many as necessary, so the objective is perfectly defined.

The **Specifications** must describe exclusively the material elements and instructions that make up the object of the work and regulate its execution, repetition, or implementation.

The **Budget** indicates the cost of the work. It shall consist of one or more partial budgets, expressing, in addition to the unit prices and breakdowns, the state of measurements and the details required for their valuation.

A Bachelor's thesis must always consist of at least a Descriptive Memory, the number of documents to be included being optional. However, the Bachelor's thesis must be defined so that another sufficiently qualified person can interpret or direct the corresponding work.

IV.1.1. Descriptive report

The generic and summarized table of contents of the 'report' may be of the following style and contents:

1. ***Background and purpose of the project***
   - a) Justification of the adopted solution
     - i) Reasons and constraints of the project
     - ii) Alternatives considered
     - iii) Justification or reasons for choosing an alternative
   - b) Development of the adopted solution
     - i) Project Engineering
       - (1) Process
       - (2) Constructions
       - (3) Facilities
       - (4) Urbanization
       - (5) Regulations
     - ii) Planning and execution control
2. ***Investment and economic evaluation***
   - c) Investment

i) General budget summary

d) Evaluation

i) Static economic study (one year of full production)

ii) Dynamic economic study (during the life of the project)

The cover page of the report document must contain the following: memory; document no. 1; the project title and location; the author's name and the date (month and year). This cover page is in addition to the cover page automatically generated by Ebrón.

IV.1.2. Annexes to the Bachelor's thesis report

This document should provide complementary and detailed information on what is stated in the memory. It comprises documents that develop, justify, or clarify specific sections of the memory or other basic documents of the project.

The document shall contain the necessary annexes (as appropriate in each case) corresponding to the headings or sections of the report. The annexes to the memory are the fundamental basis of the justification of the project and must explain aspects of the project by themselves. In practice, these annexes contain data, calculations, and studies.

The annexes usually need more pages than the memory, hence the convenience of separating or presenting them as an independent part. Each annex constitutes in itself an independent exposition unit. The morphology of each Annex should be:

- **Cover page**. Indicating annex number and title
- **Table of contents of the annex**. With the page corresponding to each section. Each annex begins on page *one* and ends on page *n*
- **Development of the contents of the annex**. In general terms, it is structured as follows:
  - Baseline data. Hypothesis
  - Development of the calculation or study
  - Tables of results

The number of annexes will depend on the complexity of the project and will be the number necessary to fulfill its purpose. The annexes must be duly numbered, following consecutively the same order of exposition of the chapters of the memory.

IV.1.3. Plans

This document must express graphically and define geometrically everything that is projected, and its information, being one of the contractual documents, is essential for the execution of the project.

It shall contain the graphic, alphanumeric, code, and scale information necessary for its comprehension and be sufficiently descriptive so that measurements can be deduced from them to serve as a basis for the pertinent valuations and the exact execution of the work.

The drawings are classified in the following groups, always in this order and by construction or functional units:

1. Location. Planimetry and altimetry

2. Civil works
  2.1. General plants
  2.2. Elevations and sections
  2.3. Construction details
3. Machinery
  3.1. Synoptic diagram of the distribution plant
  3.2. Distribution plant
  3.3. Raised
  3.4. Details
4. Facilities
  4.1. Synoptic diagram
  4.2. Plant layout
  4.3. Raised
  4.4. Details
5. Ancillary works
6. Urbanization

It should also be organized in the project as a separate document from the other project documents, being its presentation rules:

- Document No. 2 'plans' must appear on the cover, title of the project, location, author's name and city, month, and year.
- The table of contents indicating the plan number and plan title
- The plans must be numbered and ordered, and if submitted in paper format, they must be folded to the size of the chosen UNE A-4 or A-3 document and bound so that they can be consulted independently of the other project documents.

Drawings and technical documentation, in terms of general principles of representation, scales, formats, boxes, writing, labeling, dimensioning, symbology, folding, projection methods, presentation of graphic elements, etc., shall take into account the standards indicated in the UNE 157001:2002 standard.

