



# **ASIIN Seal & EUR-ACE<sup>®</sup> Label**

## **Accreditation Report**

**National Engineering Diploma Degree Programme**  
***Computer Science Engineering***

Provided by

**ENSI - Ecole Nationale des Sciences de l'Informatique**  
**(Université de la Manouba)**

Version: 22 March 2024

# Table of Content

<b>A About the Accreditation Process.....</b>	<b>3</b>
<b>B Characteristics of the Degree Programme.....</b>	<b>5</b>
<b>C Peer Report for the ASIIN Seal .....</b>	<b>7</b>
1. The Degree Programme: Concept, content & implementation .....	7
2. The degree programme: structures, methods and implementation.....	12
3. Exams: System, concept and organisation.....	17
4. Resources .....	18
5. Transparency and documentation.....	20
6. Quality management: quality assessment and development .....	22
<b>D Additional Documents .....</b>	<b>24</b>
<b>E Comment of the Higher Education Institution.....</b>	<b>25</b>
<b>F Summary: Peer recommendations.....</b>	<b>26</b>
<b>G Comment of the Technical Committee 04 - Informatics/Computer Science (08.03.2023) .....</b>	<b>27</b>
<b>H Decision of the Accreditation Commission (24.03.2023) .....</b>	<b>28</b>
<b>I Fulfilment of Requirements (22.03.2024).....</b>	<b>29</b>
Analysis of the experts and the Technical Committee/s (29.02.2024).....	29
Decision of the Accreditation Commission (22.03.2024) .....	30
<b>Appendix: Programme Learning Outcomes and Curricula .....</b>	<b>31</b>

## 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>
Diplôme National d'Ingénieur en Informatique	National Engineering degree in Computer Science	ASIIN, EUR-ACE® Label	-/-	04
<p><b>Date of the contract:</b> 19.01.2021</p> <p><b>Submission of the final version of the self-assessment report:</b> 01.04.2022</p> <p><b>Date of the onsite visit:</b> 28./29.09.2022</p> <p><b>at:</b> ENSI in Manouba, Tunisia</p>				
<p><b>Peer panel:</b></p> <p>Prof. Dr.-Ing. Dietrich Paulus, University of Koblenz-Landau</p> <p>Prof. Dr. Ulrich Bühler, Fulda University of Applied Sciences</p> <p>Gerhard Wächter, Manamak GmbH</p> <p>Wajih Hamrouni, student at International Multidisciplinary School, Sousse</p>				
<p><b>Representative of the ASIIN headquarter:</b> David Witt</p>				
<p><b>Responsible decision-making committee:</b> Accreditation Commission for Degree Programmes</p>				
<p><b>Criteria used:</b></p> <p>European Standards and Guidelines as of May 15, 2015</p> <p>ASIIN General Criteria, as of December 10, 2015</p>				

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

<sup>2</sup> TC 04 - Informatics/Computer Science;

**A About the Accreditation Process**

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Subject-Specific Criteria of Technical Committee 04 – Informatics/Computer Science as of March 29, 2018	
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## 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
Computer Science Engineering	National Diploma of Computer Science Engineering	<ul style="list-style-type: none"> <li>• Artificial Intelligence (IA)</li> <li>• Software Engineering (GL)</li> <li>• Data Science &amp; Computer Vision (DS-CV)</li> <li>• Financial Engineering (IF)</li> <li>• Embedded Software and Systems (SLE)</li> <li>• Services, Technologies and Internet of Things (St-IoT)</li> </ul>	7	Full time	-/-	6 Semester	180 ECTS	Annual, Fall

For the National Diploma of Computer Science Engineering the institution has presented the following profile in its Self-assessment report:

„This course aims to train engineers capable of intervening in the design, implementation, production and maintenance of Information Systems (IS). The alumni of the sector work in the IT professions in all sectors of economic life. The training also provides an open mind and an ability to adapt continuously to the ever-changing knowledge of computer technologies. The skills attested at the end of the "computer engineering engineer" training are as follows:

1. To master in depth the basic sciences, in particular computer science and mathematics, essential for the design and production of computer applications.
2. Set up a technology watch system to select the relevant tools and methodologies in the design, production or maintenance of an Information System (IS)
3. Analyze complex IS architectures considering non-technical constraints such as societal, health and safety, environmental or economic constraints.
4. Identify, formulate and solve complex or incompletely defined IT problems with the objective of ensuring maximum availability for users

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

5. Specify an information system in all its dimension: software, hardware and architecture using the state-of-the-art available technologies and taking into account the company's strategic objectives
6. Assess the vulnerability of an IS and implement solutions to protect applications and data.
7. Identify, locate and collect all the data necessary for the research and development of new software or new IS architectures.
8. Master good practices in terms of software development as well as applicable standards and regulations.
9. Make complex decisions based on incomplete or limited information.
10. Lead an IT project by mastering people management, risk analysis, budget compliance and change management (IS implementation).
11. Adapt your communication according to the audience (specialists or neophytes) or the context in which the function is performed (national or international) by mastering at least 3 languages.
12. Develop leadership and entrepreneurial skills and the ability to innovate, particularly through socio-cultural projects.
13. Become aware of the need to constantly update your knowledge and, if necessary, to undertake additional studies “

## 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 (intended qualifications profile)</b>
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#### Evidence:

- Self-Assessment Report
- Discussions during the audit
- Module descriptions
- Website

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

The auditors base their assessment on the learning outcomes as detailed in the Self-Assessment report of the Computer Science Engineering degree programme (as equivalent to Master's degree programme) under review.

The auditors refer to the Subject-Specific Criteria (SSC) of the Technical Committee Informatics/Computer Science and the module descriptions as a basis for judging whether the intended learning outcomes of the Master's degree programme as defined by ENSI correspond with the competences as outlined by the SSC.

