



**ASIIN Seal & EUR-ACE®**

## **Accreditation Report**

**Master's Degree Programme**  
***Aeronautical Engineering***

Provided by  
**École Supérieure de l'Aéronautique et des Technologies (ESAT), Tunis**

Version: 20 March 2020

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## A About the Accreditation Process

Name of the degree programme (in original language)	(Official) English translation of the name	Labels applied for <sup>1</sup>	Previous accreditation (issuing agency, validity)	Involved Technical Committees (TC) <sup>2</sup>
الوطنية الشهادة لمهندس اختصاص طيران	National Engineering Diploma in Aeronautics	ASIIN, EUR-ACE® Label	--	01, 02
<b>Date of the contract:</b> 17.12.2018  <b>Submission of the final version of the self-assessment report:</b> 16.12.2019  <b>Date of the onsite visit:</b> 21-22.01.2020  <b>at:</b> École Supérieure de l'Aéronautique et des Technologies (ESAT), Tunis, Tunisia				
<b>Peer panel:</b>  Naima Ben Abdallah, International Institute of Technology  Dr. Christoph Hanisch, formerly FESTO AG & Co. KG  Prof. Dr. rer. nat. Harald Jacques, University of Applied Sciences Düsseldorf  Prof. Dr.-Ing. Eike Stumpf, RWTH Aachen				
<b>Representative of the ASIIN headquarter:</b> Raphaela Forst				
<b>Responsible decision-making committee:</b> Accreditation Commission for Degree Programmes				
<b>Criteria used:</b>  European Standards and Guidelines as of 15.05.2015				

<sup>1</sup> ASIIN Seal for degree programmes; EUR-ACE® Label: European Label for Engineering Programmes

<sup>2</sup> TC: Technical Committee for the following subject areas: TC 01 - Mechanical Engineering/Process Engineering; TC 02 - Electrical Engineering/Information Technology

ASIIN General Criteria as of 10.12.2015	
Subject-Specific Criteria of Technical Committee 01 –Mechanical Engineering/Process Engineering as of 09.12.2011	
Subject-Specific Criteria of Technical Committee 02 – Electrical Engineering/Information Technology as of 09.12.2011	

## B Characteristics of the Degree Programme

a) Name	Final degree (original/English translation)	b) Areas of Specialization	c) Corresponding level of the EQF <sup>3</sup>	d) Mode of Study	e) Double/Joint Degree	f) Duration	g) Credit points/unit	h) Intake rhythm & First time of offer
Aeronautical Engineering	الوطنية الشهادة اختصاص لمهندس طيران / National Engineering Diploma in Aeronautics	Aeronautical Engineering	7	Full time	--	6 semesters (3 years) + 2 years preparatory	187 ECTS	Once a year in Fall/Winter Semester; first offered in 2004

For the Master's degree programme Aeronautical Engineering, the institution has presented the following profile in the self-assessment report:

„ESAT University has positioned itself to be a regional player when it comes to educate a highly skilled engineer in the area of Aeronautics which represents global challenges nowadays. The need for engineer's who can work in the aviation industry (Design & manufacturing, and aircraft maintenance) drives the exploration of innovative solutions for engineering education in this sector of aerospace science and technology in Tunisia, the Middle East and North Africa (MENA ) Region.

ESAT University was launched in 2003 in order to educate engineers in the area of aeronautics and aviation sector. The aeronautical engineering programme was designed and compiled in accordance with the French system (2+3). The first 2 years are called the Preparatory Cycle and the programme has a concentration on Math and Physics (up to 15 contact hours/week). At the end of this cycle students can register in one of the available engineering programmes, or also register at the affiliated institution Airline Flight Academy for Pilot training. Students who register in the aeronautical engineering programme will spend 3 years at ESAT University to complete the engineering cycle. The orientation at the end of the preparatory cycle is processed during the second year depending on the student choice and the orientation committee results (normally final results are available at the first week of July each academic year). [...]

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<sup>3</sup> EQF = The European Qualifications Framework for lifelong learning

Graduates [of the engineering programme in aeronautics at ESAT] are considered to be skilled practitioners who apply their knowledge and technical skills to solve relevant engineering problems in both aeronautical and any other related profession. The curriculum was designed initially to produce a "generalist aeronautical engineer" who can work in several area in order to open up as much as possible carrier prospects and avoid unemployment situation.

ESAT University has been working closely with industry and also academic partners in order to evaluate the programme on a yearly basis depending on their feedback where some minor adjustment mainly in workshops or professional modules content are done. Graduates acquired the necessary knowledge, competencies and skills (including soft skills) that can help them to work in the aviation industry (design office, manufacturing ), Airline company and aircraft Maintenance and Repair Organization (MRO), Civil Aviation, and Airports Authority, International organizations such as ICAO, Consulting Organizations, etc.

Honours graduates can pursue advanced postgraduate studies abroad (Germany, Canada, China, France, Spain, USA, ...).“

## C Peer Report for the ASIIN Seal<sup>4</sup>

### 1. The Degree Programme: Concept, content & implementation

<b>Criterion 1.1 Objectives and learning outcomes of a degree programme</b>
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**Evidence:**

- Objective Module Matrices for the degree programme
- Presentation of the ESAT Group
- Self-Assessment Report
- Discussions during the on-site visit

**Preliminary assessment and analysis of the peers:**

For the degree programme in question, ESAT presents the overall programme objectives and learning outcomes in the self-assessment report (SAR). These descriptions are accompanied by objective-module-matrices, matching learning objectives, and the ASIIN subject-specific criteria (SSC). The peers note that the objective-module-matrices in the self-assessment-report do not mention the specific modules, which correspond to the intended learning outcomes. However, the module handbook annexed to the report also contains further objective-module-matrices that detail the contribution (low, medium, high) of all modules in the programme to the intended knowledge, skills and competences. Thus, the peers are satisfied that the intended learning outcomes match with the individual modules in the curriculum.

The descriptions of the learning outcomes are clear and concise and are accessible to students and teachers via the internal platform, ESAT online. The peers point out that the learning outcomes or a summary should also be anchored in the diploma supplement in order to provide graduates with an official short presentation of their respective degree programme to facilitate applying for career opportunities worldwide. The peers notice that a diploma supplement has not yet been implemented (cf. criterion 5.2) and ask to establish this as soon as possible and to include a description of the qualification objectives.

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<sup>4</sup> This part of the report applies also for the assessment for the European subject-specific labels. After the conclusion of the procedure, the stated requirements and/or recommendations and the deadlines are equally valid for the ASIIN seal as well as for the sought subject-specific label.

Based on the information presented in the SAR, the peers learn that the degree programme Aeronautical engineering aims at preparing the graduates to be able to develop their professional competence to work in the highest positions dealing with aeronautical engineering technology in industry. The programme further intends to develop the graduates' abilities to adapt, to adjust, to grow independently as well as to compete globally. ESAT aims to prepare the graduates to be able to develop the chosen field of aeronautics, including the ability to continue to post-graduate studies.

According to the learning outcomes, students in this degree programme should have a fundamental understanding of mechanical and electrical engineering principles and practices as well as the necessary skills for the study, design, analysis and development of aircraft structure, engines, avionics and other high technology flight systems. They should be able to use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions. They can select, and apply modern design and simulation engineering and IT tools to complex engineering activities with an understanding of the limitations. They have the necessary oral and written communication skills mainly in French and English, and are encouraged to be certified at the international level. Students are prepared for socialization, business work and scientific environments in a dynamic and global environment by building partnerships between the institution and the industry. They have awareness of the importance of life-long learning.

The peers analyse the described learning outcomes and agree that they are overall consistent with the expectations of the European Qualification Framework Level 7 (equivalent to a Master's degree programme) as well as the respective Subject-Specific Criteria of the ASIIN Technical Committees 01 –Mechanical Engineering/Process Engineering as well as 02 – Electrical Engineering/Information Technology. Furthermore, they comply with the standards and criteria of the EUR-ACE Label.