The following considerations shall be taken into account for the numbering and arrangement of the plans:

- It must follow the logical process of the executive phase of the project.
- Draw up an orderly table of contents, including the number and title of each, to clearly identify their contents. For this purpose, the classification of the project into different construction or functional units can be used as a basis.
- Each construction or functional unit must be represented in as few drawings as possible and always providing all the necessary information for its execution.
- In the set of plans in general, and in particular, within each of them, the most appropriate standard scales will be used in increasing form so that what is to be represented is from the general to the detail. The standard scales are series 1, 2, and 5.
- Likewise, and in accordance with the chosen scale, the most appropriate standardized paper formats shall be used, avoiding large blank spaces or lack of space to provide more information (keys). The basic standard paper formats for the plans are UNE A-4, UNE A-3, UNE A-2, UNE A-1, and UNE A-0.
- The plan number and title in the table of contents must match the number and title in the labeling box.

Aspects related to the presentation of the drawings in the document.

Drawings shall maintain adequate margins. In all formats, margins must be provided between the edges of the standard format and the box delimiting the drawing execution area. This margin must be made with a continuous stroke of at least 0.5 mm wide. The width of the margin shall be,

- Format A0, A1 → 20 mm, minimum width.
- Format A2, A3, A4 → 10 mm, minimum width.

The labeling box or plan box shall contain the following information:

- BACHELOR'S THESIS - ETSIAMN - UPVV.
- PROJECT TITLE AND LOCATION (municipality and province)
- PLAN TITLE (variable)
- PLANE NUMBER (variable)
- SCALE (E - MISCELLANEOUS - S/E) (variable)
- AUTHOR NAME (labeled)
- AUTHOR'S SIGNATURE (in original)
- DATE (month and year)

The location and size of the marking box shall have the following characteristics: The identification area shall be in the lower right corner of the drawing execution area, in the direction of its reading, and shall have a maximum width length of 170 mm.

IV.1.3. Terms and Conditions

This document regulates the rules of behavior for the execution from the technical, facultative, economic, and legal points of view among the project agents involved in the execution of the project.

The solicitation documents are Document No. 3 of the project and should be organized or bound separately.

The cover page shall include specifications, document No. 3, project title and location, author's name and surname, and date (month and year). The document shall first include a detailed table of contents, by chapters and sections, indicating the corresponding page. Then, by chapters and sections, the development of the corresponding articles. The author's name is included with the city, date, and signature on the last written page.

The Specifications are structured in the following sections:

1. General Specifications
   - General Provisions
   - General Technical Conditions
   - Optional General Conditions
   - General Economic Conditions
   - General Legal Conditions

2. Particular Specifications
   - Particular Technical Conditions

- Particular Conditions of an Optional Nature
- Special Economic Conditions
- Particular Legal Conditions

IV.1.4. Budget

The budget is the economic quantification of the projected and its structure in a private promotion engineering project, is:

- Measurements and *Partial Budgets (*)* (F)
- Price Schedule No. 1.- Labor Prices
- Price Table No. 2.- Prices of materials and machinery
- Price Schedule No. 3.- Prices in handwriting of the work units (all sheets signed at the end of the page).
- Price Table No. 4.- Itemized prices of the work units
- *Partial Budgets (*)*
- General Budgets (F)
- Material Execution Budget (F)
- Contract Execution Budget (F)
- Administrative Execution Budget (F)
- Procurement Execution Budget (F)
- General Budget Summary (F)

Notes: (*) Partial budgets may be placed in the chapter on measurements or after the price schedule No. 4; (F) Indicates that the last written page of the chapter must be signed.

Document No. 4, 'budget,' the title of the project and the location, the name and surname of the author, and the date indicating month and year must appear on the cover page. On the first page of the document, there must be a detailed index of the different chapters, subchapters, and sections into which the budget has been divided, without indicating the pages because each chapter has its independent page numbering.

The table of contents is followed by an orderly development of the budget. It is convenient to head the pages of each chapter to facilitate the search.