The descriptions of the qualification objectives are comprehensive and include the achieved competencies and possible career opportunities of the graduates. These are made accessible to all stakeholders as they can be found on ENSI's website. The qualification objectives are also anchored in the (new) Diploma Supplement in order to provide graduates with an official short presentation of their respective degree programme to facilitate applying for career opportunities worldwide.

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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.

The peers learned during the onsite visit that frequent consultation about the further development of the curricula is held, internally as well as externally, for example with industry representatives. Accordingly, in the discussion with partners from the industry, it became clear that the students at ENSI have a good reputation in professional practice. The peers learned that ENSI is seen as one of the top three institutions in Tunisia in the field of Computer Science, which is why they receive extraordinary well-educated and skilled graduates from there.

The peers analysed 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 04 Informatics/Computer Science. Furthermore, they comply with the standards and criteria of the EUR-ACE Label.

Consequently, it became clear that students enrolled in the Master's degree programme will acquire an advanced and deeper understanding of central concepts and methods of their discipline in particular in computer science and mathematics, essential for the design and production of computer applications. They are also capable of selecting the relevant tools and techniques necessary for the design, production or maintenance of an Information System as well as communicating about these ideas verbally and in writing to both experts and non-technical people. Moreover, graduates will be able to use theoretical and applied knowledge to derive and develop scientific methods of computer science for difficult and complex problems as well as to recognize the economic, business, judicial, ethical, global, environmental and societal impacts of software engineering. The peers are also of the opinion that the Master's degree programme enables students to take up a scientific occupation with the aim of obtaining a doctorate.

However, due to the small modules, which according to the module descriptions are supposed to cover many topics, the experts are not sure whether each of these topics can really be covered at a Master's level, which is why they recommend, on the one hand, including a (rough) timetable in the module handbooks that shows when the individual topics are to be covered. On the other hand, the university could think about whether all of the topics mentioned really have to be covered or whether not fewer but at an (even) deeper level. In the follow-up, the university has already provided new module descriptions including a timetable regarding the individual topics of each module.

In summary, the peers consider the qualification objectives to be adequate, but ask the university to provide a module-objective-matrix that assigns the various objectives to the modules in which they are to be achieved. However, the peers assess that the described



learning outcomes adequately reflect the ASIIN Subject-Specific Criteria as well as the EQF-level 7 for Master programmes

### Criterion 1.2 Name of the degree programme

**Evidence:**

- Self-Assessment Report
- Discussions during the audit

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

The peers consider the name of the degree programme to be adequate as far as reflecting the respective aims, learning outcomes and curricula. The name of the degree programme in the original language also reflect the main teaching language, which is French.

### Criterion 1.3 Curriculum

**Evidence:**

- Self-Assessment Report
- Module descriptions
- Discussions during the audit
- Study plans for all specializations

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

The peers review the curriculum of the Master's degree programme under consideration in order to identify whether the modules prepare the students to achieve the described qualification objectives. They take into consideration the study plan, the qualification objectives, and the individual module descriptions.

The first and second years of study compromise each 36 weeks of teaching, including four weeks of internship. The third year of study consists of 32 Weeks, 16 of which are reserved for the completion of a final project. The first four semesters (the first and second “engineering year”) consists of compulsory courses in the fields of “Applied Mathematics”, “Fundamental Computing and AI”, “Algorithmics and programming”, “Software engineering”,

“Operating Systems”, “Networks”, “Architecture”, “Database”, “Signal and Image”, “Management and finance”, and “Languages, communication and law”.

After the fourth semester, the students choose one of the following six possible specialization paths: “Artificial Intelligence”, “Software Engineering”, “Data Science and computer Vision”, “Financial Engineering”, “Embedded Software and Systems”, or “Services, Technologies and Internet of things”. Each specialization path provides various compulsory and elective courses in the fifth semester. Beside the courses according to their specialization, all students also have to take the following compulsory courses in the fifth semester: “Complex Project Management”, “Computer Law and Human Rights”, “Language and communication 5: Preparing for Standardized exams”. In the sixth semester, the students conduct their final project.

After reviewing the documents and the discussions on site, the experts get the impression that the curriculum is structured in a very small way. On the one hand, it consists of a relatively large number of courses with relatively few credits (see also 2.2) and on the other hand, many topics are mentioned in the respective module descriptions. The peers are not sure whether all the topics mentioned can be dealt with at Master's level within each module. From the peers' point of view, it would be a possibility to reduce the number of topics in order to be able to teach selected topics in greater depth. However, should the university be of the opinion that this high number of topics should continue to be integrated, the peers ask for the integration of a timetable in the module handbooks, specifying when and in how many teaching units the individual topics should be discussed. The university has included such a timetable for some courses in the newly submitted module descriptions.

In summary, the peers are convinced that the curriculum covers all relevant aspects of the SSC. However, they are of the opinion that the university should review whether the module descriptions adequately describe the actual content taught and, if necessary, harmonise them.

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

- Self-Assessment Report
- Admission regulations
- Discussions during the audit

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

From the information provided, the peers understand that there are two ways of admission to the Master degree programme. As the University describes in its Self-Assessment report, “[t]he main admission route to ENSI is the successful entry to the national engineering entrance examination, which is open mainly to candidates who have completed two years of higher education in a preparatory institute in one of the fields of Mathematics and Physics (MP), Physics and Chemistry (PC) or Technology (T).” However, it is also possible to entry the Master’s degree programme under review with a prior Bachelor’s degree or Licence. This access can be done as well in first year as in second year of the Master’s degree programme. The university provides the following information on the different entry paths: “Access in the first year is open to holders of a license degree in computer science or a diploma deemed equivalent. Access to the second year of the Master is open to engineers, to students who have successfully completed the first year of a Master's degree in computer science or a diploma deemed equivalent.”