Based on the discussions with programme managers, industry partners, and alumni during the on-site visit, the peers conclude that the intended qualification profile allows the graduates to work in the aeronautical field as engineers, supervisors or managers, both in the public and private sector. Industry partners and alumni are involved in the development of the study programme and the intended learning outcomes (see criterion 6).

In summary, the peers regard the qualification objectives to be well founded. However, they ask ESAT to anchor the qualification objective in the diploma supplement and to make the intended learning outcomes also accessible to prospective students by publishing them on ESAT's website.



<b>Criterion 1.2 Name of the degree programme</b>
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**Evidence:**

- Self-Assessment Report
- Discussions during the on-site visit

**Preliminary assessment and analysis of the peers:**

The degree programme is taught in French, which is matched by the French name of the degree programme “Ingénieur Aéronautique”. The HEI explains that the name "Aeronautical Engineering" was selected in preference to "Aerospace Engineering" because the programme focuses on the engineering aspects of aeronautics and aviation (aircraft design & manufacturing technology, aircraft maintenance, etc...). This is reflected in the learning outcomes (see above).

As Arabic is the official language for all Higher Education Ministry documents in Tunisia, the degree certificate as well as official documents are in Arabic. In the Self-Assessment Report, the HEI points out that Arabic uses the same word for both “aviation” and “aeronautics”, which - while linguistically interesting - does not influence the content of the programme.

The peers conclude that degree programme name reflects the intended aims and learning outcomes as well as, fundamentally, the main course language.

<b>Criterion 1.3 Curriculum</b>
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**Evidence:**

- Objective- module-matrices for the degree programme
- Study plan for the degree programme
- Module descriptions for the degree programme
- Self-Assessment Report
- Discussions during the on-site visit.

**Preliminary assessment and analysis of the peers:**

ESAT is a private school accredited by the Tunisian Ministry of Higher Education and Scientific Research. Founded in 2003 by experts in aviation, ESAT aims to provide the aviation sector with well-trained people having acquired the necessary skills through a recognized and certified training programme. Practical training through qualifications type rating, i.e. training to be permitted to fly certain aircrafts, and industry internships allow students to get professional experience while progressing in their curriculum. ESAT offers the engineering programme in aeronautics since 2004 and is the only school in Tunisia to do so, as well as the only one in the MENA region.

At ESAT, each student has to undertake a two-year long preparatory course before beginning with their speciality, in this case aeronautical engineering. The “preparatory cycle” is open to individuals passing their final secondary education examination with success and holding the Baccalaureate, SAT, or equivalent diploma in science or technology fields. It allows graduates to access one of the study fields offered by the school without competitive examination, as the transition is made based on continuous assessment. Upon successful completion of the preparatory cycle, students can also register at the affiliated Airline Flight Academy for pilot training.

The preparatory cycle encompasses common subjects like math, physics, chemistry, computer sciences, mechanics, electronics and graph theory, as well as language classes in French and English. These subjects are taught for all students at ESAT and are supplemented with specialized subjects related to the aimed at engineering degree. In the case of aeronautical engineering, these include classes on material sciences, engines technology, air navigation, meteorology, and aviation law.

After the second year of study, students decide which of the engineering study programmes they want to pursue, among them aeronautical engineering, or if they want to go for pilot training. In the following, the discussion of the curriculum will focus on those three years when students study their specification (“engineering cycle”). At ESAT, those are the last three years of a five-year programme. Yet, as detailed under criterion 1.4, the study programme may also be studied by students, who have already achieved a Bachelor’s degree or a Licence.

The peers review the curriculum of the Master’s programme Aeronautical Engineering in order to identify whether the available modules are able to achieve the described qualification objectives. They take into consideration the study plan, objective-module-matrices, and the individual module descriptions. The peers assess that the curriculum, detailed in the annex of this accreditation report, is well founded, matches international standards, and thus well prepares students for national and international occupations. While the curriculum lacks fundamental skills, especially in the mathematical and engineering mechanics sector, the programme coordinators remind the peers that students gain these skills in the two preparatory years or their Bachelor’s degree or Licence.

During the discussions, the peers ask where the students learn interpersonal/soft skills such as intercultural competencies, leadership and teamwork, or conflict management. The programme managers explain that most modules include working in groups or teams, especially during practical works. Students are also encourage to join in the extracurricular activities and clubs offered at ESAT. The curriculum also includes the “project startup”, where students gain insights into entrepreneurship, founding their own start-up and designing

their own projects. Especially during the final year of the engineering cycle, students are also prepared for public speaking, stress and time management, as well as how to present themselves and their projects in front of different audiences. The peers recognise that various soft skills are taught in the engineering cycle. However, they suggest to also include conflict management. As engineers often work in teams and have to find solutions to a given problem while taking into consideration different stakeholders such as employers, clients as well as technical, environmental and societal aspects, knowing how to react to and handle conflict in a professional setting is an important aspect of working as an engineer.

During the discussion on-site, the peers furthermore learn that apart from the presented modules composing the curricula, students also have to undertake two internships of at least one month duration during the summer holidays. Each internship as well as the report that has to be written by the students, is a mandatory part of the curriculum and must be validated by a “defense” of the report. The peers appreciate that the students are encouraged to conduct internships during their holidays in order to improve their career opportunities after graduation. As stipulated in the regulations of the European Area of Higher Education, where all mandatory parts of the curriculum must be presented in the curriculum and awarded credit points, ESAT awards credits for these internships. The peers notice that these credits are in addition to the 300 ECTS gained over the five years of preparatory and engineering cycle (see also criterion 2.2), which is fine as long as the content and duration of the internships and the awarded credits are also included in the final transcript of records awarded with the graduation certificate.

In the study programme, there are no elective modules for the students, yet students can further specialize or chose to focus their expertise through the two mandatory internships as well as the annual project and the graduation research project. The graduation research project can be completed with an industry partner for a more practical or at a research laboratory or Higher Education Institution for a more academic focus. Students can also individualize their qualifications profile by participating in student clubs or associations, as well as their individual projects during the practical workshops of the study programme. Mobility during the internships or the graduation research projects offer further individualization.

All graduation research projects take place in cooperation with industry partners or at partner HEI with active research in the aeronautical field. The peers acknowledge that students gain practical skills through the two mandatory internships during the summer holidays, through the final project that is often undertaken in cooperation with industrial partners as well as through work in the laboratories of ESAT. Especially the work in laboratories is of

great importance to the education of future engineers and the equipment should reflect that.

In the audit discussions, the programme managers explain that the Tunisian labor market demands generalists “with an engineering mind”, i.e. problem-solving mindset. The study programme is therefore aimed at creating generalist engineers that have a broad range of knowledge and the necessary tools and soft skills to specialize after graduation based on the respective employer’s needs and the graduates interests. At this point, the HEI does not intend to introduce selective courses to enable specialization, but aims to continually develop the study programme to facilitate employability of the graduates. The alumni and industry partners agree that the current market demands for generalists and that employers offer opportunities for further specialisation if necessary. They also point out that the HEI is always open to feedback from industry partners and alumni regarding the focus of the curriculum, as well as open to introducing new aspects of aviation or updating the modules based on current developments in the aeronautical field. This is noted positively by the peers who suggest to keep on improving the curriculum by integrating new technologies and developments in the aeronautical fields. This might also include updating the equipment available for practical work (see point 4.3) and to give the students more opportunities to become familiar with these new technologies or materials.

