### 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 systems that interact with the 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 Modeling and Animation
- Public Data Services
- Robotics
- Simulation
- Structure and Design of Operating Systems

### 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

### 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
- Databases 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

### 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

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www.fib.upc.edu/en/masters/mit.html

**Master's Degree in Information Technology**

UPC, the Technical University of Catalonia
www.upc.edu
**Advanced Programming Techniques**

**Area description**
Graduates who have specialised in this area have a solid grounding in techniques for solving complex programming problems and designing software systems 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 also know how to design the most efficient solutions in terms of time and memory, taking into account the environment in which the programs must run, which might be parallel or distributed environments or specific architectures. They are also familiar with programming techniques designed for specific areas of computing, such as artificial intelligence, numerical and scientific computing, and computer security.

**Subjects in the area of specialisation**
- Artificial Intelligence
- Machine Learning
- 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 in Architecture in Programming
- Complexity
- 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

**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 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 multiprocessor operating 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
- Cryptography
- Multiprocessors
- Operations Research Models for Decision Making
- Physical Fundamentals of Computer Technologies
- 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, exploit, 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