During the discussion with the students, the peers gained the impression that students are well informed about the admission requirements and procedures as all necessary information is gathered on ENSI’s website. Since the rules are based on decrees by the Ministry of Higher Education and Scientific Research, the peers deem them binding, transparent and adequate for selecting the best students for each degree programme. Furthermore, employers of Alumni of the Master’s degree programme stated that they are very satisfied with the graduates. Consequently, the peers found the admission requirements for the programme adequate.

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

Criterion 1.1:

ENSI provides the following statement: “The "short" modules, which are only offered at the end of the last semester of studies, are in fact a possible extension of other modules which are offered by experts or professionals and whose aim is to master an aspect specific technique or have an opening towards a new axis of research. It is therefore a module of professionalization or initiation to scientific research.” The peers would like to clarify that the

term "small modules" does not only refer to the modules of the last semester, but to all modules with 3 or fewer credits.

ENSI has provided the requested objective-module-matrix.

With regard to the recommendation to assign a timetable to the individual topics covered within a module for each module, ENSI has included such timetables in the newly submitted module descriptions.

The peers consider criterion 1 to be fulfilled.

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

### Criterion 2.1 Structure and modules

#### **Evidence:**

- Self-Assessment Report
- Module descriptions
- Study plans for all specializations

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

The degree programme under review is divided into modules, which comprise a sum of teaching and learning. The peers found the amount of work in the individual modules is appropriate and manageable.

As described above, the programme offers a great variety of specializations, leaving sufficient options for the students to set individual and flexible focuses on certain topics. Furthermore, the curriculum is constantly being revised and adapted to the changing demands from future employers. In general, the peers were convinced, that the programme structure allow for an individual yet goal-oriented order of study in the designated time. Furthermore, the required internships are well-integrated into the curriculum. However, the large number of small modules, between 1,5 and 3 ECTS, does not allow for the creation of larger subject blocks and thus leads to an (unnecessary) large number of small modules.

The new description of the modules include all requested information about the module title, responsible person(s), teaching methods, credits and work load, intended learning

outcomes, content, admission and examination requirements, form(s) of exams, and literature.

### *International Mobility*

Internationalization is of increasing importance in Tunisian higher education in general and at ENSI especially. Compared to this international agenda, the current options for international mobility are rather limited as only a few students each year are spending a semester at a university abroad. Especially the students expressed in the discussion round with the peers that the existing opportunities to go abroad could be improved.

ENSI explains in the programme's study regulations that the "second and/or third year courses may be taught abroad within the framework of agreements concludes between the [ENSI] and higher education institutions providing the specialty concerned. Similarly, internships or the final year project may be carried out abroad within the framework of internship agreements."

Traditionally, Tunisian higher education institutions hold strong relations with French universities due to their common language as well as their similar educational system, including the degrees "Licence" and "Diploma". The peers acknowledge that cooperation with French HEIs and that the university as well cooperates with German Universities, e.g. in Kassel and Passau. However, the peers found out that it is quite hard for the students to take part in opportunities for Double Degrees, because only the students with the best grades are accessible for these programmes, what has not been completely clear to all students in advance.

The peers gain the impression that mobility is currently in high demand among the students, but that the existing opportunities could be improved and that students should be informed early enough about the importance of grades for participating in the Double Degree programmes. Although opportunities of international mobility are still limited, the peers find that credit transfer and the recognition of credits gained at foreign universities is possible and regulated by ENSI. These regulations are known to the students, easily accessible and in line with the Lisbon-convention.

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

- Module descriptions

- Study plan
- Self-Assessment Report
- Discussions during the audit

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

All modules of the programmes are assigned ECTS credits. Every semester comprises 30 credit points and every year comprises 60 credit points. According to the standards of EQF, ASIIN and EUR-ACE each credit point should correspond to 25 - 30 student working hours. However, in the degree programme these scopes are not respected, as one credit point corresponds to even different numbers of working hours. Thus, between 45 and 70 hours of total workload are assigned to the various courses amounting to 3 ECTS. The modules with 1.5 ECTS are assigned between 22,5 and 45 hours of total workload and the 2 ECTS modules between 40 and 45 hours. Therefore, the peers consider it necessary to assign a uniform value to a credit point, which is between 25 and 30 working hours, which also adequately and coherently reflects the actual workload.

However, the peers analyse the workload of each course and module and find it to be manageable. The feedback regarding the workload, regularly compiled through the course evaluation survey undertaken at the end of each study year, shows that students are generally content with their workload. This could be confirmed by the discussion round with the students.

<b>Criterion 2.3 Teaching methodology</b>
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**Evidence:**

- Self-Assessment Report
- Discussions during the Audit
- Module descriptions

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

The degree programme under review makes use of different educational methods for teaching the courses, such as lectures, seminars, laboratory practical work, internships, mini-projects, (some) group works and the final projects. In the discussion rounds, the university explained that during the Covid period, e-learning was used via Zoom or Google Meet. From the discussion with the teaching staff, it became apparent that the teaching methodology includes modern didactical approaches and technological innovations. Mate-

rials for all modules are being presented online where also details about the schedule, assignments, etc. are made accessible. In addition, cooperation with the industry are used to be various in the offer and to adapt to modern subjects and topics.

However, the peers are of the opinion that the university should improve the number of group works/team projects to improve the students' ability to work in teams. During the on-site visit, it seemed to the experts that students are sometimes very competitive with each other because many opportunities (e.g. Double Degree programmes) are offered to students based on the best grades. Even though it is basically to be welcomed to have such motivated students, they should be prepared for the fact that in the future they will probably have to work in companies in teams where good cooperation is important.

