UNIVERSITAT POLITÈCNICA DE CATALUNYA
BARCELONATECH
Departament d'Enginyeria de Projectes i de la Construcció

COURSE GUIDE – QT2016

AEROSPACE ENGINEERING PROJECTS (4A) - Rev. 12.09.2016

INDEX OF CONTENTS

1.- AIM OF THE COURSE

The aim of the course "ENGINEERING PROJECTS" is to provide the students with all the necessary tools to face the development of any engineering project, whatever the subject is.

2.- ORGANIZATION

The course coordinator is Professor Daniel Garcia-Almiñana; Pr. Maria Gonçalves will be in charge of one of the Theory groups and the professors in charge of the group sessions are Luis Manuel Pérez, Álvaro Shelly and Joan Llargués.

The organization of theory and laboratory groups is indicated in *table 1*:

THEORY / ROOM	LECTURER	SCHEDULE
GROUP 1 / ROOM 3.4	Maria Gonçalves	Thursday – 12 to 14h
GROUP 2 / ROOM 3.7	Daniel Garcia-Almiñana	Thursday – 12 to 14h
TEAMWORK / ROOM	CUSTOMER	SCHEDULE
GROUP 01-EA-P2016 / ROOM 3.2	Luis Manuel Pérez	Thursday – 8 to 10h
GROUP 02-EA-P2016 / SEMINAR 5	Álvaro Shelly	Thursday – 8 to 10h
GROUP 03-EA-P2016 / ROOM 0.2TR11	Joan Llargués	Thursday – 8 to 10h
GROUP 04-EA-P2016 / INTEXTER	Luis Manuel Pérez	Thursday – 10 to 12h
GROUP 05-EA-P2016 / SEMINAR 5	Álvaro Shelly	Thursday – 10 to 12h
GROUP 06-EA-P2016 / ROOM 0.2TR11	Joan Llargués	Thursday – 10 to 12h

Table 1.- Organization of theory and laboratory groups

All laboratory groups will be arranged with a similar, limited number of students (not less than 8). The size of each group will be adapted to the present number of students enrolled in the course.

During the theory sessions, the specific theoretical modules will be developed. Before the start of every theory session, the students should carefully read the corresponding module information in order to quickly proceed with the development of some related practical exercises that will be evaluated as a part of the Theory block. In order to facilitate the teamwork, laboratory groups G1, G2 and G3 will meet at Theory group G1 whilst laboratory groups G4, G5 and G6 will meet at Theory group G2.

The information provided by the course coordinator is just a guide for the theory sessions and it shall be enriched with the own student's notes and the recommended bibliography.

3.- THEORY – OUTLINE OF THE CONTENTS

The theory contents are organized into the following five modules:

M1. The Engineering Project:

- Basic concepts.
- Teamworking.
- BSCW platform.

M2. Creative Thinking. Analysis and Synthesis:

- Work Breakdown Structure (WBS).
- The need for information.
- Decision making – decision taking.

M3. Planning & Scheduling:

- Planning.
- Scheduling.

M4. Economic feasibility & Budget – Investment:

- Budget - Investment.
- Economic feasibility.

M5. Formal aspects & Engineering Project Phases:

- Theory Fundamentals.

4.- TEAMWORKING – OUTLINE OF THE CONTENTS

Laboratories working methodology will be based on PBL (Project Based Learning) and will consist in developing, in group, a preliminary design of a system (equipment, premise or service) which summarizes most of the theoretical-practical learning throughout the previous courses. The role of the attending professor will be as a *customer*.

The list of projects for the present semester is shown in *table 2*:

GROUP	PROJECT
GROUP 1	TILTING WINGS - CONVERTIPLANE
GROUP 2	TWIN PISTON ENGINE AIRCRAFT
GROUP 3	SHORT TAKEOFF AIRLINER
GROUP 4	CUBESAT CONSTELLATION
GROUP 5	TWIN PISTON ENGINE AIRCRAFT
GROUP 6	SHORT TAKEOFF AIRLINER

Table 2.- Title for the projects

It would be desirable that all necessary theoretical knowledge was explained, remarked and tested at a previous theory session. However, every customer will comment all details of the work directly to the group.

BSCW PLATFORM : REGISTRATION AND FOLDER STRUCTURE

All work and documents will be developed through a collaborative platform (BSCW). This online multi-users platform brings a folder structure where you will place all necessary information to develop your project. This course will ONLY CONSIDER, for evaluation purposes, the uploaded information in BSCW.

