CS – Scientific Knowledge

AG41 Optimisation and Operational Research

C	TD	TP	THE			
30	28	18	44	SPRING	6 CREDITS	*ILC *I2RV *LEIM *R&T

OBJECTIVES:
- Introduce the main methods and algorithms for operational research to solve most common optimisation problems.

SYLLABUS:
- Introduction to operational research
- Linear programming (Simplex algorithm)
- Integer programming by tree–searches
- Dynamic programming
- Heuristic methods
- Simulated annealing, Taboo method
- Distributed optimisation
- Genetic algorithms
- Ant colony optimization
- Swarm intelligence
- Game theory

BD40 Information Systems

C	TD	TP	THE			
30	28	14	48	AUTUMN SPRING	6 CREDITS	*ILC *I2RV *LEIM *R&T

OBJECTIVES:
- Study methods and tools for information system design.
- Develop project with RDMS MS/Access

SYLLABUS:
- Information system design methodology
- Software design: methodology and tools
- Communication modelling
- Conceptual and organisational signal treatment modelling
- Conceptual data modelling
- Logic data modelling: relational databases
- Implementation of network databases
- Requests
- Application management with formulae, drop–down lists, menus and macros
- Application development with visual basic

IA41 — Artificial Intelligence: Fundamentals and Languages

C	TD	TP	THE				
30	28	14	48		AUTUMN	6 CREDITS	*ILC *I2RV *LEIM *R&T

OBJECTIVES:

- Introducing artificial intelligence by considering the main concepts and software tools used.

SYLLABUS:

- Introduction to artificial intelligence
- Knowledge representation
- Inference engines and knowledge−based systems
- Introduction to lambda calculus
- Introduction to formal systems and logic
- Declaration programming with PROLOG
- Functional programming with LISP
- Search planning and strategies in graphs
- Game theory and graph search strategies

IN41 — Signal Treatment and Analysis

C	TD	TP	THE				
30	28	18	44		SPRING	6 CREDITS	*ILC *I2RV *LEIM *R&T

OBJECTIVES:

- Acquire fundamental skills to analyse and interpret analogue and digital signals.

SYLLABUS:

- Analogue signal revision
- Frequency representation
- Analogue filtering
- Signal digitisation
- Digital filtering
- Random signals

IN42 — Introduction to Multimedia

C	TD	TP	THE				
24	28	21	47		SPRING	6 CREDITS	*ILC *I2RV *LEIM *R&T

OBJECTIVES:

- Introduce characteristics and content of new multimedia content.
- Master design tools.
- Carry out a clearly defined teaching project on a CD−ROM or as a website.

SYLLABUS:

- Basic design principals for multimedia teaching content
- Multimedia content interface quality criteria
- Tools and techniques for multimedia design (Flash and graphic tools)
- Text: automatic indexing
- Image: digital colour imaging
- Data compression
- Sound, video: coding and formats
- Educational multimedia project requirement specification
- Multimedia internet technology: XML, XHTML Strict and CSS 2, Content Management Systems

LO41 — Operating System Architecture and Utilisation

C	TD	TP	THE				
24	28	21	47		AUTUMN SPRING	6 CREDITS	*ILC *I2RV *LEIM *R&T
							Prerequisites LO22, LO44

OBJECTIVES:

- Introduce the main concepts for operating systems: system components, standard tools and mechanisms for synchronisation, communication, scheduling and resource management.

SYLLABUS:

- Concept introductions
- File management systems
- Memory management
- Inputs/outputs
- Process synchronisation
- Resource–sharing management
- Inter–process communication
- Scheduling and deadlocking
- Micro nodes
- Recent systems

LO43 — Object–Oriented Programming Fundamentals

C	TD	TP	THE				
24	28	21	47		AUTUMN SPRING	6 CREDITS	*ILC *I2RV *LEIM *R&T
							Prerequisites LO21, LO44

OBJECTIVES:

- Introduce the main concepts of object–oriented programming and consider typical programming languages used for this purpose.