Through the discussions, the peers note positively that students and alumni alike are convinced of the importance of life-long learning and seek out opportunities to further their training and knowledge. Graduates complete further training, workshops and certifications. Students are aware that the “aeronautical field is quite big and fast paced” and that further studies needed to specialize after graduation. During their years at ESAT, they are active in the many associations and clubs organized by students, as well as cultural events offered by the HEI. Though this learning outcome is not easy to measure, the HEI obviously achieves it.

In summary, the peers are greatly impressed by the curriculum of the study programme that has been developed with the support of partners from the industry and thus allows students a promising education in the field of aeronautics. The study programme attracts students from Tunisia as well as North Africa /the MENA region and even Europe and clearly fulfils the needs of the labor market in Tunisia and North Africa. The peers understand that ESAT is training generalist engineers in aeronautical engineering, but encourage ESAT to keep on improving the curriculum by integrating new technologies and developments in the aeronautical fields.

<b>Criterion 1.4 Admission requirements</b>
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**Evidence:**

- Internal regulation of ESAT
- Admission process
- Admission requirements
- Self-Assessment Report
- Discussions during the on-site visit

**Preliminary assessment and analysis of the peers:**

From the information provided and the audit discussions, the peers understand that admission to ESAT is based on successful completion of previous education as well as the student's motivation and English level assessment.

The preparatory cycle is open to students who successfully graduated from secondary education and hold a Baccalaureate, SAT, or equivalent Diploma in Science or Technologies fields. For admittance to the engineering cycle, a successful graduation from the preparatory cycle or a Bachelor degree in sciences and technology fields, or equivalent diploma is required.

ESAT selects students based on the application form, which can be downloaded from the website, an interview and an English level assessment, i.e. an interview with the English teacher. The programme managers explain that about 70-80% of the students in the engineering cycle also studied the preparatory cycle at ESAT, the remaining students usually have a Licence/ Bachelor's degree. They also stress that the interview and the motivation of the students are the main criteria for selecting the students, alongside their capabilities in mathematics, physics and English.

Applicants from other HEIs that do not yet have the necessary knowledge in the aeronautical field can gain these by first studying the second year of the preparatory cycle before starting the engineering cycle.

During the discussion with the students, the peers gain the impression that students are well informed about the admission requirements and procedures as all necessary information is presented on ESAT's website and published in the internal rules and regulations. The focus on motivation leads to committed students and the peers notice during the discussions that students and graduates are clearly passionate about the aeronautical field. Consequently, the peers judge the process to be transparent and adequate for selecting the best students for the degree programme.

**Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 1:**

*Criterion 1.1 Objectives and Learning Outcomes*

With their statement, ESAT provides a diploma supplement that includes the qualification objective of the study programme. Additionally, the learning outcomes are published on the ESAT Website and accessible to the public.

*Criterion 1.3 Curriculum*

Regarding the peers' suggestion to incorporate conflict management into the study programme, ESAT announces that a module on conflict management will be included in the curriculum of the engineering cycle starting from the academic year 2020-2021. ESAT also affirms that they will continue to improve the curriculum in cooperation with alumni and industrial partners by integrating modules about new technologies and developments in the aeronautical field starting from the academic year 2020-2021. The peers welcome ESAT's efforts to continuously improve the curriculum, but pending implementation they maintain their recommendations to include conflict management in the curriculum and to further integrate new technologies and developments in the aeronautical fields into the curriculum.

In summary, the peers regard criterion 1 as mostly fulfilled.

## **2. The degree programme: structures, methods and implementation**

<b>Criterion 2.1 Structure and modules</b>
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**Evidence:**

- Study plan for the degree programme
- Module descriptions for the degree programme
- Statistics about the international mobility and its process
- Credit validation procedure
- Internal regulations of ESAT
- Self-Assessment Report
- Discussions during the on-site visit

### **Preliminary assessment and analysis of the peers:**

#### *Modularisation*

The degree programme is divided into modules, which comprise a sum of teaching and learning units. The peers judge the structure of the modules to be adequate and fitting.

Modules consist of a varying number of courses: while some modules entail only one course, others may encompass several courses or a combination of courses and workshops. The peers notice that if a module consists of more than one course, all sections are linked thematically and thus create one unit. For example, the module “Aeronautics”, consists of the courses “Aerodynamics”, “Airframe & Systems”, “Avionic Systems 1” and “Maintenance & Operation of Aircrafts” plus the workshop “Aircraft Engines”.

With the self-assessment report, the HEI also submits statistical data that show the low drop-out rates and successful graduation rates. Overall, the peers conclude that the curriculum is structured in a way to allow students to complete the degree without exceeding the regular course duration (see also criterium 3).

All internships are integrated into the curriculum and through the obligatory report and defense the HEI also monitors the quality of the internships in terms of relevance, content and structure.

#### *International Mobility*

The peers understand from the self-assessment report and the audit discussions that ESAT has established several cooperation agreements (Erasmus+, bilateral, ..) with other universities for either studies abroad or the graduation research projects and that ESAT intends to maintain and further develop partnerships with foreign institutions.

Apart from scholarships for the GRP and ERASMU+-mobility during the engineering cycle, ESAT has also established cooperation agreements with scholarships for further Master studies in China and Canada that graduates can benefit from. Students also benefit from reduced rates at an English language school in Malta.

While these opportunities (scholarships) for a graduation research project abroad are generally reserved for the students with the best grades, students also have the opportunity to go abroad as free-movers. An increasing percentage of the students chooses to do their graduation research project abroad. They are supported by their teachers and the ERASMUS+ coordinator in finding internship opportunities or research projects and organizing their mobility. While students and graduates are satisfied with the support offered by ESAT for finding internships and employment, the students also express a wish for more support

in finding scholarships for internship opportunities abroad (see above). They see international experience as very valuable, but financing international mobility can be a challenge. The peers can understand this and suggest helping the students find or contact external scholarship providers such as the DAAD (German Academic Exchange Service).

So far, ESAT has had no incoming exchange students and only two students studied abroad using the third semester of the engineering cycle as a window for mobility. ESAT and each student signed a learning agreement. The recognition of the classes was based on the content of each class. Students must validate 30 ECTS per semester during ERASMUS. Due to the compulsory nature of the modules, it is easier to use internships and the graduation research project as a window for mobility. The peers find that credit transfer and the recognition of credits gained at foreign universities is possible and regulated by ESAT. These regulations, anchored on ESAT's internal website and the credit validation procedure, are known to the students, transparently accessible and in line with the Lisbon-convention.

<b>Criterion 2.2 Work load and credits</b>
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**Evidence:**

- Study plan for the degree programme
- Module descriptions for the degree programme
- Self-Assessment Report
- Discussions during the on-site visit

**Preliminary assessment and analysis of the peers:**

All modules of the programme are assigned ECTS credits. One semester comprises 29-31 credit points with each credit point amounting to 25 working hours that include both attendance-based learning and self-studies. As is discussed in detail under criterion 2.1, modules can consist of one to several courses and workshops. The module structure corresponds to the standards of the EQF, ASIIN and EUR-ACE®.

The peers acknowledge that all parts of the curriculum, including the mandatory internships, are awarded credit points, leading to 187 ECTS being awarded for the engineering cycle.

The peers further analyse the workload of each course and module and find it to be suitable and manageable. Personal feedback regarding the workload between students and teachers shows that students are generally content with their workload and believe the awarded credits to reflect the workload adequately. The peers agree with the students' assessment. However, they urge ESAT to introduce systematic and institutionalized evaluations of the workload (see criterion 6).



### **Criterion 2.3 Teaching methodology**

#### **Evidence:**

- Self-Assessment Report
- Discussions during the on-site visit

#### **Preliminary assessment and analysis of the peers:**

The degree programme under review utilizes different educational methods for teaching the courses, such as lectures, travaux dirigés/TD (guided work), workshops/ laboratory practical work, excursions, internships, mini-projects and the graduation research projects. The teachers further emphasize that for the majority of courses, scripts are available. Here the peers wish for a more extensive reading list that give recommendations for self-study or further research (see also 5.1).

