

**SYLLABUS**

**Master of Science « Agricultural & Food Data Management »**

**Vol : 490 h**

**Academic Year ECTS : 60 ECTS**

**6-months internship: 30 ECTS**

**Semester 1**

**Unit 1: AGD**  
Agriculture, Food  
Science and Big  
Data  
30H, 3 ECTS

**Unit 2: ITDM1**  
Data  
management I  
30H, 4 ECTS

**UNIT 3: DMAG**  
Data Quality  
Management in  
Agriculture  
30H, 5 ECTS

**Unit 4: DAAG**  
Data Analysis  
applied to Food  
Science  
30H, 5 ECTS

**Unit 5: SE**  
Software  
Engineering  
40H, 5 ECTS

**Unit 6: SUME**  
Survey Methods  
30H, 4 ECTS

**Unit 7: CF1**  
Cross fields 1  
50H, 5 ECTS

<b>Unit 1</b> <b>Code: AGD</b>	<b>Agriculture, Food Science and Big Data</b>		<b>Coordinator</b> <b>S. TAÏBI</b>
	<b>Total</b>	<b>ECTS</b>	
	<b>30h</b>	<b>3</b>	

## TRAINING OBJECTIVES

The aims are to learn the concepts of French Agriculture. We present an overview of information systems in France and over Europe. As data privacy and property rights management takes an important part in data management, data law concepts will be taught.

## PRE-REQUISITES

None

## PROGRAM

- An overview of Agriculture and Food Science
- Information Systems in Agriculture
- Sources and reliability of Data in several agriculture sectors
- Data privacy
- Food & Agricultural data property rights
- Business Intelligence

## ASSESSMENT MODALITIES

		Coefficients			ECTS
		Workshop	Continuous assessment	Project	
<b>AGD</b>		50%		50%	3

<b>Unit 2</b> <b>Code: ITDM1</b>	<b>Data management I</b>		<b>Coordinator</b> <b>J. DANTAN</b>
	<b>Total</b>	<b>ECTS</b>	
	<b>30h</b>	<b>4</b>	

## TRAINING OBJECTIVES

The Information Technology Data Management 1 (ITDM1) Course Unit deals with data format standards as well as relational databases.

## PRE-REQUISITES

Excel basics

## CONTENTS

ITDM1: Data sources (sensors, communications protocols/networks), data exchange standards (XML, JSON, opendata, web of data).

ITDM2: Relational Database Management Systems (RDBMS) course

- Database modeling
- Work on Excel and Access Database creation
- SQL requests

## ASSESSMENT MODALITIES

		<b>Coefficients</b>			<b>ECTS</b>
		Workshop	Continuous assessment	Project	Final Exam
<b>ITDM1</b>				100%	4
<b>ITDM2</b>					

<b>UNIT 3</b> <b>Code: DMAG</b>	<b>Data Quality Management in Agriculture</b>		<b>Coordinator</b> <b>S. TAÏBI</b>
	<b>Total</b> <b>30h</b>	<b>ECTS</b> <b>5</b>	

## TRAINING OBJECTIVES

This course leads to exploring and summarizing datasets and automate reports, studying which tools to use. The aim is to prove the accuracy of data using descriptive statistics, applied statistics and inference to create storytelling and data visualisation.

## PRE-REQUISITES

Basic Statistics  
Basic Probability Theory

## PROGRAM

- Nonparametric Statistics
- Data Processing
- Sampling Strategy for Big Data
- Applied Statistics

## ASSESSMENT MODALITIES

		<b>Coefficients</b>				<b>ECTS</b>
		Workshop	Continuous assessment	Project	Final exam	
<b>DMAG</b>	DMAG1		50%			4
	DMAG2			50%		

<b>Unit 4</b> <b>Code: DAAG</b>	<b>Data Analysis applied to Food Science</b>		<b>Coordinator</b> <b>S. TAÏBI</b>
	<b>Total</b>	<b>ECTS</b>	
	<b>30h</b>	<b>5</b>	

## TRAINING OBJECTIVES

The students are able to organize and analyze the information contained in large databases, whether numeric, textual or geographic.