The structure of a Budget for a public promotion project according to the Law of Public Sector Contracts is as follows:

7. Measurements
  7.1. Auxiliary measurements
  7.2. General measurement
8. Price lists
  8.1. Price list No. 1 (unit prices in words)
  8.2. Price list No. 2 (decomposed unitary)
9. Budget
  9.1. Partial budgets
  9.2. General budget

In public promotion projects, the "price justification annex" is required, the purpose of which is to determine and provide a reasoned demonstration of the material execution cost of each of

the basic execution units or work units involved in the project. The structure of this annex is as follows:

1. Purpose of the Annex
2. Price basis or tariffs used, indicating the prices that are not part of that basis (codification).
3. Direct costs involved in the work units:
   - 3.1. Labor cost justification
   - 3.2. Justification of the cost of materials
   - 3.3. Justification of machinery cost
4. Justification and calculation of the Ki coefficient for indirect costs
5. Labor and machinery yields
6. Auxiliary decomposed prices
7. Application decomposed prices
8. Justification of raised items

IV.2. Contents and structure of the professional work, including an engineering design

1. Introduction to the problem: Background, objective, and justification.

A clear and detailed statement of the technological, theoretical, environmental, social (relation with the SDGs) or other problems to be solved with the project, as well as background information (pre-existing studies or projects) and alternative techniques or approaches that exist at the time the project is proposed. The motivation must expressly mention the academic nature of the Bachelor's thesis.

2. Scope and range of work solutions.

Presentation of solutions, hypothesis, calculation method, etc. About the exposition of solutions, at least in some basic aspect of the project, a proposal of alternatives, their analysis and evaluation, and the justification of the selection made by the regulations in force and other multiple restrictions that may be convenient to contemplate in each case must be included. Likewise, express mention must be made of the legislation in force applicable to the project (regulations), being carried out in such a way as to guarantee its compliance. The student must verify that the applicable legislation is in force when submitting the Bachelor's thesis. The student must also justify the use of those regulations that are not mandatory and that they deem appropriate to adopt.

3. Verification of Project Feasibility and Impacts. Economic Study and Budget.

The viability and impact of the problem must be verified from a technological, economic, social, and environmental point of view by means of different types of analysis and considering aspects of health, welfare, and public safety. For economic feasibility, the necessary economic analyses will be carried out (investment budget, operating budget, etc.), including the valuation of the effort made and resources consumed in the development of the Bachelor's thesis as one of the investment costs.

4. Calculations

The Bachelor's thesis documents (usually as annexes to the report) must include (if any) in detail all the calculations necessary to perform it. All simplifications and calculation hypotheses adopted must be justified and expressed in the documentation submitted for evaluation.

5. Graphical representations

The Bachelor's thesis must contain all those PLANS, CROCHISES, SCHEMATICS, DIAGRAMS, or any GRAPHIC REPRESENTATION necessary for its correct interpretation and realization by any competent technician. If the Drawings Document is prepared, it shall contain all those required by the project, ordering them from the smallest (location, overall drawings) to the most detailed (installations, circuit diagrams, etc).

6. Bibliography

Since it is an academic document, the necessary citations should be included to verify the bibliographic or commercial consultations made. Commercial catalogs and standards should be referenced in the bibliography, but it is optional to reproduce them in the report. They should be included in an attached electronic format if it is convenient.

Annex V. Recommendations for Bachelor's thesis text editing.

V.1. Bachelor's thesis style rules

The following general rules for document presentation are recommended. These rules are intended to achieve uniformity in the texts presented.

1. DIN A-4 format (297 X 210 mm).
2. The written text once the spelling and grammar have been checked. Times or Arial 11 or 12 point font, but another font that allows a clear reading can be used.
3. Drawings, if any, correctly delineated.
4. Margins: A top and bottom margin of 25 mm, a left margin of 30 mm, and a right margin of 25 mm. Single line spacing of 1 or 1.3 maximum. Text justified on both sides.
5. Uniform spacing should be used throughout the text, except when more space is needed to improve readability (such as above and below equations) or as suggested when introducing titles, subtitles, table headings, and figure captions.
6. All document pages should be numbered consecutively in the footer, except for the title page and abstracts that do not contain page numbering. Pages containing indexes should be numbered in Roman numerals. Likewise, appendices must have their pages numbered.
7. The wording of headings and sentences should be direct and complete, paragraphs should be short, and the style should be impersonal and objective (e.g., "have been analyzed" instead of "we analyzed").
8. Drawings, if any, shall be drawn up in standardized format, up to A4 format. The box dimensions, units of measurement, layout thicknesses, etc., shall be those established by ISO, UNE, and ASTM standards or specific instructions and standards.