This is the course folder structure in BSCW:

- Folder B – Library : This folder will contain ALL reference information of the group (external documents). It is of capital importance that this information is properly documented and organized in subfolders, to be useful to the rest of the group members.
- Folder C – Communication with your customer : This folder will contain the messages from / to your costumer, as well as all documents developed under D folder that should be revised by your costumer.
- Folder D – Documents in development : This folder will contain ALL documents developed by the group team (internal documents).
- Folder F – Thread discussion : This folder is foreseen for your internal discussion and agreements.
- Folder S – Follow-up activities ; This folder will contain, properly organized, ALL minutes of the group meetings as well as the agenda for the scheduled meetings.
- Folder T – Final documents : This folder will contain ALL documents that are being submitted for evaluation by the course coordinator.

The access to the BSCW platform is done through the following link : http://senna.upc.es/BSCW/

To enter into the platform it is necessary to hold a username and password. This information will be provided by each student through the instructions you will receive in a registration e-mail sent by the BSCW. It is mandatory to use the following structure for your username:

name.surname (avoid blanks)

Other related information about the organization and the BSCW environment can be found at http://www.youtube.com/user/enginova97.

CONTENTS OF THE PROJECT

There are FOUR project documents that shall delivered at the end of the course by each team :

- Report, including all necessary attachments.
- Budget.
- Drawings.
- Technical sheets.

There are FOUR additional documents to be delivered :

- Minutes of the meetings (see template in attachment 1 of this guide).
- Planning and Scheduling (will be evaluated as a part of the report).
- Project presentation.
- Project poster (will be evaluated as a part of the presentation).

There ONE document that can voluntarily be delivered :

- Video of about 3-6 minutes (would be evaluated as a part of the presentation).

All revised documents to be delivered by each team will be uploaded in BSCW platform (folder T). Moreover, a DVD will also be submitted by each team to the group coordinator as indicated in attachment 2 of this guide.

DOCUMENT - REPORT

The REPORT will be organized as follows (these chapters can be adapted according to the features of each project) :

- COVER PAGE (see template in attachment 3 of this guide).
- NUMBERED OUTLINE (pages, figures and tables).
- AIM (text; brief description of the main goal of the project).
- SCOPE (bulleted; list of tasks, activities and deliverable documents that shall be developed in order to achieve the goal of the project).
- REQUIREMENTS (bulleted; technical, economical, legal or milestone specifications that shall fulfil the projected item, the starting point of it or the process elements).
- BACKGROUND (text; description of the need that is being covered / advantages or disadvantages of your approach / usefulness of the project / critical elements of the designing process / previous experiences a.s.o.).
- STATE OF THE ART.
- MAIN ALTERNATIVES AND DECISION OF THE BEST ONE.
- DEVELOPMENT OF THE CHOSEN SOLUTION.
- ECONOMICAL FEASIBILITY STUDY.
- ENVIRONMENTAL IMPACT STUDY.
- SOCIAL AND SECURITY CONSIDERATIONS.
- PLANNING AND SCHEDULING FOR THE FOLLOW-UP OF THE PROJECT.
- CONCLUSIONS AND RECOMMENDATIONS.
- BIBLIOGRAPHY AND REGULATIONS.

REPORT ATTACHMENTS

The suggested attachment organization (that can be adapted according to the features of each project) is as follows :

- COVER PAGE (see details in attachment 3 of this guide).
- NUMBERED INDEX (pages, figures and tables).
- DESCRIPTIVE ATTACHMENTS.
- CALCULATION ATTACHMENTS.
- ORGANIZATION, PLANNING, SCHEDULING.
- MINUTES OF THE MEETINGS.
- OTHERS (brochures a.s.o.).

DOCUMENT - BUDGET

The suggested budget organization (that can be adapted according to the features of each project) is as follows :

- COVER PAGE (see details in attachment 3 of this guide).
- NUMBERED INDEX.
- UNITS.
- UNIT PRICES.

- BUDGET.

See some examples at http://senna.upc.es/bscw/bscw.cgi/865540

DOCUMENT – TECHNICAL SHEETS

The suggested technical sheets organization (that can be adapted according to the features of each project) is as follows :

- COVER PAGE (see details in attachment 3 of this guide).
- NUMBERED INDEX.
- TECHNICAL SHEETS (of the components a/o subsystems).

See some examples at http://senna.upc.es/bscw/bscw.cgi/865540

FORMATTING SUGGESTIONS

- Each chapter starts a new page.
- DIN A4 sheet (for drawings, A3 and larger formats can also be used).
- Arial, Helvetic o similar font, size 11.
- Margins : upper and lower 25 mm, left and right 30 mm.
- Single spacing.
- All pages shall be numbered at the bottom centre of the page. Every page number will be preceded by initials R, RA, B, D, T referred to report, report attachments, budget, drawings or technical sheets.
- Every table and figure (images, photos, diagrams, a.s.o.) will be foot numbered; there will be a short identification/explanation and, if necessary, sourced).