## PRE-REQUISITES

Basic Statistics  
Linear Algebra  
Analysis of Variance

## PROGRAM

- Principal component Analysis
- Factor Analysis
- Cluster Analysis
- Discriminant Analysis
- Multivariate Analysis for multiblock and multigroup data
- Data Mining
- Software Analysis R/SPSS/MATLAB

## ASSESSMENT MODALITIES

		<b>Weighting</b>				<b>ECTS</b>
		Workshop	Continuous assessment	Project	Final Exam	
<b>DAAG</b>	<b>DAAG1</b>			30%	50%	5
	<b>DAAG2</b>	20%				

<b>Unit 5 Code: SE</b>	<b>Software Engineering</b>		<b>Coordinator J.DANTAN</b>
	<b>Total</b> 40h	<b>ECTS</b> 5	

## TRAINING OBJECTIVES

The Software Engineering (SE) Course Unit deals with the classical software architectures present in the information systems of the companies, and more particularly the web architectures. It also deals with programming of software (Python) and automation of tasks in Excel (VBA).

## PRE-REQUISITES

None.

## CONTENTS

- Client-server, component-based architectures, multi-tier architectures, Model View Controller, Web services: Service-Oriented Architectures (SOA), REST, cloud computing.
- Algorithmic, object-oriented programming, variables, logical tests, loops, functions, Human/computer interaction, object oriented language.
- Automating repetitive tasks in Excel via Visual Basic for Applications (VBA) macros: procedures, variables, logical tests, loops, linking VBA with Excel sheets, forms

## ASSESSMENT MODALITIES

		Weighting			ECTS
		Workshop	Continuous assessment	Project	
SE	SE1			80%	5
	SE2				
	SE3		20%		

<b>Unit 6</b> <b>Code: SUME</b>	<b>Survey Methods</b>		<b>Coordinator</b> <b>S. TAÏBI</b>
	<b>Total</b> <b>30h</b>	<b>ECTS</b> <b>4</b>	

## TRAINING OBJECTIVES

The aim is to work on a survey project and to develop an experimental design to provide knowledge about a topic, to get a response to a problematic.

## PRE-REQUISITES

Sampling Methods  
Data Analysis

## PROGRAM

- Methods of collecting data in survey cases
- Unstructured Data/
- Multiple Correspondence Analysis
- Survey data Analysis/ Data Consumers
- Text mining: social network analysis

## ASSESSMENT MODALITIES

		<b>Weighting</b>				<b>ECTS</b>
		Workshop	Continuous assessment	Project	Final exam	4
<b>Codes</b>	<b>SUME</b>			100%		

<b>Unit 7</b> <b>Code: CF1</b>	<b>Cross Fields I</b>			<b>Coordinator</b> <b>S.TAÏBI</b>
	<b>Total</b>	<b>ECTS</b>		
	<b>50h</b>	<b>5</b>		

## TRAINING OBJECTIVES

Big data will amounts a disruption in agricultural life, and then overhaul of working methods, so the objective of this unit course is to study methods of management. Foreign students can learn French Language.

## PRE-REQUISITES

None

## PROGRAM

- Rural sociology, an approach in smart agriculture
- Project management
- French language (social network)

## ASSESSMENT MODALITIES

		<b>Coefficients</b>				<b>ECTS</b>
		Workshop	Continuous assessment	Project	Final exam	5
	Exam 1	50%				
	Exam 2			50%		



## Master of Science « Agricultural & Food Data Management»

### Semester 2

Unit 8: MAG  
Precision  
Agriculture  
40H, 4 ECTS

Unit 9: ITDM2  
Data  
management 2  
30H, 4 ECTS

Unit 10: MLM  
Machine Learning  
Methods  
40H, 6 ECTS

Unit 11: MOD  
MODELIZATION  
20H, 3 ECTS

Unit 12: QIA  
Quantitative  
Image Analysis  
30H, 4 ECTS

Unit 13: CF2  
Cross fields 2  
40H, 3 ECTS

Unit 14: DPAG  
Data Project for  
agriculture  
50H, 6 ECTS

<b>UNIT 8</b> <b>Code : MAG</b>	<b>Precision Agriculture</b>			<b>Coordinator</b> <b>S.TAIBI</b>
	<b>Total</b>	<b>ECTS</b>		
	<b>40h</b>	<b>4</b>		
<b>20h video conference</b>				

## TRAINING OBJECTIVES

By understanding the concepts of precision farming, students will develop strategies for future new cases.

