Master's Degree in Information Technology

Interfaces and System Integration

Area description

Graduates who have specialised in this area have in-depth knowledge of interfaces between computer systems and between systems and their users.

Professionals who have specialised in this area have been trained to design and develop mechanisms for interaction between computer systems and users. They are also able to design and implement complex systems that interact with their environments and that are controlled by computer systems, such as automated production control and management systems.

Subjects in the area of specialisation

- Advanced Visualisation
- Artificial Intelligence Applications
- Business Management Techniques and Procedures
- Computer Vision
- Data and Image Compression
- Digital Systems and Microcontrollers
- Information Technology Systems for Automation
- Interactive Graphics Systems
- Natural Language Processing
- Numerical Computation
- Physical Fundamentals of Computer Technologies
- Physics of Realistic Modelling and Animation
- Public Data Services
- Robotics
- Simulation
- Structure and Design of Operating Systems

Software Engineering and Information Systems

Area description

Graduates who have specialised in this area have in-depth knowledge of software engineering and information systems.

Professionals who have specialised in this area have all the skills expected of project managers who develop software for the management of organisations. This entails providing customer service, supervising technical aspects and managing human and material resources. They are able to analyse an organisation's information system requirements, as well as drawing up specifications for, designing and implementing high-quality software systems at a low cost. They have a broad knowledge of databases. They are able to design them, monitor them, assess their performance and manage them. They also know how to use the very latest technologies for the development of distributed applications.

Subjects in the area of specialisation

- Business Management Techniques and Procedures
- Concurrent and Distributed Programming
- Database and Object Management Systems
- Decision Making and Project Management in Business
- Design and Administration of Databases
- Design of Web-Based Systems
- Distributed and Networked Operating Systems
- Engineering of Requirements
- Information Systems for Organisations
- Logic in Information Technology
- Operations Research Models for Decision Making
- Planning and Management of Information Technology Projects and Systems
- Public Data Services
- Security in Information Technology Systems
- Simulation
- Viability of Business Projects

Supercomputing

Area description

Graduates who have taken this specialization area have in-depth knowledge using and applying supercomputers to solve real world problems in different scientific areas, as astrophysics, earth sciences, etc.

They are professionals trained to parallelize and optimize an application and to use the tools provided by a supercomputer in order to solve technical and scientific problems of a specific specialization area. They are also able to apply supercomputing methods in both technological and industrial environments to improve quality and productivity.

The Barcelona Supercomputing Center (BSC-CNS) provides supercomputing resources to carry out practical work required in the courses.

Subjects in the area of specialisation

- Applications of computational astrophysics
- Computational astrophysics
- Data mining 2
- Environmental modelling
- High performance computational mechanics: introduction, algorithms and applications
- Optimization of numerical simulations in engineering
- Parallel programming models and algorithms
- Performance tuning and analysis tools
- Supercomputer architectures

Telematic Networks and Operating Systems

Area description

Graduates who have specialised in this area are trained to design, scale, install, manage, maintain and assess telematic networks and operating systems.

They are professionals trained to build computer systems based on uniprocessors and multiprocessors and design their interconnections and basic software. They are able to select the most appropriate interface according to the requirements of each application and architecture. They are also experts in the different types of telematic networks and network applications. They are able to design remote network systems at all levels and to develop distributed Internet applications, taking into account features related to security and data protection in computer systems.
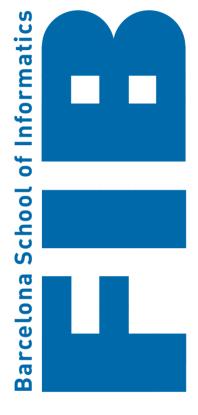
Subjects in the area of specialisation

- Computer Networks and Operating Systems Project
- Concurrent and Distributed Programming
- Cryptography
- Cutting-Edge Computer Architectures
- Data and Image Compression
- Design of Web-Based Systems
- Distributed and Networked Operating Systems
- Information and Coding Theory
- Internet and Multimedia Application Protocols
- Multiprocessors
- Operating Systems Administration
- Operations Research Models for Systems Analysis
- Public Data Services
- Security in Information Technology Systems
- Structure and Design of Operating Systems
- System Performance Evaluation

Barcelona School of Informatics

FIB

Syllabus

1st semester	Computer Architecture (7.2 ECTS)	Software Engineering I (6.0 ECTS)	Artificial Intelligence (7.2 ECTS)	Programming Project (4.8 ECTS)	Operating Systems Project (6.0 ECTS)
2nd semester	Compilers (7.2 ECTS)	Software Engineering II (7.2 ECTS)	Computer Networks (7.2 ECTS)	Software Engineering and Databases Project (6.0 ECTS)	Information resources in Information Technologies (1.2 ECTS)
3rd semester	5 Elective courses of the chosen area of specialization (30 ECTS)				
4th semester	Master project on the chosen area of specialization (30 ECTS)				

MTI will have a **yearly periodicity**. Assistance to the courses is **mandatory** and the total student's workload is **120 ECTS**, which should be accomplished in four whole-time semesters.