In summary, the peers acknowledge that ENSI uses a variety of teaching methodologies and that the teaching methodology applied in the programmes under review is mostly state-of-the-art and ensures the learning progress of all students, but that group work could be improved.

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

##### **Evidence:**

- Self-Assessment Report
- Discussions during the audit

##### **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. The students told the peers that they are able to give constant and direct feedback in case any issues arise. As an example, the students explained that there was a problem with the exam dates and that after contacting the student representative, the schedule for the exams was rescheduled.

The students confirm that they are generally 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. In the discussion during the audit, the peers came to the view that the teaching staff seems to be very committed and engaged. Based on this, the peers have the opinion that there seems to be a very good relation between the students and the teaching staff.

Overall, the peers concluded that the support and assistance offered is beneficial to the academic success.

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

Criterion 2.1:

ENSI provides the following statement: “Due to financial constraints, and although the agreements are signed with reciprocity and offer of exchange, during the last five years only double diplomacy exchange of students is being active. ENSI have signed new double diplomacy agreement for student exchange with Canada (University of Laval), Mauritania (Ecole Supérieure Polytechniques), in addition french partners (IMT-TSP, IMTBS, ECL, ENSIIE, ...).”

The peers thank the university for its explanations and support the further steps undertaken to strengthen the international mobility. However, the peers are of the opinion that this increased internationalisation should be further developed and should be reassessed in the course of reaccreditation, so that they are still in favour of a recommendation in this regard.

Criterion 2.2:

ENSI provides the following statement: “1 ECTS corresponds to 15 hours of face-to-face and an average of 10 to 15 hours of personal or group teaching, which corresponds on average to a workload of between 25 and 30 hours for 1 ECTS.”

The inconsistencies regarding credit and workload allocation have not yet been resolved, so the experts are still of the opinion that ENSI must establish a new system in line with the ECTS.

The peers consider criterion 2 not to be fulfilled.



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

#### Criterion 3 Exams: System, concept and organisation

##### **Evidence:**

- Self-Assessment Report
- Module descriptions
- Examination Regulations
- Discussions during the audit
- Statistics Drop-out rate

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

Examination types are selected based on their competencies tested and may include written exams, oral exams, presentations, and practical tests. All relevant rules and regulations regarding the exam procedure are anchored in ENSI's Quality System Management.

There are end-of-term exams and in some cases so called continuous assessment as well that make up 35% of the final grade. At the beginning of each semester, students are informed about the date of the exam, its form and duration. The programme coordinators explain that all examinations are held during the fifteenth week of each semester. The newly provided module descriptions (also see 5.1) note the form of the examination and the composition of the final grade.

Due to the fact that each course is examined, the students have up to eleven exams per semester. However, during the discussions, the students told the peers that they are satisfied with the examination procedure and that they do not feel overwhelmed by the many exams.

The peers conclude that the final projects do adhere to an academic level comparable to the European Qualification Framework (EQF) level 7.

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

The peers consider criterion 3 to be fulfilled.

## 4. Resources

### Criterion 4.1 Staff

**Evidence:**

- Self-Assessment Report
- Staff Handbook with teachers' CV
- Discussions during the audit

**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 respective programmes. In total, ENSI has eight (Full) Professors, nine Associate Professors, 56 Assistant Professors, four Assistants, seven Teacher on a part-time basis, and one Contractual Teacher, which equals a total of 85 teachers involved. All teachers are of outstanding qualification and most of them have international degrees (most from France).

In summary, the panel has no doubt about the qualification and the sufficient quantity of the staff for the study programme under review.

### Criterion 4.2 Staff development

**Evidence:**

- Self-Assessment Report
- On-site-visit
- Discussions during the Audit

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

As mentioned above, the staff feels well supported by the University in terms of research as well as individual development. Offers are made by the University for teachers to go abroad during the holidays or to attend conferences. Related to this, the lecturers confirmed that they are free to go to conferences and that there is no limitation. If at all, there is a financial constraint. For that reason, during the Covid period, it was way easier for the staff to participate in (many) international conferences, since they were carried out online. Furthermore, during the audit the teaching staff explained that it is possible for them to take a sabbatical and work at another university for one year.

<b>Criterion 4.3 Funds and equipment</b>
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**Evidence:**

- Self-assessment Report
- On-site-visit
- Discussions during the Audit

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

During the on-site visit, the peers were able to gain a comprehensive impression of the facilities, and laboratories at the ENSI. As a public institution, ENSI belongs to the University of Manouba and its budget consists of own income (approx. 20%) and state subsidies (approx. 80%).

The peers found that the funding and the equipment of the University as a whole but especially of the programme under review are sufficient. Analysing the equipment, the peers remark that it is absolutely fitting the needs of the programme under review. In addition, the students confirm that they are very satisfied with the equipment and accessibility of the laboratories and that they meet the needs of the programme and its educational requirements.

However, the experts are of the opinion that the equipment of the laboratories could be somewhat improved. The results achieved (especially in research) seem to be good, but a lot of work has to be done with simulations; for example, topics in robotics are worked on without robots and in VR without VR glasses. The experts are all the more impressed by the results that the university achieves with these limited resources, which once again speaks for the high motivation and skills of the students and the teachers involved.

In addition, the peers found that the library is rather small and does not offer all the books listed in the module handbooks of the programme under review. The peers acknowledge that ENSI provides a sufficient catalogue of books and journals that can be accessed online and that the students were satisfied with the library. However, they suggest that it would be a good idea to provide at least one version of each book mentioned and recommended in the module handbooks in the library.

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

The peers consider criterion 4 to be fulfilled.