SYLLABUS:

- Main concepts in object–oriented programming languages
- Introduction of two typical object–oriented programming languages
- Introduction of object–oriented graphic development environments
- Object–based design and analysis methods

MT44 — Numerical Analysis and Splines

C	TD	TP	THE				
30	28	14	48		SPRING	6 CREDITS	*ILC *I2RV *LEIM *R&T

OBJECTIVES:

- Acquire basic numerical skills to see their importance in computer science
- Introduction to and use of spline concepts
- Practicals

SYLLABUS:

- Error and error transmission
- Polynomial interpolation
- Numerical integration: classic and Gaussian methods
- Non–linear equation solving
- B–spline functions
- Plan–view B–spline curves: Bézier case study
- Surface representation: B–spline tensor products

Glossary of Online UV consultation

Prerequisite : Some UVs require that previous UVs must have been successfully completed. Some UVs have several prerequisites.
ACM : Actuators and Mechatronic Control Systems Specialisation.
C : Lecture
Category : Each UV is classed in one of the following categories:
- CS Scientific Knowledge;
- TM Techniques and Methods;
- EC Expression and Communication;
- CG General Education;
- RN Revision;
- EX Exterior.

CDP : Product Design and Development Specialisation
CIM : Design and Material Innovation Specialisation
UV Code : Code designating a UV
ECTS Credit : The value of a UV in the ECTS system (European Credit Transfer System)
CSM : Mechatronic System Design Specialisation
CSP : Production Systems Design Specialisation
Department : Teaching Department
Dept. Teaching Department
DIC : Industrial Design Specialisation
EDD : Energy and Sustainable Development Specialisation.
EDIM : Ergonomics, Design and Mechanical Engineering Department
EIC : Ergonomics, Design and Innovation Specialisation
EnE : Energy and Environment Specialisation.
ESE : Electronics and On−Board Systems Specialisation
Specialisation : Specialisation within a department
GESC : Electrical Engineering and Control Systems Department
UV Guide : The UV Guide catalogues all UVs taught at UTBM during an academic year.
HUMA : Humanities Department
IIRV : Image, Interaction and Virtual Reality Specialisation
ILC : Software and Knowledge Engineering Specialisation
IMAP : Manufacturing Management and Engineering Department
INFO : Computer Science Department
IP : Product Industrialisation Specialisation
Language (teaching) : Language in which a UV is taught in.
LEIM : On−Board Software and Mobile Computing Specialisation
MC : Mechanical Engineering and Design Department
MOM : Numerical Modelling in Mechanics.
MPL : Management of Production and Logistics Specialisation
Level : Level of UV within degree courses. From 01 to 06
Basket : Contains the UVs chosen by a user to create a personalised catalogue
PISP : Managing and Computerising Production Systems Specialisation
Recognition : Level of recognition within a specialisation or department (0, 1 or 2) for a UV :
- 0: the UV has no link with the specialisation. It does not count as part of the department's degree course, but rather as an additional UV.
- 1 or *: the UV is related to the department's degree course but is not part of the group of key skills to be acquired for the specialisation.
- 2 or **: the UV is part of the group of key skills to be acquired for the specialisation.

R&T : Networks and Telecoms Specialisation
Semester : Indicates during which semester a UV is taught
Timetable Organisation : The way in which a UV is divided up into its constituent parts (TD, TP, Lecture, THE)
TC : Common core. Equivalent to first two years of an Engineering Degree
TD : Tutorials
THE : Unsupervised work. The number of hours of personal work necessary to complete a UV
TP : Practicals
TSE : Transport and Drive Systems Specialisation.
UV (Course Credit) : Course taught at UTBM. A Course Credit is taught within a department or department specialisation

Key

1. C : Lecture
2. TD : Tutorials
3. TP : Practicals
4. THE : Unsupervised work. The number of hours of personal work necessary to complete a UV.
5. Prerequisite : Some UVs require that previous UVs must have been successfully completed. Some UVs have several prerequisites.
6. EIC : Ergonomics, Design and Innovation Specialisation
7. DIC : Industrial Design Specialisation
8. ECTS Credit : The value of a UV in the ECTS system (European Credit Transfer System)
9. Language (teaching) : Language in which a UV is taught in.

CP92 — Design and Dimensioning of Complex Shapes

C (1)	TD (2)	TP (3)	THE (4)	Language (9)		ECTS (8)	
32	28	18	42		SPRING	6 CREDITS	*DIC (7) *EIC (6) Prerequisite CP80 (5)

OBJECTIVES:

- Gain awareness in the modelling of complex shapes.
- Students should be able to model objects and their associated interfaces using ergonomic and aesthetic criteria.

SYLLABUS:

- Impact of aesthetic, ergonomic, material and manufacturing constraints on product shape
- CAD surfaces in advanced software
- Mathematics applied to geometry (splines, Bézier curves, Nurbs')
- A–class complex surfaces