Master's Degree in Information Technology (MTI)

The MTI is an academically oriented master's degree which provides graduates with a professional specialization. It has been designed on the basis of the Barcelona School of Informatics (FIB) academic and administrative structure, with the collaboration of all the departments that have teaching responsibilities at FIB. The MTI aims to provide students with a general training in informatics and also with additional in-depth knowledge in some areas of computer science. Then, students specialize in one of the following **professional areas**:

- Advanced Programming Techniques
- Fundamentals of Computation
- High Performance Computer Architectures
- Information Management and Use
- Interfaces and System Integration
- Software Engineering and Information Systems
- Supercomputing
- Telematic Networks and Operating Systems

The MTI has a remarkable European and international vocation which means more than just adjusting learning processes to match the European Higher Education area trends. Specifically, the MTI encourages mobility of both students and instructors, taking advantage of the international agreements already existing between the FIB and a large number of foreign universities. In consequence, knowledge of the English language is required for the MTI students.

The MTI promotes social and environmental values related to the computer science discipline. Moreover, MTI courses intend to develop abilities particularly oriented to the professional practice. Working in group, leading working groups, oral and written communication skills are also promoted. MTI graduates are prepared and encouraged to learn throughout their professional lifes.

The FIB offers **50 vacancies** per academic year. Taking into account the preferences declared by the applicants, and according to the legal requirements, the FIB will take a final decision on the student's admission.

Advanced Programming Techniques

Area description
Graduates who have specialised in this area have a solid grounding in techniques for solving complex programming problems and programming techniques for specific fields.

Professionals who have specialised in this area are trained to solve complex programming problems efficiently and rapidly. They know how to choose the most suitable programming languages and paradigms in designing solutions to specific problems. They know how to design the most efficient solutions in terms of time and memory, taking into account the environments in which the programs must be run, which might be parallel or distributed environments or specific architectures. They are also familiar with programming techniques developed for specific areas of computing, such as artificial intelligence, numerical and scientific computation and computer security.

Subjects in the area of specialisation
- Algorithmics
- Artificial Intelligence Applications
- Awareness of Architecture in Programming
- Complexity
- Concurrent and Distributed Programming
- Cryptography
- Data and Image Compression
- Information Retrieval
- Interactive Graphics Systems
- Logic in Information Technology
- Machine Learning
- Multiprocessors
- Numerical Computation
- Physics of Realistic Modelling and Animation
- Programming Languages

Fundamentals of Computation

Area description
Graduates who have specialised in this area have an in-depth understanding of computer science.

Professionals who have specialised in this area are able to tackle problems that require in-depth knowledge of the foundations of computer science and a system-wide view of all the levels in a computer system. They are able to assess the difficulty of a computing problem and recommend the most suitable machines, languages and programming paradigms for designing a solution.

Subjects in the area of specialisation
- Algorithmics
- Artificial Intelligence Applications
- Awareness of Architecture in Programming
- Complexity
- Computational Geometry
- Concurrent and Distributed Programming
- Cryptography
- Cutting-Edge Computer Architectures
- Data and Image Compression
- Distributed and Networked Operating Systems
- Information and Coding Theory
- Information Retrieval
- Internet and Multimedia Application Protocols
- Logic in Information Technology
- Machine Learning
- Multiprocessors
- Numerical Computation
- Physical Fundamentals of Computer Technologies
- Programming Languages
- Structure and Design of Operating Systems
- Security in Information Technology Systems

High Performance Computer Architectures

Area description
Graduates who have chosen this area have specialised in computer architectures, the technologies required to design them and architecture-aware software.

Professionals who have specialised in this area have the skills needed to design computers and develop applications in keeping with the computer architecture on which they will be executed, taking full advantage of the resources available and attaining high performance. They are proficient in the assessment of computers, concurrent programming, operating system tools, internal structure and code generation and optimisation. They are well acquainted with multiprocessing systems, supercomputers and other advanced architectures. They are able to make the most of the features of systems with specialised architectures and tools for designing microprocessors and other integrated circuits.

Subjects in the area of specialisation
- Awareness of Architecture in Programming
- Concurrent and Distributed Programming
- Cutting-Edge Computer Architectures
- Digital Systems and Microcontrollers
- Internet and Multimedia Application Protocols
- Logic in Information Technology
- Microprocessor Design
- Multiprocessors
- Operations Research Models for Decision Making
- Physical Fundamentals of Computer Technologies
- Simulation
- Structure and Design of Operating Systems
- System Performance Evaluation

Information Management and Use

Area description
Graduates who have specialised in this area are experts in managing and using information in organisations.

Professionals who have specialised in this area are able to organise, maintain, explore and present the information available within an organisation. They know how to use a wide range of computing techniques to analyse this information and acquire new knowledge. Based on this knowledge, they know how to help organisations take strategic decisions and how to plan processes and actions, in addition to anticipating and assessing the results of these actions.

Subjects in the area of specialisation
- Artificial Intelligence Applications
- Business Management Techniques and Procedures
- Data Mining
- Database and Object Management Systems
- Decision Making and Project Management in Business
- Design and Administration of Databases
- Engineering of Requirements
- Information Exploitation Project
- Information Retrieval
- Information Systems for Organisations
- Machine Learning
- Natural Language Processing
- Operations Research Models for Decision Making
- Planning and Management of Information Technology Projects and Systems
- Security in Information Technology Systems
- Simulation
- Viability of Business Projects