TM – Techniques and Methods

IN55 Image Generation

C	TD	TP	THE				
30	21	18	51		SPRING	6 CREDITS	*ILC **I2RV *LEIM *R&T

OBJECTIVES:
- Acquire fundamental skills for computer generated images and use of graphic libraries (OpenGL and Java3D).

SYLLABUS:
- Introduction
- Vector and matrix calculations
- Geometric transformations
- Projections and intersection calculations
- Lighting calculations
- Materials and textures
- Rendering with shader
- Hidden parts removal
- OpenGL
- Java3D

MT51 Mathematics for Imaging

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

OBJECTIVES:
- Develop skills with mathematical tools (some of which are very recent) for image processing
- Develop strong skills for image analysis and synthesis
- Practicals

SYLLABUS:
- Complex number revision
- Transformation groups, pattern operations
- Euclidean and orthogonal space, graphical object visibility
- Projective space, projective transformation matrices
- Plan and space isometrics
- Projections and scale changes
- Quaternion bodies and rotations in space
- Introduction to Voronoï and Delaunay diagrams
- Infographics tools

TX52 Laboratory Project

C	TD	TP	THE			
0	0	0	120		AUTUMN SPRING	6 CREDITS	*ILC *I2RV *LEIM *R&T

OBJECTIVES:

- Introduce students to experimentation.
- Encourage student awareness in research, as carried out in research and development departments.

SYLLABUS:

- Choice of subject (subjects suggested by jury)
- Specification of objectives, necessary resources, expected results and timescale with tutor
- Written report clearly specifying the expected results. Presentation of project to jury

VI51 Virtual Life Simulation

C	TD	TP	THE			
30	21	18	51		SPRING	6 CREDITS	*ILC **I2RV *LEIM *R&T

OBJECTIVES:

- Explain and understand the concepts and the tools required to create virtual simulations with and without interactions with the final user. The focus is put on the simulation models instead of the geometrical and graphical models. The studied simulation models are inside the subclass of real–time simulation models.

SYLLABUS:

- Why and how artificial intelligence (AI)(and MAS) in VR ?
- Simulator architectures
- How to connect an AI simulator and arendering engine
- Simulation models
- Semantic models of static and dynamicEnvironments
- Course credit taught in English.

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