TEAM GROUP ORGANIZATION

The tasks to be performed by the group will be organized by a group coordinator. This position will be chosen amongst the team members and it will be the contact point with the customer. All weekly meetings with the customer will be formalized though an agenda. The minutes of each group session will be written at the end of each meeting, taking specially care on the development of the agenda and the agreements. A new agenda will be produced at the end of the meeting in order to schedule the next meeting.

Besides the group coordinator, every group will choose a group secretary. This position will be in charge of the proper storage and organization of all documents and information related to the project. Moreover, the group secretary will be responsible for the safe-keeping and delivering of the agenda and the minutes of the meetings. The group can decide to create other positions of internal responsibilities (working group coordinator, a.s.o).

The agreed group organization as far as the internal distribution of roles and responsibilities will be informed to the customer and must be appear in the corresponding minutes.

At every group session with the customer it is compulsory to deliver the updated planning (Gantt diagram or similar). This requirement starts with the delivery of the Project Charter. The Project Charter template is developed in attachment 4.

6.- COURSE SCHEDULE

As stated in the academic timetable, the Theory sessions will start the 15th of September and will end the 22nd of December. Laboratory sessions will start the 15th of September.

Classes will stop during the period from 31st October to 7th November due to mid-term exams (although this course has no mid-term exam).

The Project Charter shall be delivered the 6th October at the latest, unless a different agreement is taken with the customer.

The oral presentation of the project to a review panel of experts will take place the 22nd December during the last laboratory session.

The final exam will take place the 11th January 2017 (for those students not attending the Theory session under full continuous assessment).

7.- COURSE EVALUATION

The course evaluation will combine the theory and practical contents according to *formula 1*:

$$NP = 0.50 \times (N1 \text{ or } N2) + 0.50 \times N3$$

Formula 1.- Course evaluation

Where "NP" is the final mark of the course, "N1" is the weighted average of the continuous assessment marks, "N2" is calculated 60% as the final exam mark and 40% as the weighted average of the continuous evaluation marks and "N3" is the individuate project group mark. Each student will decide, before the final exam, which mark (N1 or N2) will be used in his/her specific case.

The overall team mark awarded by the expert panel is the maximum average mark for the whole team. Each professor-customer will individuate it accordingly to their assessment on the work (in-class and out of the class) performed by each member of the team.

The overall group project mark is calculated as 30% of the oral presentation and 70% of the delivered project documents evaluation.

One of the considered criteria for evaluation is the student's participation during the weekly follow-up meetings. Any not justified absence* to any of the foreseen team meetings will cause a course final mark of NO PRESENTAT.

(* the only justified absence to a team meeting with the customer must be motivated by either a medical or academicals reason (duly justified with the specific documents)). Different reasons of the above mentioned will be ignored.

Besides your individual marks, at the end of the semester every student will be given three additional evaluation grades to measure three generic skills :

- Teamworking capacity.
- Synthesis and analysis capacity.
- Effective oral and written communication.

These three outstanding skills will be evaluated along the group sessions with the customer.

8.- COURSE TIMETABLE

THEORY SESSIONS – PRELIMINARY PLANNING

WEEK	W 37	W 38	W 39	W 40	W 41	W 42	W 43	W 44	W 45	W 46	W 47	W 48	W 49	W 50	W 51	W 52	W
	15 S	22 S	29 S	6 O	13 O	20 O	27 O	3 N	10 N	17 N	24 N	1 D	8 D	15 D	22 D		
ITEM	0	1	2	3	4	5	5	SP	6	6	7	7	7	7			

0. Course explanation / Teamwork organization / Course evaluation /
1. Module M1-M5 – Project fundamentals / In-class exercises.
2. Module M2 – WBS / In-class exercises.
3. Module M3 – Planning / In-class exercises.
4. Module M3 – Scheduling / In-class exercises.
5. Module M2 – Decision making / In-class exercises.
6. Module M4 – Economic feasibility / In-class exercises.
7. Extra teamwork / Questions about environmental, social and/or security issues / Questions about the oral presentation and the final documents to be delivered by the group / Extra exercises.

SP Mid-term exams (without teaching nor exam).

