**Programme regulation - Minor in “Smart infrastructures”**

The Minor career is separate from the Master Degree career. Students enrolled in specific Second Cycle degree programmes (see table below) at the University of Bologna can apply for a Minor according to the admission criteria therein specified. Minors consist in a 30 CFU total working load, 18 of which are recognized from the Master Course study plan and consistent with the minor program, the remaining 12 CFU are extra credits to be acquired within one year from graduation.

Enrolment to Minor programmes is tuition fee free and admission is done through a specific call for application. Students who gained 30 CFU valid for the Minor programme and that develop a dissertation in a consistent topic, will get the Minor Certification.

**Admission requirements and application modalities**

Admissions to Minor is reserved to students regularly enrolled in one of the following **core** and **affine** Second Cycle Degree Programmes at the University of Bologna:

|  |
| --- |
| **Core Degree Programmes** |
| Biomedical Engineering, DEI, Cesena |
| Ingegneria Elettronica e Telecomunicazioni per l’Energia, DEI, Cesena |
| Civil Engineering, DICAM, Bologna |
| Ingegneria Civile, DICAM, Bologna |
| Ingegneria e Scienze Informatiche, DISI, Cesena |

|  |
| --- |
| **Affine Degree Programmes**  |
| Telecommunication Engineering, DEI, Bologna |

**Restricted access**

There are 60 available positions per academic year in the Smart Infrastructures Minor.

Selection is carried out on a yearly basis with a dedicated call for application. The evaluation revolves around applicants' career merit, according to the reserved quota established for students enrolled in **core degree programmes**.

|  |  |
| --- | --- |
| **Reserved Quota** | **Degree Programme** |
| 20 | Civil Engineering e Ingegneria Civile |
| 10 | Ingegneria e Scienze informatiche |
| 3 | Ingegneria Elettronica e Telecomunicazioni per l’Energia |
| 7 | Biomedical Engineering |
| 40 | **Reserved quota for core courses students** |

**Consistency between Second Cycle Degree career and Minor to access the Certification.**

Admission to the Minor programme and the subsequent chance to get the certification is subject to:

- consistency of the student's career both with its Second Cycle Degree Programme and Minor course structure diagram;

- development of a final dissertation consistent with minor topics.

Assessment of entry requirements is carried out by an appointed Minor Board specified in the next section.

Students must choose 18 credits among teaching activities listed in tables A, B and D and 12 credits among "Design Thinking Activities" listed in table C (tables are displayed In the section: "*Minor teaching activities for academic year 2021/2022*").

The Board will check consistency of chosen activities with the study plan to avoid repetitions and verify prerequisites; the Board will assign courses on Table C according to the reserved quota. Each teaching activity listed in table C allows a maximum of 30 students per course. If requests exceed the maximum capacity, students will be selected in order to guarantee a mixed composition of the classrooms in the means of degree programmes composition. Morevoer, selection will be based on career scores.

Upon approval to the Minor study plan, the student must edit his Second Cycle Degree study plan accordingly.

In any case, if the final Minor study plan is different form the one approved by the Board, the student cannot be awarded the certification.

**If the student does not accept the study plan proposed by the Minor Board, the student cannot enroll to the programme and its place will be given to the following eligible candidate in the waiting list.**

Exams registered during the Second Cycle degree programme that are consistent with Minor course structure diagram will be recognized and will add up to the total required credit amount.

Minor Certification will be released to the students who comply with all the requested conditions (18CFU of curricular activities, chosen on agreement with the Board, 12CFU of extra-curricular activities named as "*Design Thinking*", dissertation project consistent with minor topics).

Students who edit the Minor study plan without the Board approval, will not pursue the certification.

