| MODULES | TITLE | ECTS | |
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| HUMANITIES | FRENCH AS A FOREIGN LANGUAGE | 2 | 2 |
| | PHYSICAL EDUCATION | 2 | 3 |
| | ENGLISH | 2 | 4 |
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| TECHNICAL | ADVANCED ALGORITHMICS | 3 | 5 |
| | INTRODUCTION TO ARTIFICIAL INTELLIGENCE | 3 | 6 |
| | WEB SERVICES | 4 | 7 |
| | WIRELESS COMMUNICATION | 2 | 8 |
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| PROJECTS | TECHNICAL PROJECT | 8 | 9 |
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| Module title: **FRENCH FOR FOREIGNERS** |
| Module leader : Nathalie Caradec Nathalie.caradec@enssat.fr |
| Type of module: COMPULSORY |
| Duration of module: 30 HOURS |
| Module components /Types of Courses:<br>• Practical courses in small group<br>• Dialogues, role-play, variety of teaching material through the media and digital technology |
| ECTS: 2 |
| Workload: In class studying |
| Content:<br>CEFR French levels are used on the four skills speaking – listening-reading and writing<br>• Level A1-A2<br>can introduce him/herself, can ask and answer questions about personal details such as where he/she lives, people he/ she knows, and things he/she has. Can interact in a simple way provided the other person talks slowly and clearly.<br>• Level B1-B2<br>Can understand the main points of clear standard input on familiar matters regularly encountered in work, school, leisure, etc. Can deal with situations most likely to arise whilst travelling in an area where the language is spoken. Can produce simple connected text on topics which are familiar or of personal interest. Can describe experiences and events, dreams, hopes & ambitions and briefly give reasons and explanations for opinions and plans.<br><br>Common European Framework of References : CECRL (Cadre Européen Commun de Références pour les Langues) |
| Learning outcomes: Development of the different skills according to the level. |
| Assessment: continuous assessment<br>• Written assignment<br>• Oral assignment |
| Language of instruction: FRENCH |
| Additional information: |

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| Module title: **PHYSICAL EDUCATION** |
| Module leader: Mr. Bertrand LEFEBVRE Bertrand.lefebvre@enssat.fr |
| Type of module: COMPULSORY |
| Duration of module: 30 HOURS |
| Module components /Types of Courses (lectures, practical course, lab, tutorial, internship, …) |
| ECTS: 2 |
| Workload: not requested |
| Content: TENNIS OR WINDSURFING |
| Learning outcomes:<br>• Health and safety<br>• Team Spirit<br>• Local sports activities |
| Assessment:<br>• Written assignment (final report to be handed in)<br>• Oral assignment |
| Language of instruction: ENGLISH/FRENCH |
| Additional information: swimming skills are mandatory for water sports. |

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| Module title: **GENERAL ENGLISH COURSES** |
| Module leader: Claire LE PAGE claire.le-page@enssat.fr |
| Type of module: COMPULSORY |
| Duration of module: 30 HOURS |
| Module components /Types of Courses:<br>• Practical courses in small group<br>• Dialogues, role-play, variety of teaching material through the media and digital technology |
| ECTS: 2 |
| Workload:<br>• In class studying: 30 hours<br>• Student managed learning: 20 hours |
| Content: This course is designed to teach students at an “independent level” to communicate effectively in English at the B2 /C1 level on general topics. |
| Learning outcomes:<br>At the end of this course students will be able to<br>• Do presentations<br>• Debate on topical issues<br>• Interact with a degree of fluency which makes communication with a native speaker possible<br>• Write reports on a wide range of interests.<br>• Understand the main ideas of complex texts on concrete or abstract topics<br>• Understand extended speech or conferences |
| Assessment: continuous assessment<br>• Written assignment<br>• Oral assignment |
| Language of instruction: ENGLISH |
| Additional information: B1 level is a prerequisite |

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| Module title: **ADVANCED ALGORITHMICS** |
| Module leader: Olivier Pivert olivier.pivert@enssat.fr |
| Type of module: COMPULSORY |
| Duration of module: 36 HOURS |
| Module components / Types of Courses: lectures (14h), practical course (14h), lab (8h) |
| ECTS: 3 |
| Workload:<br>• In class studying: 36 h<br>• Student managed learning: 20 h |
| Content:<br>• Introduction<br>• Reminder about computational complexity<br>• Divide and Conquer<br>• Trials and errors<br>• Dynamic programming<br>• Greedy algorithms |
| Learning outcomes:<br>The objective is to master different classical algorithmic methods, whose list is given above. Particular attention will be paid to the computational complexity aspect. |
| Assessment: Final Written assignment |
| Language of instruction: ENGLISH |
| Additional information: |