## 5. Transparency and documentation

### Criterion 5.1 Module descriptions

**Evidence:**

- Self-Assessment Report
- Module descriptions
- Discussions during the audit

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

From the discussion with the students, it became apparent that they receive detailed information about the respective content, learning outcomes, examinations, and grading at the beginning of each course. However, before the on-site visit, the peers were provided with an incoherent module handbook, which did not meet ASIIN requirements, as information on credit points/workload, admission and examination forms, and literature was missing in some cases.

Following the on-site-visit, however, ENSI has already developed a completely new and coherent module handbook meeting ASIIN requirements. However, in order to match international standards, it must be ensured that the module handbook of the degree programme contains module descriptions for all modules. This also applies to internships and final projects. In addition, the peers got the impression that the bibliographical references within the module descriptions did not fully reflect the listed course contents. Therefore, the expert group considers that the university should review these references to ensure that the bibliographical references in the module descriptions are complete.

### Criterion 5.2 Diploma and Diploma Supplement

**Evidence:**

- Exemplary Diploma Supplement
- Exemplary Diploma
- Exemplary Transcript of Records

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

From the presented documents, the peers understand that at the graduation every student is awarded a Diploma, a Diploma Supplement and a transcript of records. However, the

ENSI does not yet award a Diploma Supplement as required by ASIIN. 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 (compare also criterion 1.1), the individual module grades of the student, as well as statistical data of the comparable final grades in one cohort. 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.

However, following the on-site visit, ENSI prepared a new Diploma Supplement in accordance with ASIIN's requirements and European standards.

### **Criterion 5.3 Relevant rules**

#### **Evidence:**

- Self-Assessment Report
- Admission requirements
- Examination Regulations
- Internal Rules and Regulations
- Discussions during the audit

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

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

#### **Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 5:**

As already stated in the report, following the on-site visit, ENSI created a new Diploma Supplement in line with ASIIN's requirements and European standards, so this requirement is already fulfilled.

Furthermore, ENSI has created a completely new Module Handbook that meets ASIIN's requirements. However, the module descriptions for the internship as well as the final project/thesis are still missing. Consequently, the peers decide that this requirement remains in place.

The peers consider criterion 5 not to be fulfilled.

## 6. Quality management: quality assessment and development

### Criterion 6 Quality management: quality assessment and development

#### Evidence:

- Self-Assessment Report
- Discussions and presentations during the audit
- Organizational Chart

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

From the documents presented, from the discussions as well as a presentation during the on-site visit, the peers gain a positive impression of the quality management procedures that are in place at ENSI and for the programme under review.

Each course is being evaluated constantly through different surveys by teachers and students. Further surveys are carried out by gathering statistics about graduates and alumni. The discussion with the students revealed that those in charge are always eager and open for feedback aside from the official evaluations and that students have the impression that their comments are taken into consideration with regard to the further improvement of the programme. This becomes apparent in the constant curricular revision process that is performed under participation of students and industry partners. 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.

That this process is fruitful and effective, becomes visible in the high percentage of graduates that find employment immediately after graduation. Concerning the internal feedback loops the results of the course evaluations are centrally assessed and analysed. A summary of the results is made accessible to the students. In case the satisfaction of the students

with staff members is deficient, the Heads of Department will contact the respective teacher, discuss the issue and propose solutions. Thus, the peers agree that the quality management circles at ENSI are well established and work under participation of all stakeholders.

In summary, the peers are satisfied with the quality management system at ENSI, especially with the continuous feedback loops and the involvement of important stakeholder groups such as students, alumni and representatives from the industry.

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

The peers consider criterion 6 to be fulfilled.

## D Additional Documents

Before preparing their final assessment, the panel ask that the following missing or unclear information be provided together with the comment of the Higher Education Institution on the previous chapters of this report:

- D 1. Study plan of the new reform
- D 2. Exemplary Diploma Supplement



## **E Comment of the Higher Education Institution**

The institution provided the following additional documents :

New Module Handbook

Draft Diploma Supplement

## F Summary: Peer recommendations

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

<b>Degree Programme</b>	<b>ASIIN Seal</b>	<b>Maximum duration of accreditation</b>	<b>Subject-specific label</b>	<b>Maximum duration of accreditation</b>
Ma Computer Science Engineering	With requirements for one year	30.09.2028	EUR-ACE®	30.09.2028

### Requirements

- A 1. (ASIIN 2.2) Implement a credit and workload system according to the ECTS.
- A 2. (ASIIN 5.1) Provide complete module descriptions for all modules including internship and thesis.

### Recommendations

- E 1. (ASIIN 2.1) It is recommended to improve the opportunities for the international mobility of students.
- E 2. (ASIIN 2.3) It is recommended to increase the number of team projects.
- E 3. (ASIIN 4.3) It is recommended that at least one book specified in the respective module handbook is available in the library.

## **G Comment of the Technical Committee 04 - Informatics/Computer Science (08.03.2023)**

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

The Technical Committee discusses the accrediting procedure and follows the assessment of the peers with only editorial changes of the recommendation E 3.

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

The Technical Committee deems that the intended learning outcomes of the degree programmes do comply with the engineering specific parts of Subject-Specific Criteria of the Technical Committee 04 – Informatics/Computer Science.

The Technical Committee 04 – Informatics/Computer Science recommends the award of the seals as follows:

<b>Degree Programme</b>	<b>ASIIN Seal</b>	<b>Maximum duration of accreditation</b>	<b>Subject-specific label</b>	<b>Maximum duration of accreditation</b>
Ma Computer Science Engineering	With requirements for one year	30.09.2028	EUR-ACE®	30.09.2028

### **Requirements**

- A 1. (ASIIN 2.2) Implement a credit and workload system according to the ECTS.
- A 2. (ASIIN 5.1) Provide complete module descriptions for all modules including internship and thesis.