The travaux dirigés are guided exercises included in the class or lecture. This is predominantly used during the preparatory cycle, the latter years of the engineering cycle focus more on project-based exercises. During practical work, no more than 10-12 students are in one class, with 2-3 students working together on one of the machines or tools. For workshops and for projects, teachers also use the inverted classroom technique.

In summary, the peers acknowledge that ESAT uses a variety of teaching methodologies. As discussed in 4.2, the peers suggest offering the teachers further didactical training to allow for a wider variety of teaching methods.

### **Criterion 2.4 Support and assistance**

#### **Evidence:**

- Self-Assessment Report
- Discussions during the on-site visit

#### **Preliminary assessment and analysis of the peers:**

During the on-site discussions with the programme coordinators, the teachers and especially the students, the peers gather a comprehensive impression of the offers related to supporting and assisting the students. Being a private university, ESAT manages to offer classes in the small size of 20-25 students, which enables close relations between staff and students and thus allows for constant and direct feedback in case any issues arise. Each student is also assigned to a member of the teaching staff (supervisor) that acts as a first contact person for all consultations that a student may need.

The students confirm that they are very satisfied with the support and assistance they receive from their professors and that they can contact them at any time if problems occur,

whether related to the taught subjects or of a personal nature. As most teachers are non-permanent teachers, meaning they hold other occupations as well, the peers ask how student hold contact to these members of staff. They learn that non-permanent teachers have fixed office hours on certain days during which they are always available in person at ESAT

Apart from subject-specific support, ESAT also offers several other means to aid its students: the ERASMUS+ coordinator supports international mobility, the Internship and Career Support Service within the administration informs about updated vacancy and its requirements. Open days and forums are organized during each academic year to facilitate networking with private companies, which are seeking potential aeronautical engineers.

While students and graduates are satisfied with the support offered by ESAT for finding internships and employment, the students also express a wish for more support in finding scholarships for internship opportunities abroad (see above). They see international experience as very valuable, but financing international mobility can be a challenge. The peers can understand this and suggest helping the students find or contact external scholarship providers such as the DAAD (German Academic Exchange Service).

Overall, the peers are satisfied with the support and assistance the students at ESAT receive.

**Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 2:**

*Evaluation of workload – see criterion 6; reading list – see criterion 5; teaching methodologies – see criterion 4*

*Student mobility*

In their statement, ESAT points out that they publish all opportunities offered by DAAD to ESAT students in order to encourage them to participate in open days organized by DAAD mainly those in the City of Sciences – Tunis [informational sessions on scholarships, studying and researching in Germany]. The peers thank ESAT for the information, but wish to clarify that they suggested the DAAD as one possible example. Nevertheless, they are convinced by the documentation and the on-site-visit that ESAT offers comprehensive support to its students regarding student mobility.

As such, they regard this criterion as fulfilled.

### **3. Exams: System, concept and organisation**

<b>Criterion 3 Exams: System, concept and organisation</b>
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**Evidence:**

- Official documents outlining the examination process
- Exams calendar
- Self-Assessment Report
- Discussions during the on-site visit

**Preliminary assessment and analysis of the peers:**

The peers analyse the provided documents and notice that all course content within the reviewed degree programmes is examined. Examination types are selected based on their competences orientation and may include written exams, tests, reports, defense/presentation, practical tests (e.g. in meteorology or navigation), oral examination, project work, laboratory session or essay. If not stated in the module descriptions, student receive information about examination and grading at the beginning of each course. All relevant rules and regulations regarding the exam procedure are anchored and published on ESAT's internal website.

As it is usual in Tunisia, ESAT uses a system of continuous monitoring (tests and midterms during the semester) and a final examination at the end of each semester.

The programme coordinators explain that all examinations are held during a two-week examination period at the end of each semester. The dates of the examination period are communicated at the beginning of each academic year and published in the academic calendar. Three or four weeks prior to the examination period, the schedule of the examination period is published, stating which exam is written at what precise day and time during the aforementioned two-week period. To avoid any complication with the schedule and to make sure the workload is manageable for the students, there is always a rest day between exam days, though students might have two exams per day.

Due to the fact that each course is examined, students have up to twelve exams during the examination schedule at the end of each semester, so more than one exam per day. The students tell the peers that this workload is manageable for them, especially if one continuously studies during the semester. There are also mid-term exams and continuous assessment (e.g. tests or short reports) that make up 40% of the final grade and are appreciated by the students as they force them to learn during the semester, which eases the workload during the final examination period.

In order to pass a module, students must obtain an overall average score of at least 10/20. This takes into account the continuous assessment and the final exam of all courses/workshops in a module. Students with a lower score are automatically signed up to sit the exam again in the remedial session that is scheduled at the end of each semester. This session must take place within one week after the announcement of the results. If a student is sick during the main session, they are referred directly to the remedial section.

Only students that have validated all credits, i.e. obtained a passing score in all modules, are allowed to pass to the next year. If not, they have to repeat the whole year. The peers understand that this is common practice at Tunisian HEIs and they recognize that the system of continuous assessment + final examinations as well as resit regulations offer the students opportunities to make up failing grades and avoid delays to student progression.

The peers also inspect a sample of examination papers and final project works and are overall satisfied with the general quality of the samples. They confirm that they hold an academic level comparable to the European Qualification Framework (EQF) 7.

In summary, the peers acknowledge that the system, conception and organization of examinations at ESAT is efficient.

**Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 3:**

ESAT does not comment on this criterion.

The peers regard criterion 3 as fulfilled.

## 4. Resources

<b>Criterion 4.1 Staff</b>
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**Evidence:**

- Handbook of Academic Staff
- Self-Assessment Report
- Discussions during the on-site visit

**Preliminary assessment and analysis of the peers:**

In the self-assessment report, the university presents data about the number and overall qualification of staff for the aeronautical engineering programme and during the discussion onsite the peers gain a good impression of the quality of the teaching personnel. Based on

legal requirements, teaching staff must at least have a qualification on Master level and it is recommended that 50% of the staff members should hold a PhD.

In total, the staff is composed of full-time staff members solely employed by ESAT (13 members of core faculty) and of part-time staff that is recruited either among the staff of the public HEIs (39 adjunct faculty members) or among industry partners (21 lecturers and professionals). Members of the core faculty also perform administrative tasks/oversee departments and participate in the educational management and scientific research. They act as supervisors to the students and provide personalized follow-up to the students. As non-permanent teachers are still reachable by the students (cf. criterion 2.4), the peers do not regard the high number of non-permanent teachers as problematic.

During the discussions, the peers learn that the HEI has defined an adequate recruiting process for teaching staff and that preparation for the next academic year might also include recruitment for further teaching staff as Tunisia faces an emigration of engineers, doctors and HEI professors. Recruitment of teaching staff is however always able to be done in time for the next academic year. The teaching staff indicate that they are quite satisfied with the working relationship with ESAT. The peers also notice that the staff members, especially the core faculty, are very motivated and convinced of the offered study programme.

The peers conclude that the teaching staff is well qualified and quantitatively sufficient in order to sustain the programme under review.

<b>Criterion 4.2 Staff development</b>
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**Evidence:**

- Self-Assessment Report
- Discussions during the on-site visit

**Preliminary assessment and analysis of the peers:**

The peers understand from the self-assessment report and the audit discussions that ESAT does not yet offer training and support for the teachers' improvement in pedagogical skills. Some staff has visited courses and seminars on didactical training, or have received such training by their employer (in case of industry partners) or at other universities.