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| Module title: **INTRODUCTION TO ARTIFICIAL INTELLIGENCE** |
| Module leader : Maroua KOTTI maroua.masmoudi-kotti@univ-rennes.fr |
| Type of module: COMPULSORY |
| Duration of module: 30 HOURS |
| Module components /Types of Courses: lectures (12h), practical course (8h), lab (10h) |
| ECTS: 3 |
| Workload:<br>• In class studying: 30 hours<br>• Student managed learning: 20 hours |
| Content<br>• Search in discrete spaces<br>• Game theory<br>• Machine learning |
| Learning outcomes:<br>At the end of this course students will be able to<br>• Identify situations an instances of known problems<br>• Formalize situations as known problems<br>• Run space exploration algorithms<br>• Train machine learning<br>• Analyze the performance of exploration algorithms<br>• Analyse the performance of machine learning models |
| Assessment: continuous assessment<br>• Written assignment<br>• Oral assignment |
| Language of instruction: ENGLISH |
| Additional information: |

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| Module title: **WEB SERVICES** |
| Module leader : Vincent Barreaud vincent.barreaud@enssat.fr |
| Type of module: COMPULSORY |
| Duration of module: 30 HOURS |
| Module components /Types of Courses: lectures (20h), lab (36h) |
| ECTS: 4 |
| Workload:<br>• In class studying: 56 hours<br>• Student managed learning: 20 hours |
| Content: This course focuses on Service Oriented Architectures and more precisely on RESTful Web Services Architecture. The main programing language used is JavaScript on NodeJS servers and JEE. |
| Learning outcomes:<br>At the end of this course students will be able to<br>• Implement server-side software on NodeJS and in JEE.<br>• Describe what a REST architecture is (compared to SOAP architecture).<br>• Choose the architecture accordingly to the given specifications.<br>• Implement the given architecture on NodeJS or in JEE. |
| Assessment: continuous assessment<br>• Lab reports<br>• Project |
| Language of instruction: ENGLISH |
| Additional information: |

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| Module title: **WIRELESS NETWORK** |
| Module leader: Robin Gerzaguet robin.gerzaguet@enssat.fr |
| Type of module: COMPULSORY |
| Duration of module: 20 HOURS |
| Module components /Types of Courses: lectures (10h), lab (10h) |
| ECTS: 2 |
| Workload:<br>• In class studying: 20 h<br>• Student managed learning: 13 h |
| Content:<br>This course offers an in-depth exploration of advanced wireless communication networks, focusing on both theoretical principles and practical applications. Students will learn about the evolution of communication technologies, over-the-air transmission techniques, and specific protocols and standards such as 5G NR and LTE. The course will also cover the fundamental principles of Orthogonal Frequency Division Multiplexing (OFDM) and Wi-Fi communication (802.11a). |
| Learning outcomes:<br>At the end of this course students will be able to<br>• Understand the historical evolution of communication technologies, particularly cellular communications.<br>• Analyze various transmission techniques and models, including multipath and multiple access schemes.<br>• Describe the characteristics and parameters of 4G LTE and 5G NR.<br>• Identify core network components and protocols<br>• Understand Wi-Fi standards, including the MAC layer and CSMA-CA. |
| Assessment: individual Project<br>• You have received a signal from a 5G NR base station (BS) with a simplified frame. Your task is to sequentially decode all the logical and physical channels to finally obtain your ASCII message.<br>• Notebook to be completed in Python (or as a classic Python script). |
| Language of instruction: ENGLISH |
| Additional information: |

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| Module title: **TECHNICAL PROJECT** |
| Module leader : Julien Lolive julien.lolive@enssat.fr |
| Type of module: COMPULSORY |
| Duration of module: 50 HOURS |
| Module components /Types of Courses: lab (project) |
| ECTS: 8 |
| Workload:<br>• In class studying: 50 hours<br>• Student managed learning: 100 hours |
| Content: The technical project aims to be a multidisciplinary project for which the subject is proposed by a teacher at Enssat. |
| Learning outcomes: |
| Assessment:<br>• Report<br>• Demonstration<br>• Oral presentation |
| Language of instruction: ENGLISH/FRENCH |
| Additional information: |

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| Module title: |
| Module leader : |
| Type of module: COMPULSORY |
| Duration of module: 30 HOURS |
| Module components /Types of Courses: lectures (12h), practical course (8h), lab (10h) |
| ECTS: 3 |
| Workload:<br>• In class studying: 30 hours<br>• Student managed learning: 20 hours |
| Content<br>• Search in discrete spaces<br>• Game theory<br>• Machine learning |
| Learning outcomes:<br>• At the end of this course students will be able to<br>• Identify situations an instances of known problems<br>• Formalize situations as known problems<br>• Run space exploration algorithms<br>• Train machine learning<br>• Analyze the performance of exploration algorithms<br>• Analyse the performance of machine learning models |
| Assessment: continuous assessment<br>• Written assignment<br>• Oral assignment |
| Language of instruction: ENGLISH |
| Additional information: |