### **Recommendations**

- E 1. (ASIIN 2.1) It is recommended to improve the opportunities for the international mobility of students.
- E 2. (ASIIN 2.3) It is recommended to increase the number of team projects.
- E 3. (ASIIN 4.3) It is recommended to provide the literature specified in the module handbook in the library.

## H Decision of the Accreditation Commission (24.03.2023)

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

The Accreditation Commission discusses the accreditation procedure and decides to delete the recommendation E3, as sufficient books and articles are already available online, so that this recommendation is not necessary. Otherwise, the AC follows the assessment of the peers and the TC without any changes.

*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 Committee 04 – Informatics/Computer Science.

The Accreditation Commission decides to award the following seals:

Degree Programme	ASIIN Seal	Maximum duration of accreditation	Subject-specific label	Maximum duration of accreditation*
Ma Computer Science Engineering	With requirements for one year	30.09.2028	EUR-ACE®	30.09.2028

\*Subject to the approval of the ENAEE Administrative Council

### Requirements

- A 1. (ASIIN 2.2) Implement a credit and workload system according to the ECTS.
- A 2. (ASIIN 5.1) Provide complete module descriptions for all modules including internship and thesis.

### Recommendations

- E 1. (ASIIN 2.1) It is recommended to improve the opportunities for the international mobility of students.
- E 2. (ASIIN 2.3) It is recommended to increase the number of team projects.

## I Fulfilment of Requirements (22.03.2024)

### Analysis of the experts and the Technical Committee/s (29.02.2024)

#### Requirements

##### For both degree programmes

A 1. (ASIIN 2.2) Implement a credit and workload system according to the ECTS.

Initial Treatment	
Experts	Fulfilled. Vote: unanimous Justification: The university has established a system accordingly to the ECTS. This is also reflected in the revised module hand-book.
TC 04	Fulfilled. Vote: unanimous Justification: The TC follows the assessment of the experts.
AC	Fulfilled. Vote: unanimous Justification: The AC follows the assessment of the experts.

A 2. (ASIIN 5.1) Provide complete module descriptions for all modules including internship and thesis.

Initial Treatment	
Experts	Fulfilled. Vote: Unanimous Justification: The university provides a revised and complete module handbook that fulfils the requirement.
TC 04	Fulfilled. Vote: unanimous Justification: The TC follows the assessment of the experts.
AC	Fulfilled. Vote: unanimous Justification: The AC follows the assessment of the experts.

## Decision of the Accreditation Commission (22.03.2024)

<b>Degree programme</b>	<b>ASIIN-label</b>	<b>Subject-specific label</b>	<b>Accreditation until max.</b>
National Engineering Diploma Degree Programme Computer Science Engineering	All Requirements fulfilled	EUR-ACE®	30.09.2028

## Appendix: Programme Learning Outcomes and Curricula

According to the Diploma Supplement the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Computer Science Engineering degree programme:

“The competences acquired by the ENSI engineering courses are as follows:

- C1. To master in depth the basic sciences, in particular computer science and mathematics, essential for the design and production of computer applications.
- C2. Set up a technology watch system to select the relevant tools and methodologies in the design, production, or maintenance of an Information System (IS).
- C3. Analyze complex IS architectures considering non-technical constraints such as societal, health and safety, environmental or economic constraints.
- C4. Identify, formulate, and solve complex or incompletely defined IT problems with the objective of ensuring maximum availability for users
- C5. Specify an information system in all its dimensions: software, hardware and architecture using the state-of-the-art available technologies and considering the company's strategic objectives
- C6. Assess the vulnerability of an IS and implement solutions to protect applications and data.
- C7. Identify, locate, and collect all the data necessary for the research and development of new software or new IS architectures.
- C8. Master good practices in terms of software development as well as applicable standards and regulations.
- C9. Make complex decisions based on incomplete or limited information.
- C10. Lead an IT project by mastering people management, risk analysis, budget compliance and change management (IS implementation).
- C11. Adapt your communication according to the audience (specialists or neophytes) or the context in which the function is performed (National or international) by mastering at least 3 languages.
- C12. Develop leadership and entrepreneurial skills and the ability to innovate, particularly through socio-cultural projects.
- C13. Become aware of the need to constantly update your knowledge and, if necessary, to undertake additional studies.”

The following **curriculum** is presented:

## 0 Appendix: Programme Learning Outcomes and Curricula

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### Common core courses:

#### Semester 1:

code	Title	Credits
MAT.1.1	Probability and Statistics	3
MAT.1.2	Mathematics of engineering	3
FIN.1.1	Introduction to banking and Financial systems	3
EHA.1.1	Digital circuits	3
EHA.1.2	Analog Electronics	1,5
AI.1.1	Formal Logic	3
DAT.1.1	Database and DBMS	3
AP.1.2	Algorithmics and Data Structures	3
AP.1.3	Advanced C programming	1,5
BDC.1.1	Management of Organization	3
BDC.1.2	Language and communication 1 : English for Computer Science	3

#### Semester 2:

code	Title	Credits
MAT.2.1	Graph algorithmic	3
MAT.2.2	Numerical methods	3
EHA.2.1	Microprocessor and microcontroller engineering	3
NET.2.1	Digital transmission	3
OS.2.1	Introduction to operating systems and Unix environment	3
AP.2.1	Object-oriented programming	3



## 0 Appendix: Programme Learning Outcomes and Curricula

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AP.2.2	Web technologies	1,5
AP.2.3	Automata theory and formal Languages	3
DAT.2.1	Database lab	1,5
IMA.2.1	Image introduction	3
BDC.2.1	Language and communication 2	3