V.2. Other text editing recommendations

1. Prevent the last two paragraph lines from going to the top of the next page.
2. A decimal system should be used for numbering chapters and subchapters. It is recommended to use up to four levels.

3. TITLE OF THE FIRST LEVEL SECTION: Writing it all in capital letters is recommended. It should be aligned with the left margin. It is recommended to leave a blank space above (concerning the previous paragraph) and a blank line before the following text.
4. First Subtitle: It is recommended to write it in upper and lower case letters (capital letters for the initial letter of each significant word) and align it with the left margin. It is recommended to leave spaces between the subtitle and the subsequent text.
5. Second Subtitle: Using italics and upper and lower case letters or underlining is recommended. It should be aligned with the left margin. Write the text on the same line, leaving five spaces between the last letter of the subtitle and the text.
6. A subtitle should not be placed on the last line of a page since ending the page earlier is preferable. Place the title at the top of the next page.
7. Footnotes, when necessary, shall be indicated by superscript numbering.
8. Equations: All equations must be centered. It is recommended to leave a blank line between the text and the first line, center each line, and leave a blank line between each equation line and the following text. They should be numbered in parentheses on the right margin.
9. TABLES: Tables should be self-explanatory. Each table should be placed next to its explanation in the text. It is recommended to number the tables consecutively throughout the paper. Leave two lines above and below the table. In the heading, describe the content of the table and the corresponding number in capital letters and then the title of the table centered on it. Try to center the table in the space for the text. When numerical data is presented, it is recommended to align the decimal character. If this is not possible, the figures should be centered. It is recommended to use only decimal places as necessary.
10. FIGURES AND ILLUSTRATIONS: As with tables, figures should be self-explanatory. It is recommended to reserve enough space in the text for the illustration and to place them close to their comments or explanations. The figure and its caption should be on the same page. The caption should be placed immediately below the illustration, leaving a blank line between them and another line for the preceding or following text. All illustrations should be numbered consecutively (Fig. 1. Fig. 2, otherwise, number them consecutively by chapters (Fig. 3.1, Fig. 3.2, etc.) A homogeneous character should be chosen for the whole text.
11. REFERENCES: A list of bibliographies, reviews, and references should appear at the end of the academic work (usually as the last chapter of the Report) with the following title
12. BIBLIOGRAPHY and/or REFERENCES as section title. Citations will be included in the text with the format Author (Year). Examples: http://blog.apastyle.org/apastyle/2011/01/writing-in-text-citations-in- apa-style.html

- Direct quotation: *systems .....(Pérez and Martínez, 2007; Alba, 2010).*
- Indirect: *As Perez and Martinez (2007) stated, the systems.....*
- with more than two authors *(Gutiérrez et al., 2003)*

References not cited in the text should not be included in the bibliography.
It is suggested to use the APA format (http://www.apastyle.org/) for the bibliography; examples can be found in:

- http://www.upv.es/pls/obib/ser_bibpublicado.bib_download?p_id_lista={ 1330D426-5911-40DF-9286-645CACAE7444}&p_id_fila=192-{1330D426- 5911-40DF-9286-

645CACAE7444}&p_id_doc=192-{1330D426-5911-40DF- 9286-645CACAE7444}0&p_idioma=c&p_vista=MS

- http://bib.us.es/aprendizaje_investigacion/publicar_citar/como_elaborar/references_bibliographic-ides-idweb.html
- http://www.ub.edu/biblio/citae-e.htm

Annex VI. EVALUATION RUBRIC FOR THE FINAL PROJECT OF THE BACHELOR'S DEGREE IN AGRICULTURAL AND BIOLOGICAL ENGINEERING WITH ABET ACCREDITATION.