Regarding professional development, ESAT hosts conferences for aeronautics and technologies and sends their teachers to participate in conferences in Tunisia and abroad. All graduation research projects take place in cooperation with industry partners or at partner HEI with active research in the aeronautical field. Working with partner institutions in several

countries by co-supervising graduation research projects has also led to new research topics. Adjunct faculty members that also teach at other HEI do research and use examples specific to the aeronautical field in order to keep students up to date with current problems/developments. Staff members regularly participate in international conferences, symposia and relevant scientific meetings.

The peers conclude that there are opportunities for professional development. However, they consider it necessary for ESAT to provide offers and support mechanisms for teaching staff who wish to further develop their teaching skills. Additionally, although research in the form of paid spare time, such as sabbaticals of six to twelve months duration are not yet common in Tunisia, they would greatly aid in increasing the research activities at ESAT.

#### **Criterion 4.3 Funds and equipment**

##### **Evidence:**

- Partnership Agreements
- List of laboratories and equipment
- On-site visit
- Self-Assessment Report
- Discussions during the on-site visit

##### **Preliminary assessment and analysis of the peers:**

Being a completely private institution, ESAT is funded solely by tuition fees of 7000 Dinar per academic year as no government support is provided to sustain the institution. From this budget, ESAT offers scholarships for student research as well as allows its staff to participate in conferences. ESAT is part of the ESAT group, which also encompasses an Airline company and a flight academy. Students can visit and view the fleet of aircrafts of the flight academy.

During the on-site visit, the peers were able to gain a comprehensive impression of the facilities and laboratories at the ESAT. There is a separate workshop solely for student projects that students can access during opening hours which allows for own practical activities.

The peers were impressed with the flight simulators and the infrastructure in terms of flight training. The remaining equipment is adequate to conduct the study programme, but continuous developments in the field and the integration of these into the curriculum might also necessitate updating the equipment available for practical work and expanding the lab infrastructure. This would also provide students more opportunities to gain a deeper understanding of the links between theory and praxis and to become familiar with these new

technologies or materials. The peers understand that the current campus does not allow for an extension of laboratories, but they learn from the programme managers that planning for a new and bigger building has already begun.

ESAT also provides space for student life and club activities, as well as a library. The peers note that as a more recently established university the library is not yet extensive and so far focuses mainly on the preparatory cycle. The peers therefore recommend to give the students more access to relevant books, publications and journals for course work and the graduation research projects beyond the university's library, e.g. by cooperating with other universities in Tunis.

**Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 4:**

*Criterion 4.2 Staff development*

With their statement, ESAT provides documentation for a three-day training session on "Mastering the requirements of the new ISO 21001-2018 standard: Management system of education / training organizations" for the core teaching staff. Learning management systems offer opportunities to deliver and manage content such as documents, videos, quizzes etc. and can be utilized for flipped classroom techniques. The peers appreciate ESAT's quick response regarding staff development. Still, they find it important to continue to offer didactical training or to give staff the opportunity to further develop their teaching skills.

*Criterion 4.3 Funds and Equipment*

Regarding the equipment for practical work, ESAT provides a list of further equipment and components for the laboratories, mainly the electronics and embedded systems laboratory, which it plans to acquire by July 2020. ESAT also details for which modules the equipment will be used. The peers regard the additional equipment as expedient, especially as it completes the equipment in the electronics and embedded systems laboratory. However, they urge ESAT to further update or complete the equipment available for practical work when new developments in the field of aerospace are integrated into the curriculum.

In their statement, ESAT also clarifies the online resources accessible to students, teaching and administrative staff. These resources include the online library of AUF (Agence Universitaire de la Francophonie), Avialogs (an aviation library), Biblioaccess – France, IEEE Explore as well as NASA STI (aerospace). Additionally, ESAT discusses partnering with BIRUNI (a local network of university libraries), CNUDEST (the national online documentation center - Tunisia) or worldwide online libraries in order to improve the existing library. The peers

thank ESAT for the clarification. They see that students have access to relevant books, publications, and journals, but ask ESAT to further improve students' access to sources for course work and the graduation research projects.

The peers regard criterion 4 as mostly fulfilled.

## 5. Transparency and documentation

### Criterion 5.1 Module descriptions

**Evidence:**

- Module descriptions
- Self-Assessment Report
- Discussions during the on-site visit

**Preliminary assessment and analysis of the peers:**

The peers appreciate that the module descriptions were presented beforehand with the self-assessment report in an English translation. The module descriptions in French are available to students and teaching staff via the internal ESAT website.

The module descriptions contain the module identification code, person(s) responsible for each module, teaching method(s) and work load, credit points, intended learning outcomes and module content, the planned use/applicability, admission and examination requirements, form(s) of assessment, and recommended literature. The grade for each module is marked according to the Tunisian scoring system (see criterion 3 exams) and thus not further explained in the module descriptions.

However, the peers advise to detail the amount and content of practical work in the module descriptions of the relevant courses and to add reading recommendations for further self-study at least for the field-specific subjects.

### Criterion 5.2 Diploma and Diploma Supplement

**Evidence:**

- Self-Assessment Report
- Discussions during the on-site visit

**Preliminary assessment and analysis of the peers:**

From the presented documents, the peers gather that at graduation every student is awarded a Diploma and a Transcript of Records listing the modules and individual grades.



However, ESAT does not yet award a Diploma Supplement. At the completion of the degree programme, all graduates should be provided a Diploma Supplement that contains a concise description of the programme's learning outcomes, the list of modules and individual module grades of the student, the relative grade of the comparable graduates' cohort as well as information regarding the Tunisian system of higher education. Such a Diploma Supplement will increase the international comparability of the graduates and facilitate the employment process as employers receive a complete set of information together with the applicant's Diploma.

<b>Criterion 5.3 Relevant rules</b>
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**Evidence:**

- Internal Rules
- Examination Regulations
- Self-Assessment Report
- Discussions during the on-site visit

**Preliminary assessment and analysis of the peers:**

From the documents provided as well as the discussions during the on-site visit, the peers assess that ESAT follows a policy of transparent and open rules and regulations. All required rules and regulations are made accessible to students and are published on ESAT's website. The discussion with the students confirms that they feel well informed about regulations and comfortable about the access to any information pertaining their degree programmes.

**Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 5:***Criterion 5.1 Module descriptions*

ESAT provides an updated module handbook. The module descriptions now detail the amount and content of lab works for the relevant modules, as well as a reading list and the coefficient (in addition to the ECTS) for all modules.

*Criterion 5.2 Diploma and Diploma Supplement*

With their statement, ESAT also submits in a newly developed diploma supplement that contains a concise description of the programme's learning outcomes, as well as information regarding the Tunisian system of higher education. The list of modules and individual module grades of the student as well as the relative grade of the comparable graduates' cohort are listed in the Transcript of Records that is awarded together with the diploma.

The peers thus regard this criterion as fulfilled.

## 6. Quality management: quality assessment and development

<b>Criterion 6 Quality management: quality assessment and development</b>
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**Evidence:**

- Internal rules
- Examination Regulation
- Statistics about students
- Questionnaire used for the evaluation of courses
- Results of the evaluation of courses
- Self-Assessment Report
- Discussions during the on-site visit

**Preliminary assessment and analysis of the peers:**

From the documents presented and from the discussions during the on-site visit the peers gain an impression of the quality management procedures that are in place at ESAT and for the programme under review.

In 2018, ESAT introduced a quality management system in line with the standards of ISO 9001:2015 for administrative and managerial activities. The quality management system also includes regular surveys about the level of satisfaction and expectations of students, new applicants, academic staff and other staff members, alumni and employers. The results from these surveys are reported during the regular staff meetings, aggregated results are analysed and evaluated at the end of the academic year.

At the end of each semester, students evaluate each of their courses anonymously and online. The questionnaire covers the teacher's performance, the subject content, the learning outcome, and the exams. ESAT does not formally assess the students' workload. The peers find it necessary to implement systematic and institutionalized evaluations of the workload, as workload is an indicator for the academic feasibility of the programme, and suggest evaluating the workload as part of the course evaluations.