GROUP SESSIONS – PRELIMINARY PLANNING

WEEK	W 37	W 38	W 39	W 40	W 41	W 42	W 43	W 44	W 45	W 46	W 47	W 48	W 49	W 50	W 51	W 52	W
	15 S	22 S	29 S	6 O	13 O	20 O	27 O	3 N	10 N	17 N	24 N	1 D	8 D	15 D	22 D		
ITEM	0	1	1	2	3	3	3	SP	4	4	4	4	4	5	6		

0. Brief description of the aim of the project by the customer / Team organization (rules and agreements) / Decision of project coordinator and secretary / Minutes of the meeting / Document formats / Initial agreements concerning the organization and task distribution.
1. Preliminary follow-up sessions with the customer / Work in group / New tasks distribution.
2. Project Charter delivery (unless other agreement with your customer).
3. Intermediate follow-up sessions with the customer / Work in group / New tasks distribution.
4. Final follow-up sessions with the customer / Work in group / New tasks distribution.
5. Project draft delivered to the customer.
6. Oral presentation of the Project (at Sala de Juntes ETSEIAT).

SP Mid-term exams (without follow-up sessions).

9.- ORAL PRESENTATIONS

One of the specific objectives of this course is the effective development of oral presentations of the performed tasks and activities. For this reason there are several oral presentation sessions foreseen along the course duration. At the end of the semester every student must, at least, perform one public exposition of his/her work.

Most of the presentations will be done during the group sessions and will consist in showing the degree of development of your work. The foreseen duration of each exposition is around 15-20 minutes.

At the end of the course (week 51) there will be a final presentation that will be evaluated as a part of the course. This presentation is foreseen to be developed in around 20 to 25 minutes.

The main aspects to be considered in an oral presentation are :

1. Previous preparation of the presentation. The indirect parameters to be considered are :
   - Duration of the presentation: Fitting or not to the scheduled time.
   - Audiovisual media: Density of the slides, colour contrast, images instead of words, size of the text.
   - Conduction of the presentation: Tested or written, clarity and security in the expression, body language, change of speakers, looking at the room or at the screen.
2. Contents of the presentation (relevant elements). The indirect parameters to be considered are :
   - Clear explanation of the aim and background of the project (including a brief description of the state of the art).
   - Clear explanation of the scope and the basic requirements.
   - Clear explanation of the possible alternatives and the decision on the final choice.
   - Clear explanation of the chosen solution.
   - Clear explanation of the economic aspects.
   - Clear explanation of the social, environmental and security aspects.
   - Clear explanation of the expected planning for future works.
   - Clear explanation of the conclusions and recommendations.
3. Dynamics and clarity of the presentation (degree of interest-catching). The indirect parameters to be considered are:
   - Focused and clear development of the contents: Ordered or mess exposition.
   - Oral transmission: Suitable tone and speed of the exposition, volume of the voice, lack of blanks during the exposition.
   - Clarity of the slides: Suitable amount of information, lack of written mistakes / correct usage of technical units.
4. Finals answers to the experts after the presentation :
   - Clarity of the answer: Is the answer focusing on the question?
   - Coherence and conviction in the answers.

10.- BIBLIOGRAPHY AND ADDITIONAL INFORMATION

- Aguinaga, J.M. (1994). *Aspectos Sistemáticos del Proyecto en Ingeniería*. Ed. ETSEII Madrid.
- De Cos, M. (1997). *Teoría General del Proyecto. Ingeniería de Proyectos/Project Engineering*. Ed. Síntesis.
- Domingo Ajenjo, A. (2005). *Dirección y Gestión de Proyectos – Un enfoque práctico.* Ed. RA-MA.

- Gómez Senent, E. (1997). *El Proyecto Diseño en Ingeniería*. Ed. Servicio de Publicaciones de la UPV.
- Gómez Senent, E. (1992). *Las Fases del Proyecto y su Metodología*. Ed. Servicio de Publicaciones de la UPV.
- Graham, N. y Portny, S.E. (2011). *Project Management for Dummies.* Ed. John Wiley & Sons.
- Mantel, Meredith, Shafer y Sutton (2011). *Project Management in Practice.* Ed. John Wiley & Sons.
- Project Management Institute (2013). *Guía de los fundamentos de la dirección de proyectos (guía del PMBOK).* Ed. Project Management Institute.
- Sapag, N. y Sapag R. (2000). *Preparación y Evaluación de Proyectos*. Ed. McGraw Hill.

ATTACHMENT 1.- TEMPLATE FOR THE MINUTES OF THE MEETING

Departament de Projectes d'Enginyeria
UNIVERSITAT POLITÈCNICA DE CATALUNYA

Secció de Terrassa

MINUTES OF THE MEETING XX

Project: Títol del treball / Projecte

Participants:	Tutor (inicials)	Projects Department
	Nom1 (inicials)	G_/EA-T2016
	Nom2 (inicials)	G_/EA-T2016
	Nom3 (inicials)	G_/EA-T2016
	Nom4 (inicials)	G_/EA-T2016
	Nom5 (inicials)	G_/EA-T2016

Date and time: XX XXXX 2016, from XX:XX to XX:XX

Place: (CLASSROOM XXX) – ETSEIAT

AGENDA

- S'indica la relació de punts que està previst tractar a la reunió.