The members of the board, after studying the Bachelor's thesis report and attending the oral defense of the work, must fill in the following table in which they evaluate on a scale of 0 to 4 the fulfillment of each of the following points:

CONCEPT		0	1	2	3	4
1.- Identify	1.1.- Problem and opportunity statement					
	1.2.- Constraints (standards, codes, needs, requirements, and specifications)					
	1.3.-Setting of goals					
2.- Formulate	2.1.- Creative solution generation (analysis)					
	2.2.- Evaluation of multiple solutions and decision-making (synthesis)					
3.- Resolve	3.1.- Fulfillment of objectives					
	3.2.- Overall impact and scope (contributions and practical recommendations)					
4.- Communicate	4.1.- Quality, clarity, and conciseness of the report					
	4.2.- Quality, clarity, and conciseness of the oral presentation					

The meaning of the scores in each element is as follows:

0: The element is not present.
1: The element is present but is deficient.
2: The element is present and is correctly addressed.
3: The element is present and is addressed notably.
4: The element is present andis addressed outstandingly.

For a Bachelor's thesis to be approved, the score in all elements is required to be equal to or higher than 2. If any item scores 0 or 1, the Bachelor's thesis cannot be approved. It must be improved and resubmitted until it is demonstrated to include all the items in the table above.

The following is a detailed description of what should be assessed in each of the sections of the rubric to help the board in its assessment, and also the student in planning and carrying out their work:

1.1.- **Problem and opportunity statement**

Is the problem or opportunity addressed by the work clearly identified?

Explain why it is important to address this problem or opportunity in the field of agricultural and biological engineering.

Is the problem to be addressed linked to one or more degree subjects?

1.2.- **Constraints (standards, codes, needs, requirements, and specifications)**

Are the requirements and limitations of all types relevant to the job disclosed?

Some possible constraints are environmental, legal, regulatory, aesthetic, economic, temporal, ergonomic, accessibility, health and safety, feasibility of execution/construction, extensibility, functionality, interoperability, maintenance and service life, manufacturability, marketability, policy, or usability.

Is there a demonstrated understanding of the impact of these requirements and constraints on the design/project process?

Is there an analysis of how the design/project conforms to agri-food and rural engineering industry standards, codes, regulations, and best practices?

1.3.- **Establishment of** objectives

Are the objectives of the work clearly stated?

Is the methodology to be used to achieve these objectives (methods, materials, etc.) determined?

Are the objectives consistent with the problem statement, opportunity, and all relevant constraints?

Has a study of the state of the Art been carried out in the specific field covered by the work, and have the objectives been set out in a way consistent with this study?

Do the objectives require the resolution of a complex engineering problem (i.e., do they address far-reaching or conflicting technical issues, have no obvious solution, address problems not addressed by current standards and codes, involve diverse stakeholder groups, include many parts or subproblems, involve multiple disciplines, or have significant implications in different contexts)?

2.1.- **Generation of creative solutions (analysis)**

Is the creative and iterative process used to generate possible solutions described?

Is the application of agricultural engineering technologies, mathematics, and basic sciences described in the design/project process?

Do the proposed solutions meet the proposed objectives, taking into account public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors?

2.2.- **Evaluation of multiple solutions and decision-making (synthesis)**

Are multiple solutions evaluated against identified requirements?

Is information provided on the decision-making process and how different solutions were considered and compared?

Are the risks associated with the design/project options considered and assessed?

Is it demonstrated that the trade-offs made in the design process to mitigate risks and meet requirements are understood?

3.1.- **Fulfillment of objectives**

Does the text justifiably explain that the initially stated objectives are met?

Is the proposed solution the best possible under the circumstances?

3.2.- **Overall impact and scope (contributions and practical recommendations)**

Is the impact of the work in general and in the field of agricultural and biological engineering adequately discussed?

Are the contributions, limitations, and practical recommendations of the adopted solution adequately described?

Are health, safety, welfare, cultural, social, environmental, and economic impacts summarized?

Are the contributions of the work to the achievement of the United Nations Sustainable Development Goals highlighted?

4.1.- **Quality, clarity, and conciseness of the report**

Is the wording correct, and is it easy to understand?

Is the formatting adequate (table of contents, font size, page numbering, etc.)?

Is the documentation well organized and concise, providing a clear picture of the work?

4.2.- **Quality, clarity, and conciseness of the oral presentation**

Is the presentation well organized and concise, providing a clear view of the work performed?

Is the essence of the design/project process and its results effectively communicated?

Are the questions posed by the board adequately answered?