### Semester 3:

code	Title	Credits
MAT.3.1	Linear and nonlinear programming	3
EHA.3.1	Processor design methodology	3
NET.3.1	Local Area Networks (LAN)	3
NET.3.2	Lab Local Area Networks	1,5
OS.3.03	Operating Systems and concurrent programming	3
AP.3.1	Compilation techniques	1,5
AP.3.2	Design and analysis of computer algorithms	3
SE.3.1	Software engineering	3
SE.3.2	Object-oriented analysis and design	3
AI.3.1	AI & Machine Learning	3
BDC.3.1	Language and communication 3	3

### Semester 4:

## 0 Appendix: Programme Learning Outcomes and Curricula

code	Title	Credits
MAT.4.1	Stochastic processes	3
EHA.4.1	Introduction to Embedded Systems	3
NET.4.1	Computer networks	3
SE.4.1	Formal development methods	3
SE.4.2	Software Architectures	3
SEC.4.1	Cybersecurity & Cryptography	3
FIN.4.1	Introduction to financial markets	3
DDP.4.1	Design and development project	3
BDC.4.1	introduction to Entrepreneurship and innovation	3
BDC.4.2	Language and communication	3

### Semester 5:

code	Title	Credits
BDC.5.1	Complex Project Management	1,5
BDC.5.2	Computer Law and Human Rights	1,5
BDC.5.3	Language and communication5: Preparing for Standardized exams	1,5

### Semester 5 Specializations courses

#### Artificial Intelligence:

Code	Title	Contact Hours	Credits	Type
AI.5.1	Multi-agent systems	30	2	Compulsory
AI.5.2	Non-Classical Logics	30	2	Compulsory

## 0 Appendix: Programme Learning Outcomes and Curricula

AI.5.3	Applied Deep Learning	30	2	Compulsory
AI.5.4	Natural Language Processing	30	2	Compulsory
AI.5.5	Robotics and soft computing	30	2	Compulsory
ISA.5.1	Big Data	30	2	Compulsory
ISA.5.3	Interactive Decision Support Systems	30	2	optional
ISA.5.2	Data mining	30	2	Compulsory
MAT.5.1	Combinatorial Optimization	30	2	optional
MAT.5.2	Category theory and functional programming	30	2	Compulsory
AI.5.6	Knowledge Representation & Reasoning	15	1	Compulsory
ISA.5.6	Text Mining	15	1	Compulsory
ISA.5.5	Recommender systems	30	2	optional
ISA.5.4	Business Intelligence	30	2	optional
AI.5.7	Deep Reinforcement Learning	15	1	optional
ISA.5.7	Distributed data Bases	15	1	optional
ISA.5.8	Advanced BI	15	1	optional
AI.5.10	Semantic web & Linked data	15	1	optional
AI.5.8	Affective computing	15	1	optional
AI.5.9	Intelligent Transport Systems	15	1	optional
DOS.5.8	Introduction to Cloud computing	15	1	Compulsory
DOS.5.2	Blockchain	15	1	Compulsory
AI.5.11	AIOT	15	1	optional
	Complementary module1	30		
	Complementary module2	30		
	Complementary module3	30		
	Complementary module4	15		
	Complementary module5	15		
	Complementary module6	15		

### Software Engineering:

Code	Title	Contact Hours	Credits	Type
SE.5.1	Software Reengineering	30	2	compulsory
SE.5.2	Software quality & test	30	2	compulsory
SE.5.3	Mobile Development	15	1	compulsory
SE.5.4	Complex systems engineering	30	2	optional
SE.5.5	Model driven engineering	30	2	optional
ISA.5.1	Big Data	30	2	compulsory
ISA.5.3	Interactive Decision Support Systems	30	2	compulsory
ISA.5.7	Distributed databases	15	1	compulsory
ISA.5.4	Business Intelligence	30	2	compulsory
ISA.5.9	Geographic Information Systems	30	2	optional
ISA.5.2	Data mining	30	2	compulsory
ISA.5.10	Urbanization of information systems	30	2	optional
ISA.5.11	Data Engineering	30	2	optional
ISA.5.6	Text Mining	15	1	optional
ISA.5.8	Advanced BI	15	1	compulsory
AI.5.3	Applied Deep learning	30	2	compulsory
AI.5.1	Multi-agent systems	30	2	optional

## 0 Appendix: Programme Learning Outcomes and Curricula

DOS.5.1	Cloud computing	30	2	compulsory
DOS.5.2	Blockchain	15	1	compulsory
DOS.5.3	IoT	15	1	optional

### Data Science & Computer Vision

Code	Title	Contact Hours	Credits	Type
AI.5.14	Machine and Deep Learning	30h	2	Compulsory
CV.5.1	Restoration and digital Considerations	30h	2	Compulsory
CV.5.2	Shape recognition and geometric invariants	30h	2	Compulsory
CV.5.3	3D representation: Curves, Shapes and Surfaces	30h	2	Optional
CV.5.4	Discrete Representation of 3D Objects	30h	2	Optional
CV.5.5	Compression techniques for computer vision applications	30h	2	Optional
CV.5.6	Mathematical Morphology and medical applications	30h	2	Compulsory
CV.5.7	Multispectral image processing	30h	2	Compulsory
CV.5.8	Multidimensional signal processing	30h	2	Optional
CV.5.9	Computer vision	30h	2	Optional
ISA.5.1	Big Data	30h	2	Compulsory
AI.5.13	Machine and Deep Learning Workshops	15h	1	Compulsory
AI.5.14	Speech recognition&Chatbots application	15h	1	Compulsory
AI.5.15	Optimization and Reinforcement Learning	15h	1	Compulsory
AI.5.16	Introduction to Natural Language Processing	15h	1	Optional
CV.5.11	Medical Imaging Workshops	15h	1	Compulsory
DOS.5.2	Blockchain	15h	1	Optional
DOS.5.3	IoT	15h	1	Optional
DOS.5.8	Introduction to cloud computing	15h	1	Optional
SE.5.3	Mobile Development	15h		Optional
	Complementary module1	30h	2	
	Complementary module2	30h	2	
	Complementary module3	30h	2	
	Complementary module4	15h	1	
	Complementary module5	15h	1	
	Complementary module6	15h	1	