Since ESAT is a private university funded exclusively by the fees paid by the students the reliance on students' feedback and the necessity to ensure and improve the employability

of the graduates are of major importance to the coordinators. The discussion with the students revealed that those in charge are always eager and open for feedback and that students have the impression that their comments are taken into consideration with regard to the further improvement of the programmes. Feedback from alumni on study conditions such as infrastructure, course content, academic atmosphere, administration, internships and industry partners, mobility and academic partners is collected in a non-standardized form via emails, social media, direct discussion during meeting, forums, or conferences.

The industry representatives confirm in the discussion that the University is eager to receive feedback about new developments and trends and the employability of their graduates and that the university is open to implement changes to the curriculum to respond to developments in the aeronautical field. ESAT collects feedback from different stakeholders, which is then discussed by the programme managers at the end of the academic year and used to adapt the study programme.

The peers note that ESAT includes feedback from students, alumni, industry partners and teaching staff in the development of the study programme. This feedback is however often gathered informally in direct communication and there are no structures for follow-up processes or “closing the loop”, i.e. communication of the results to the relevant stakeholders. The peers understand that the quality management system is newly implemented. The peers consider it necessary to formalize follow-up structures for evaluation results (closing the loop), to formalize the evaluation of the workload and the evaluation of the overall satisfaction with the study programme for alumni.

**Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 6:**

In their statement, ESAT explains that as noticed by the peers, the quality management system is newly implemented. ESAT is therefore focusing on survey elaboration including the workload assessment by April 2020. Following that, ESAT will follow up systematically with analysis, recommendations and corrective actions. The HEI also provides a sample of a survey with follow-up actions. The peers thank ESAT for the information. However, they would like a concept that details the concrete steps of implementing quality assurance procedures for the yearly course evaluations, the evaluation of the students' workload as well as an evaluation of the overall satisfaction with the study programme.

The peers regard criterion 6 as mostly fulfilled.

## D Additional Documents

No additional documents needed.

## **E Comment of the Higher Education Institution (03.02.2020)**

The institution provided a detailed statement as well as the following additional documents:

- Updated module handbook
- Exemplary diploma supplement
- List of laboratory equipment
- Library and online documentation
- Refresher course & training for teaching staff
- Students survey

## F Summary: Peer recommendations (09.03.2020)

Taking into account the additional information and the comments given by ESAT, the peers summarize their analysis and **final assessment** for the award of the seals as follows:

Degree Programme	ASIIN-seal	Subject-specific label	Maximum duration of accreditation
Ma Aeronautical Engineering	With requirements	EUR-ACE®	30.09.2025

### Requirements

#### For the master programme Aeronautical Engineering

- A 1. (ASIIN 6) Provide a concept how to implement quality assurance procedures for the yearly course evaluations, the evaluation of the students' workload as well as an evaluation of the overall satisfaction with the study programme.

### Recommendations

#### For the master programme Aeronautical Engineering

- E 1. (ASIIN 1.3) It is recommended to include conflict management in the curriculum.
- E 2. (ASIIN 1.3) It is recommended to further integrate new technologies and developments in the aeronautical fields into the curriculum.
- E 3. (ASIIN 4.2) It is recommended to provide more offers and support mechanisms for teaching staff who wish to further develop their teaching skills.
- E 4. (ASIIN 4.3) It is recommended to improve students' access to relevant books, publications, and journals for course work and the graduation research projects.
- E 5. (ASIIN 4.3) It is recommended to increase the laboratory equipment and to give students more opportunity to do practical work.

## **G Comment of the Technical Committees (09.03.2020)**

### **Technical Committee 01 – Mechanical Engineering/Process Engineering**

*Assessment and analysis for the award of the ASIIN seal:*

Unlike the peers, the Technical Committee sees no reason to integrate courses on conflict management into the curriculum and therefore discards the corresponding recommendation. For all other requirements and recommendations, the Technical Committee agrees with the experts.

*Assessment and analysis for the award of the EUR-ACE® Label:*

The Technical Committee deems that the intended learning outcomes of the degree programme do comply with the engineering specific part of Subject-Specific Criteria of the Technical Committee 01 – Mechanical Engineering/Process Engineering.

The Technical Committee 01 – Mechanical Engineering/Process Engineering recommends the award of the seals as follows:

<b>Degree Programme</b>	<b>ASIIN-seal</b>	<b>Subject-specific label</b>	<b>Maximum duration of accreditation</b>
Ma Aeronautical Engineering	With requirements	EUR-ACE®	30.09.2025

#### **Requirements**

##### **For the master programme Aeronautical Engineering**

- A 1. (ASIIN 6) Provide a concept how to implement quality assurance procedures for the yearly course evaluations, the evaluation of the students' workload as well as an evaluation of the overall satisfaction with the study programme.

## **Recommendations**

### **For the master programme Aeronautical Engineering**

- E 1. (ASIIN 1.3) It is recommended to further integrate new technologies and developments in the aeronautical fields into the curriculum.
- E 2. (ASIIN 4.2) It is recommended to provide more offers and support mechanisms for teaching staff who wish to further develop their teaching skills.
- E 3. (ASIIN 4.3) It is recommended to improve students' access to relevant books, publications, and journals for course work and the graduation research projects.
- E 4. (ASIIN 4.3) It is recommended to increase the laboratory equipment and to give students more opportunity to do practical work.

## **Technical Committee 02 – Electrical Engineering/Information Technology**

### *Assessment and analysis for the award of the ASIIN seal:*

The Technical Committee discusses the procedure and largely follows the peer's suggestions for requirements and recommendations. However, the members of the Technical Committee propose an amendment to requirement 1: According to the audit report, the higher education institution has already introduced quality assurance measures and is implementing them according to the peers. Therefore, the requirement should obviously only refer to the necessary further development of quality assurance, especially with regard to the closing of the feedback cycles in course evaluation as well as workload monitoring, and not to the fundamental introduction of quality management.

### *Assessment and analysis for the award of the EUR-ACE® Label:*

The Technical Committee deems that the intended learning outcomes of the degree programme do comply with the engineering specific part of Subject-Specific Criteria of the Technical Committee 02 – Electrical Engineering/Information Technology.



The 02 – Electrical Engineering/Information Technology recommends the award of the seals as follows:

Degree Programme	ASIIN-seal	Subject-specific label	Maximum duration of accreditation
Ma Aeronautical Engineering	With requirements	EUR-ACE®	30.09.2025

### Requirements

#### For the master programme Aeronautical Engineering

- A 1. (ASIIN 6) Provide a concept how to systematically close feedback-cycles for the yearly course evaluations and the evaluation of the students' workload.

### Recommendations

#### For the master programme Aeronautical Engineering

- E 1. (ASIIN 1.3) It is recommended to include conflict management in the curriculum.
- E 2. (ASIIN 1.3) It is recommended to further integrate new technologies and developments in the aeronautical fields into the curriculum.
- E 3. (ASIIN 4.2) It is recommended to provide more offers and support mechanisms for teaching staff who wish to further develop their teaching skills.
- E 4. (ASIIN 4.3) It is recommended to improve students' access to relevant books, publications, and journals for course work and the graduation research projects.
- E 5. (ASIIN 4.3) It is recommended to increase the laboratory equipment and to give students more opportunity to do practical work.

## H Decision of the Accreditation Commission (20.03.2020)

*Assessment and analysis for the award of the subject-specific ASIIN seal:*

The Accreditation Commission discusses the procedure and follows the Technical Committees' suggestions. They accept the proposed changes to the requirement regarding the quality management as well as the suggestion to discard the recommendation concerning conflict management. For all other recommendations, the Accreditation Commission agrees with the peers' assessment.