**Minor Board**

The Head of DEI Department, in agreement with other participating Departments (DEI, DICAM, DISI), agreed on the composition of the Minor Board as follows:

* Prof. Alberto Bellini (DEI)
* Prof. Emanuele Giordano (DEI)
* Prof. Alessandro Marzani (DICAM)
* Prof. Cristiana Bragalli (DICAM)
* Prof. Franco Callegati (DISI)
* Dott. Alessandra Iosi

The Board Task is to verify consistency of the proposed Minor study plan with Bachelor and Master degree career of the student to avoid eventual inconsistencies with the pre-requisites or eventual course repetition.

The Board will also:

* Select the students who will attend the *“Design Thinking*” teaching units (as listed onward in “Table C”), in case those exceed the established reserved quota for those (max 30 students);
* Verify the consistency of proposed thesis with minor topics ahead of time. For this reason, students enrolled into the Minor programme have to send to the Minor Board the following information: abstract, supervisor and thesis title at least three months prior to defense. Verification will be done according to a specific set of rules that the board will approve on the first regular meeting.
* Verify and update the current set of rules.

Upon its first meeting, the Board elects the President. The President will have coordination tasks within the Board and will always have to consult with the Board for contents and editing of this set of rules.

**Teachings language and modalities**

“*Design thinking*” teaching activities, active for the Minor purposes, will be normally thought in English.

Lectures are delivered in mixed modalities so that students enrolled in different Campuses will be able to follow the lectures online.

**Transitional arrangements**

“*Design Thinking*” Activities should normally be attended after graduation. “*Design Thinking” a*ctivities for students enrolled in the academic year 2021/2022 will be available for academic year 2023/2024.

According to recent transitional arrangements, “*Design Thinking”* activities will be activated for academic year 21/22 and can be selected from students enrolled in previous years and will be available as type D activities, up to the reserved quota which allows a maximum of 30 students for each activity (including students not enrolled in Minors).

For a.y. 2021/2022 activities reported in table C can be attended also as 6 credits modules.

**Minor teaching activities for academic year 2021/2022**

Minor teaching activities are shown down below in tables A, B, C, D. Teaching activities in table A and B are repeated from the University programme catalogue.

“Design Thinking” courses are inserted in table C and they are specifically created for the Minor programme.

Table D contains transferable skills offered by the University deemed as consistent with the Minor programme.

 **Tabella A-smart, competenze di tipo ingegneristico (6-12 CFU)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Codice** | **Denominazione** | **SSD** | **CFU** |
| 92991 | Learning and Estimation of Dynamical Systems M | ING-INF/04 | 6 |
| 34984 | Elaborazione Numerica dei Segnali LM | ING-INF/03 | 6 |
| 85738 | Advanced Automotive Sensors M | ING-INF/07 | 6 |
| 34987 | Sensori e Attuatori LM | ING-INF/01 | 6 |
| 90390 | Elaborazione Statistica dei Segnali M | ING-INF/01 | 6 |
| 93914 | Laboratory of wearable sensors and mobile health | ING-INF/06 | 6 |
| 30569 | Elaborazione dei Segnali | ING-INF/03 | 9 |
| 93913 | Bioelectromagnetism | ING-INF/02 | 6 |
| 07941 | Campi Elettromagnetici | ING-INF/02 | 9 |
| 69774 | Comunicazioni Digitali e Internet | ING-INF/03 | 12 |
| 86582 | Building Information Modelling | ICAR/17 | 6 |
| 72748 | Sustainability in construction | ICAR/09 | 6 |
| 92869 | Road infrastructure sustainable and safe management | ICAR/04 | 6 |
| 92867 | Survey and monitoring of transport infrastructures | ICAR/06 | 6 |
| 72785 | Structural safety | ICAR/09 | 6 |
| 72800 | Diagnostica e sperimentazione delle strutture M | ICAR/09 | 6 |
| 30993 | Elementi di tecnica delle costruzioni T | ICAR/09 | 6 |
| 31593 | Fondamenti di Infrastrutture Idrauliche T | ICAR/02 | 6 |
| 72879 | Sistemi Idraulici Urbani M  | ICAR/02 | 6 |
| 72860 | Progettazione dei Sistemi di Trasporto | ICAR/05 | 6 |
| 92868 | Transport System Design and Planning | ICAR/05 | 6 |
| 29686 | Meccanica dei Fluidi T | ICAR/01 | 6 |
| 95941 | Geotechnical Engineering for Land Protection | ICAR/07 | 6 |
| 72801 | Dinamica delle Strutture M | ICAR/08 | 6 |
| 93470 | Cybersecurity | ING-INF/05 | 6 |
| 72529 | Smart City e Tecnologie Mobili | ING-INF/05 | 6 |
| 73435 | Project Management | ING-INF/05 | 6 |
| 95631 | Machine Learning and Data Mining – non attivo per l’a.a. 21/22 | ING-INF/05 | 6 |
| 81615 | Pervasive Computing | ING-INF/05 | 6 |
| 95638 | Operational Analytics – non attivo per l’a.a. 21/22 | ING-INF/05 | 6 |
| 72521 | Instradamento e Trasporto in Internet | ING-INF/03 | 6 |
| 95628 | Business Models | SECS-P/10 | 6 |
| 96101 | Organization, Teams and Digital Leadership | SECS-P/10 | 6 |