### Financial Engineering

Code	Title	Contact Hours	Credits	Type
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## 0 Appendix: Programme Learning Outcomes and Curricula

FIN.5.1	International Finance	30h	2	compulsory
MAT.5.3	Numerical Optimization with R	30h	2	compulsory
FIN.5.2	The Risk Modelling and Dynamic Financial Risk Management	30h	2	compulsory
FIN.5.3	Bank Management	30h	2	compulsory
ISA.5.1	Big Data	30h	2	compulsory
FIN.5.4	Monte carlo methods and financial model simulation	30h	2	compulsory
MAT.5.5	Data analysis	30h	2	compulsory
MAT.5.4	Statistical Inference with R	30h	2	optional
ISA.5.4	Business intelligence	30h	2	optional
AI.5.1	Multi agent systems	30h	2	optional
FIN.5.6	Valuation and financing of companies	30h	2	compulsory
AI.5.12	Introduction to Deep Learning	15 h	1	compulsory
FIN.5.5	Quantitative Finance	15h	1	compulsory
DOS.5.2	Blockchain	15h	1	compulsory
SE.5.3	Mobile Development	15h	1	optional
ISA.5.7	Distributed data Bases	15h	1	optional
DOS.5.3	IoT	15	1	optional

### Embedded Software and Systems:::

Code	Title	Contact Hours	Credits	Type
AI.5.5	Robotics and soft computing	30H	2	Optional
AI.5.12	Introduction to Deep Learning	15H	1	Optional
DOS.5.4	Advanced Architectures and parallel programming models	30h	2	Optional
DOS.5.5	Real Time Operating Systems	30h	2	Compulsory
DOS.5.6	Distributed Systems and applications	30h	2	Compulsory
DOS.5.7	Embedded Linux	30h	2	Optional
DOS.5.8	Introduction to cloud computing	15H	1	Compulsory
DOS.5.9	Software Development for robotics	15h	1	Optional
DOS.5.10	Introduction to Digital EcoSystems: from IoT to Cloud computing -DES	15h	1	Optional
ESDV.5.1	Microcontroller-based systems	30h	2	Compulsory
ESDV.5.2	System Integration (VHDL)	30h	2	Compulsory
ESDV.5.3	Real-Time systems design and validation	30h	2	Compulsory
ESDV.5.4	Cyber-Physical Systems	30h	2	Optional
ESDV.5.5	Electronics for embedded systems	30h	2	Compulsory
ESDV.5.6	Embedded Interfacing	15h	1	Optional
ESDV.5.7	Integration project	15h	1	Compulsory
ESDV.5.8	Microcontroller Project	15h	1	Compulsory
ESDV.5.9	Reconfigurable Architectures	15h	1	Optional
IAP.5.1	Soft Actuator Control and Applications	30H	2	Optional
IAP.5.2	Programming connected objects	15h	1	Optional
IAP.5.3	Positioning Systems and Applications -PSA.	15h	1	Optional
SEC.5.1	Diagnosis, safety and reliability of embedded systems	30h	2	Optional
SEC.5.2	IoT Security	30h	2	Compulsory
SEC.5.3	Automotive Architecture and Security	15h	1	Optional
SEC.5.4	IoT security project	15h	1	Compulsory
ISA.5.12	Introduction to Datamining	15H	1	Optional
	Complementary module1	30h	2	
	Complementary module2	30h	2	
	Complementary module3	30h	2	
	Complementary module4	15h	1	

## 0 Appendix: Programme Learning Outcomes and Curricula

	Complementary module5	15h	1
	Complementary module6	15h	1

### Services, Technologies and Internet of Things:

Code	Title	Contact Hours	Credits	Type
ESEP.5.1	Microcontrollers based Systems	30h	2	Optional
ESEP.5.2	Connected Objects Programming	30h	2	Optional
ESEP.5.3	Cyber-Physical Systems	15h	1	Optional
NET.5.1	Muti-service Cellular Networks	30h	2	compulsory
NET.5.2	communication Architectures and protocols for IoT	30h	2	compulsory
NET.5.3	Networks Management	15h	1	compulsory
NET.5.4	QoS & Traffic eng.	15h	1	compulsory
DOS.5.5	Real time operating systems	30H	2	compulsory
DOS.5.6	Distributed systems and applications	30H	2	compulsory
DOS.5.12	Distributed Storage systems	30h	2	compulsory
DOS.5.4	Advanced architectures and parallal programming	30h	2	compulsory
DOS.5.8	introduction to Cloud computing	15H	1	compulsory
IAP.5.3	Positioning Systems: tecniques and Applications	15H	1	Optional
DOS.5.11	IoT Middelwares & frameworks	15H	1	Optional
DOS.5.2	Blockchain	15h	1	Optional
AI.5.12	Introduction to Deep Learning	15H	1	compulsory
ISA.5.12	Introduction to Datamining	15H	1	Optional
ISA.5.1	Big Data	30H	2	Optional
AI.5.13	Introduction to Robotique &soft computing	15h	2	Optional
SEC.5.2	IoT Security	30h		compulsory
SEC.5.4	IoT security project	15h		Optional