*Assessment and analysis for the award of the EUR-ACE® Label:*

The Accreditation Commission deems that the intended learning outcomes of the degree programme do comply with the engineering specific parts of Subject-Specific Criteria of the Technical Committees 01 and 02.

The Accreditation Commission for Degree Programmes decides to award the following seals:

Degree Programme	ASIIN-seal	Subject-specific label	Maximum duration of accreditation
Ma Aeronautical Engineering	With requirements	EUR-ACE®	30.09.2025

### Requirements

#### For the master programme Aeronautical Engineering

- A 1. (ASIIN 6) Provide a concept how to systematically close feedback-cycles for the yearly course evaluations and the evaluation of the students' workload.

### Recommendations

#### For the master programme Aeronautical Engineering

- E 1. (ASIIN 1.3) It is recommended to further integrate new technologies and developments in the aeronautical fields into the curriculum.
- E 2. (ASIIN 4.2) It is recommended to provide more offers and support mechanisms for teaching staff who wish to further develop their teaching skills.

- E 3. (ASIIN 4.3) It is recommended to improve students' access to relevant books, publications, and journals for course work and the graduation research projects.
- E 4. (ASIIN 4.3) It is recommended to increase the laboratory equipment and to give students more opportunity to do practical work.

## Appendix: Programme Learning Outcomes and Curricula

According to the Self-Assessment Report the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Master degree programme\_Aeronautical Engineering:

### **“Programme Objectives:**

1. Prepare the graduates to be able to develop their professional competence to work in the highest positions dealing with aeronautical engineering technology in industry, solution providers or officials.
2. Prepare the graduate abilities to adapt, to adjust, to grow independently as well as to compete globally
3. Prepare the graduates to be able to develop the chosen field, including the ability to continue to post-graduate studies.

### **Learning outcomes are as follows:**

#### ***Field Specific Outcomes***

##### *Stage 1: Preparatory Cycle*

- 1) To have fundamental understanding of Mathematics (Calculus, Algebra & Geometry); Physics (Optics, Electromagnetism, Electronics, Thermodynamics, Fluid Mechanics, and Solid Mechanics).
- 2) To have appropriate aviation and engineering related basic knowledge's such as (Air navigation, Air law, Meteorology, Electronics, computer programming, etc...)

##### *Stage 2: Engineering Cycle*

- 3) To have fundamental understanding of mechanical & Electrical engineering principles and practices through mathematical, methodological, numerical and experimental courses & workshops,
- 4) To have necessary skills for the study, design, analysis and development of aircraft structure, engines, avionics and other high technology flight systems,

*General & Soft Skills Outcomes:*

- 5) Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 6) Select, and apply modern design & Simulation engineering and IT tools to complex engineering activities with an understanding of the limitations.
- 7) To have necessary oral and written communication skills mainly in French, English, and encouraging them to be certified at the international level.
- 8) To be prepared for socialization, business work and scientific environments in a dynamic and global environment by building partnerships between the institution and the industry.
- 9) To have awareness of the importance of life-long learning”

The following **curriculum** is presented:

**Preparatory Cycle (2 years)**

**Classroom courses, Guided work, workshops**

<b>Cycle: Preparatory      Year : 1      Semester : 1</b>					
Code	Subject	Coeff.	Contact Hours/Week	Self Study Hours/week	Credit ECTS
P 1101	<b>1.</b> Calculus	3	4.5	3	4
P 1102	<b>2.</b> Algebra	3	4.5	3	4
P 1103	<b>3.</b> Physics	4	6	2	4
P 1104	<b>4.</b> Chemistry	2	2	1.5	2
P 1105	<b>5.</b> Theory of Materials	1.5	1.5	1	2
P 1106	<b>6.</b> Mechanics	1.5	1.5	1	2
P 1107	<b>7.</b> Electrical Circuits	1.5	2	1	2
P 1108	<b>8.</b> Computer Programming	1.5	2	1	2
P 1109	<b>9.</b> English	2	3	1	2
P 1110	<b>10.</b> French Communication	1.5	1.5	1.5	2
P 1111	<b>11.</b> Air Navigation	2	1.5	1.5	2
P 1112	<b>12.</b> Graph Theory	1.5	1.5	2	2
<b>Total</b>		<b>25</b>	<b>31.5</b>	<b>19.5</b>	<b>30</b>
<b>Total workload/week= 51Hrs Total workload/semester=714 Total Credit=30 ECTS</b>					

<b>Cycle: Preparatory      Year : 1      Semester : 2</b>					
Code	Subject	Coeff.	Contact Hours/Week	Self Study Hours/week	Credit ECTS
P 1201	<b>1.</b> Calculus	3	4.5	3	4
P 1202	<b>2.</b> Algebra	3	4.5	3	4
P 1203	<b>3.</b> Physics	4	6	2	4
P 1204	<b>4.</b> Chemistry	2	2	1.5	2
P 1205	<b>5.</b> Theory of Materials	1.5	1.5	1	2
P 1206	<b>6.</b> Mechanics	1.5	1.5	1	2
P 1207	<b>7.</b> Electrical Circuits	1.5	2	1	2
P 1208	<b>8.</b> Computer Programming	1.5	2	1	2
P 1209	<b>9.</b> Air Navigation	2	1.5	1.5	2
P 1210	<b>10.</b> Meteorology	2	1.5	1.5	2
P 1211	<b>11.</b> English	2	3	1	2
P 1212	<b>12.</b> French Communication	1.5	1.5	1.5	2
<b>Total</b>		<b>25.5</b>	<b>31.5</b>	<b>19</b>	<b>30</b>
<b>Total workload/week= 50.5Hrs Total workload/semester=707 Total Credit=30 ECTS</b>					

## 0 Appendix: Programme Learning Outcomes and Curricula

<u>Cycle: Preparatory</u>		<u>Year : 2</u>	<u>Semester : 1</u>		
Code	Subject	Coeff.	Contact Hours/Week	Self Study Hours/week	Credit ECTS
P 2101	1. Calculus	3	4.5	3	4
P 2102	2. Algebra	3	4.5	3	4
P 2103	3. Physics	4	6	2	4
P 2104	4. Chemistry	2	2	1.5	2
P 2105	5. Mechanics	1.5	1.5	1	2
P 2106	6. Engines Technology	2	1.5	1	2
P 2107	7. Digital Electronics	2	1.5	1.5	2
P 2108	8. Computer Programming	2	3.5	2	3
P 2109	9. Meteorology	2	1.5	1	2
P 2110	10. English	2	3	1	2
P 2111	11. French Communication	1.5	1.5	1	2
<b>Total</b>		<b>25</b>	<b>31</b>	<b>18</b>	<b>29</b>
<b>Total workload/week=49Hrs Total workload/semester=686 Total Credit=29 ECTS</b>					

<u>Cycle: Preparatory</u>		<u>Year : 2</u>	<u>Semester : 2</u>		
Code	Subject	Coeff.	Contact Hours/Week	Self Study Hours/week	Credit ECTS
P 2201	1. Calculus	3	4.5	3	4
P 2202	2. Algebra	3	4.5	3	4
P 2203	3. Physics	4	6	2	4
P 2204	4. Chemistry	2	2	1.5	2
P 2205	5. Mechanics	1.5	1.5	1	2
P 2206	6. Engines Technology	2	1.5	1.5	2
P 2207	7. Digital Electronics	2	3	2.5	3
P 2208	8. Computer Programming	2	3.5	2	3
P 2209	9. Introduction to Geographic Information System GIS	1.5	1.5	1	2
P 2210	10. English	2	3	1	2
P 2211	11. French Communication	1.5	1.5	1	2
<b>Total</b>		<b>24.5</b>	<b>32.5</b>	<b>19.5</b>	<b>30</b>
<b>Total workload/week=52Hrs Total workload/semester=728 Total Credit=30 ECTS</b>					