**Tabella B-smart, attività affini e integrative (6 CFU)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Codice** | **Denominazione** | **SSD** | **CFU** |
| 94025 | Reti Wireless per l’Internet of Things LM | ING-INF/03 | 6 |
| 35114 | Sistemi di Telecomunicazioni LM | ING-INF/03 | 6 |
| 72521 | Instradamento e Trasporto in Internet | ING-INF/03 | 6 |
| 72529 | Smart City e Tecnologie Mobili | ING-INF/05 | 6 |
| 93470 | Cybersecurity | ING-INF/05 | 6 |
| 73435 | Project Management | ING-INF/05 | 6 |
| 95631 | Machine Learning and Data Mining – non attivo per l’a.a. 21/22 | ING-INF/05 | 6 |
| 81615 | Pervasive Computing | ING-INF/05 | 6 |
| 95638 | Operational Analytics – non attivo per l’a.a. 21/22 | ING-INF/05 | 6 |

**Tabella C-smart, attività di design thinking (12 CFU)**

Da frequentare e sostenere solo dopo il conseguimento del titolo di laurea magistrale.

|  |  |  |  |
| --- | --- | --- | --- |
|  **Codice** | **Denominazione** | **CFU** | **CFU modulo** |
| 98210 | **Smart monitoring of Civil infrastructures (C.I.)** | 12 |  |
|  | 98261 Advanced monitoring for Civil Engineering applications |  | 6 |
|  | 98212 Technologies for monitoring of infrastructures |  | 6 |
| 98213 | **Smart City Infrastructures (C.I.)** | 12 |  |
|  | 98214 Intelligent Cyber-Physical Systems  |  | 6 |
|  | 98215 Smart City Civil infrastructures |  | 6 |
| 98216 | **Smart Communication Infrastructures (C.I.)** | 12 |  |
|  | 98217 5G intelligent networks and systems |  | 6 |
|  | 98218 Programmable networks |  | 6 |

**Tabella D-smart, competenze trasversali (0-6 CFU)**

|  |  |  |
| --- | --- | --- |
| Codice | Denominazione | CFU |
| 73387 | Creativity and innovation | 3 |
| 94136 | Critical thinking - argomentazione e pensiero critico | 6 |
| 94119 | Employability: come presentarsi nel mondo del lavoro | 3 |
| 86716 | Imprenditorialità – Bologna | 3 |
| 94121 | Introduzione al project management e alle soft skill-L  | 3 |
|

|  |  |
| --- | --- |
| 81799 | PROJECT MANAGEMENT AND SOFT SKILLS M |

 | Project management and soft skills – M | 3 |