ITEMS ON THE AGENDA

- Es va desenvolupant l'ordre del dia, indicant les informacions rellevants que poden afectar al treball / projecte (terminis, continguts...).

DECISIONS MADE - ASSIGNMENTS

- Es van relacionant els acords que es van prenent i que afecten el desenvolupament del treball / projecte. Cal indicar qui es fa responsable de què. Convé separar els acords de cara a la propera reunió dels altres acords a més llarg termini.
- El darrer acord acostuma a ser la fixació de la propera reunió (dia, hora i ordre del dia).

SIGNATURES

Coordinator: **Customer:**

ATTACHMENT 2.- TEMPLATE FOR THE PROJECT DVD

Departament de Projectes d'Enginyeria
UNIVERSITAT POLITÈCNICA DE CATALUNYA

Degree: *AEROSPACE ENGINEERING*

Course: Engineering Projects **Group:** GX/EA-T2016

Title and acronym:

……

……

Students:

Student 1	Student 6
Student 2	Student 7
Student 3	Student 8
Student 4	Student 9
Student 5	Student 10

Customer: *XXXXXXXXXXXXXXX*

Delivery date: 22/12/2016

The organization of items in the DVD will be as follows :

1. Report (files in format PDF, DOC or DOCX)
2. Report attachments (files in format PDF, DOC or DOCX)
3. Budget (files in format PDF, DOC or DOCX)
4. Drawings (files in format PDF or DWG)
5. Technical sheets (files in format PDF, DOC or DOCX)
6. Minutes of the meeting (files in format PDF, DOC or DOCX)
7. Scheduling (files in format PDF, DOC, DOCX or MPP)
8. Presentation (files in format PPT or PPTX)
9. SUMMARY - Poster (files in format PPT or PPTX)
10. SUMMARY - Video (files in format FLV) – Whether proceeds

ATTACHMENT 3.- COVER PAGES

Departament de Projectes d'Enginyeria
UNIVERSITAT POLITÈCNICA DE CATALUNYA

Secció de Terrassa

Degree: *AEROSPACE ENGINEERING*

Course: Engineering Projects

Title and Acronym of the Project:

……
……
……

Contents: REPORT / ATTACHMENTS / BUDGET / DRAWINGS / TECHNICAL SHEETS (whenever proceeds)

Group: GX/EA-T2016

Delivery date: 22/12/2016

Students (Family name, first name):

Student 1
Student 2
Student 3
Student 4
Student 5
Student 6
Student 7
Student 8
Student 9
Student 10
Student 11
Student 12

Customer (Family name, first name): *XXXXXXXXXXXXXXX*

ATTACHMENT 4.- PROJECT CHARTER TEMPLATE

ESEIAAT
Project & Construction Engineering Department

[Project Name]

[Acronym]

Project Charter

Group XX EA-T2016 [DD-MM-YYYY]

Contents

1 Aim of the project

(Breve descripción del objeto principal del proyecto)

2 Scope of the project

(Identificación, por puntos, de los trabajos precisos que van a desarrollarse a lo largo del proyecto, hasta la conclusión del mismo)

3 Basic requirements of the project

(Identificación, por puntos, de las restricciones existentes en cuanto al resultado final del proyecto, en cuanto al punto de partida del mismo o en cuanto a las posibles soluciones técnicas que puedan adoptarse)

4 Justification

(Indicación de la necesidad / utilidad del proyecto, ventajas o inconvenientes del enfoque que quiere darse, aspectos que se consideran críticos en el desarrollo, …)

5 Group organization

5.1 Organization structure

(Descripción de la estructura organizativa del grupo de proyectos y de los otros participantes en el mismo [stakeholders])

5.2 Roles and responsibilities

(Resumir los roles y responsabilidades de los diferentes *stakeholders*]

6 Planning of the project

6.1 Tasks identification from work breakdown structure (WBS)

6.2 Brief tasks description

6.3 Interdependency relationship among tasks

Code of task	Task identification	Preceding task(s)
…	…….	….
…	…..	….

6.4 Human resources and level of effort (hours) to develop each task

Code of task	Resources	Level of effort
….	……	……
….	……	……
….	……	……

6.5 Scheduling - Gantt Chart

7 Budget (preliminary estimate for the engineering basic project)