## Aeronautical Engineering Cycle Year 1

Cycle: Engineering		Year : 1	Semester : 1		
Code	Subject	Coeff.	Contact Hr/W	Self study Hr/W	Credit ECTS
<b>Mathematics for Engineering</b>					
MA01	Applied Mathematics	3	5	3	4
<b>Aeronautics</b>					
AE01	Aerodynamics	3	3	2.5	3
AE02	Airframe & Systems	2	3	2	3
AE03	Avionic Systems 1	2	1.5	1.5	2
<b>Mechanical Engineering</b>					
ME01	Mechanics Strength Of Materials (SOM)	2	1.5	1.5	2
ME02	Continuum Mechanics	2	1.5	1.5	2
ME03	Mechanical Design	2	2	1.5	2
<b>Electronics</b>					
EL01	Analog Electronics	3	4.5	3	4
EL02	Measurement & Instruments	1	1.5	1	2
<b>Computer Programming</b>					
CP01	Programming (Python/Java)	2	2	1	2
<b>Social Sciences</b>					
SC01	English	2	1.5	2	2
<b>Total</b>		<b>24</b>	<b>27</b>	<b>20.5</b>	<b>28</b>
<b>Total workload/week=48.5Hrs Total workload/semester=679Hrs Total Credit=28 ECTS</b>					

Cycle: Engineering		Year : 1	Semester : 2		
Code	Subject	Coeff.	Contact Hr/W	Self study Hr/W	Credit ECTS
<b>Applied Mathematics for Engineering</b>					
MA01	Applied Mathematics	3	5	3	4
<b>Aeronautics</b>					
AE01	Aerodynamics	3	3	2	3
AE02	Airframe & Systems	2	3	2	3
AE03	Avionic Systems 1	2	1.5	1	2
AE04	Maintenance & Operation of Aircrafts	2	1.5	1	2
AE05	Workshop Aircraft Engines	1	2	1	2
<b>Mechanical Engineering</b>					
ME01	Mechanics Strength Of Materials (SOM)	2	3	2	3
ME02	Workshop Computer Aided Design CAD	2	2	1	2
<b>Electronics</b>					
EL03	Computer Architecture	2	3	1	2
EL04	Workshop Embedded Systems	1	3	1	2
<b>Computer Programming</b>					
CP01	Programming (Python/Java)	2	2	1.5	2
<b>Social Sciences</b>					
SC01	English	2	1.5	2	2
SC02	Economy & Management	1	1.5	1	2
<b>Total</b>		<b>25</b>	<b>32</b>	<b>19.5</b>	<b>31</b>
<b>Total workload/week=51.5Hrs Total workload/semester=721Hrs Total Credit=31 ECTS</b>					



## Aeronautical Engineering Cycle Year 2

Cycle: Engineering      Year : 2      Semester : 1					
Code	Subject	Coeff.	Contact Hr/W	Self study Hr/W	Credit ECTS
<b>Aeronautical Structures &amp; Systems</b>					
AS01	Aircraft Structures	3	3	2	3
AS02	Propulsion	2	1.5	1.5	2
AS03	Turbo Reactors	2	3	2	3
AS04	Avionic Systems 2	2	2	1.5	2
<b>Mechanical Engineering Design</b>					
ME03	Finite Elements Method (FEM)	2	1.5	1.5	2
ME04	Workshop Computer Aided Design CAD (Catia)	2	2	1	2
ME05	Workshop NDT (Non Destructive Testing)	1	2	1	2
<b>Electronics &amp; Control</b>					
EL05	Automatic Control	2	1.5	1.5	2
EL06	Signal Processing	2	3.5	2	3
EL07	Embedded systems	2	3	2	3
<b>Computer Programming</b>					
CP02	UML Programming	2	2	1	2
<b>Social Sciences</b>					
SC03	English	2	1.5	2	2
SC04	Air transport Economy	2	1.5	1	2
<b>Total</b>		<b>26</b>	<b>28</b>	<b>20</b>	<b>30</b>
<i>Total workload/week=48Hrs Total workload/semester=672Hrs Total Credit=30 ECTS</i>					

Cycle: Engineering      Year : 2      Semester : 2					
Code	Subject	Coeff.	Contact Hr/W	Self study Hr/W	Credit ECTS
<b>Aeronautical Structures &amp; Systems</b>					
AS01	Aircraft Structure	3	4.5	3	4
AS02	Flight Mechanics	2	3	1	2
AS03	Turbo Reactors	2	3	1	2
AS04	Avionic Systems 2	2	1.5	1.5	2
<b>Engineering Tools &amp; Workshops</b>					
ET01	Workshop Computer Aided Design CAD (Catia)	2	2	1	2
ET02	Numerical Simulation1 -ANSYS	1	2	1	2
ET03	Numerical Simulation2 -ABAQUS	1	2	1	2
ET04	Workshop Finite Elements Method (FEM)	1	2	1	2
<b>Electronics &amp; Control</b>					
EL08	Automatic Control	2	1.5	1	2
EL09	Signal Processing	2	3.5	2	3
EL10	Workshop Embedded systems	2	1.5	1	2
<b>Industrial Management</b>					
IM01	Statistical Process Control SPC	2	2	1	2
<b>Social Sciences</b>					
SC03	English	2	1.5	2	2
<b>Projects</b>					
PR01	Annual Research Project	2	2	2	2
<b>Total</b>		<b>28</b>	<b>29.5</b>	<b>20.5</b>	<b>31</b>
<i>Total workload/week=50Hrs Total workload/semester=700Hrs Total Credit=31 ECTS</i>					

## Aeronautical Engineering Cycle Year 3

<u>Cycle: Engineering</u> <u>Year : 3</u> <u>Semester : 1</u>					
Code	Subject	Coeff.	Contact Hr/W	Self study Hr/W	Credit ECTS
<b>Aircraft</b>					
AC01	Radar Telecom	3	3	1.5	3
AC02	Aero elasticity (Fluid mechanics)	2	2	1	2
AC03	Composites Materials	2	1.5	1	2
AC04	Aircraft Hydraulic Systems	2	1.5	1.5	2
AC05	Aircraft Technical Data	2	1.5	1.5	2
AC06	Aircraft Certifications	2	1.5	1.5	2
<b>Engineering Tools &amp; Workshops</b>					
ET05	Project -Computer Aided Design CAD (Catia)	2	2	2	2
ET06	Numerical Simulation ANSYS	1	2	1	2
ET07	Workshop Feedback Control (Matlab)	2	3	1	2
<b>Industrial Management</b>					
IM02	Quality Systems & Lean Management	2	3	1	2
IM03	Industrial Production Management	1	1.5	1	2
IM04	Project Startup	1	1.5	1	2
<b>Social Sciences</b>					
SC05	English: TOEIC Preparation	2	1.5	2	2
SC06	French Communication Technique	2	1.5	1.5	2
<b>Projects</b>					
PR02	Synthesis Project	2	2	1	2
	<b>Total</b>	<b>28</b>	<b>29</b>	<b>19.5</b>	<b>31</b>
<b>Total workload/week=48.5Hrs Total workload/semester=679Hrs Total Credit=31 ECTS</b>					

## Graduation Reasearch Project

<u>Cycle: Engineering</u> <u>Year : 3</u> <u>Semester : 2</u>					
Code	Subject	Coeff.	Contact Hr/W	Self study Hr/W	Credit ECTS
IGP 03	Graduation Research Project (4-6 months)	5	-	50	30
	<b>Total</b>	<b>5</b>	<b>-</b>	<b>50</b>	<b>30</b>
<b>Total workload/week=50Hrs Total workload/semester=700Hrs Total Credit=30 ECTS</b>					