## PRE-REQUISITES

None

## PROGRAM

- Digital agriculture
- Heterogeneity and micro parcels experimental design
- Modulation of doses in the fields and associated equipment
- Precision agriculture and decision making tools
- Artificial intelligence and connected agriculture

## ASSESSMENT MODALITIES

		<b>Weighting</b>				<b>ECTS</b>
		Workshop	Continuous assessment	Project	Final exam	
	MAG1			20%	50%	4
	MAG2	20%				

<b>Unit 9</b> <b>Code: ITDM2</b>	<b>Data management 2</b>		<b>Coordinator</b> <b>J. DANTAN</b>
	<b>Total</b>	<b>ECTS</b>	
	<b>30h</b>	<b>4</b>	

## TRAINING OBJECTIVES

The Data management 2 (ITDM2) Course Unit deals with databases for big data as well as computer security

## PRE-REQUISITES

Relational databases (ITDM1 course unit)

## CONTENTS

ITMD21: databases for big data

- Data sources
- Relational databases, OLAP, compared with Big data technologies.
- Extract/Transform/Load (ETL).
- Distributed file systems, Hadoop.
- Parallel, distributed, massive data processing with Map Reduce.
- NoSQL/NewSQL: column, key-value, document, graph.
- Query languages and applications for Big Data.

ITDM22: IT security

- Vulnerabilities, protection-privacy / security policies, cryptography

## ASSESSMENT MODALITIES

		<b>Weighting</b>				<b>ECTS</b>
		Workshop	Continuous assessment	Project	Final exam	4
	ITMD21			80%		
	ITDM22		20%			

<b>Unit 10</b> <b>Code: MLM</b>	<b>Machine Learning Methods</b>			<b>Coordinator</b> <b>S. TAÏBI</b>
	<b>Total</b>	<b>ECTS</b>		
	<b>40 h</b>	<b>6</b>		

## TRAINING OBJECTIVES

This kind of methods will allow to create algorithms and build predictive models and decision support tools. These technics are very powerful and robust for Big Databases.

## PRE-REQUISITES

Sampling Methods  
Data Analysis  
R software

## PROGRAM

- Neural Networks
- Regression trees, bagging
- Support Vector Machine
- Random Forests
- Kernel Methods
- K-Nearest Neighbors
- Sparse Methods for high dimensional data
- Deep Learning

## ASSESSMENT MODALITIES

		Weighting			ECTS
		Workshop	Continuous assessment	Project	
<b>Codes</b>	MLM1	30%			6
	MLM2			70%	

<b>Unit 11</b> <b>Code: MOD</b>	<b>MODELIZATION</b>			<b>Coordinator</b> <b>S. TAÏBI</b>
	<b>Total</b>	<b>ECTS</b>		
	<b>20 h</b>	<b>3</b>		

## TRAINING OBJECTIVES

The course aims to develop skills and knowledge in modelling. This course deals with parametric and non-parametric model construction methods. For big data set we will describe statistical tools for time series case.

## PRE-REQUISITES

Sampling Methods  
Linear Algebra  
Data Analysis  
R software

## PROGRAM

- General Linear Models
- Non Linear models
- Statistical validation
- Time series analysis in finance and business

## ASSESSMENT MODALITIES

		<b>Weighting</b>				<b>ECTS</b>
		Workshop	Continuous assessment	Project	Final exam	3
<b>Code</b>	LNM1					
	LNM2		50%		50%	

<b>Unit 12</b> <b>Code: QIA</b>	<b>Quantitative Image Analysis</b>			<b>Coordinator</b> <b>S. TAÏBI</b>
	<b>Total</b>	<b>ECTS</b>		
	<b>30 h</b>	<b>4</b>		

## TRAINING OBJECTIVES

The aim is to show how spatial data processing and visualization is implemented. A number of digital devices and systems are making 3D visualizations more accessible to create a mapping with QGIS software

## PRE-REQUISITES

Sampling Methods  
Data Analysis  
R software

## PROGRAM

- Signal Image Processing
- Mapping
- Data Visualization
- QGIS Software

## ASSESSMENT MODALITIES

		<b>Weighting</b>				<b>ECTS</b>
		Workshop	Continuous assessment	Project	Final exam	4
<b>Code</b> <b>QIA</b>	<b>QIA1</b>	50%				
	<b>QIA2</b>			50%		

<b>Unit 13</b> <b>Code: CF2</b>	<b>Cross Fields 2</b>		<b>Coordinator</b> <b>S. TAÏBI</b>
	<b>Total</b> <b>40h</b>	<b>ECTS</b> <b>3</b>	

### TRAINING OBJECTIVES

In fact data consumers are very useful for marketing studies. Such in the case of big data from social networks this course presents methods of text mining. The aim is to describe numerous models and frameworks to assist in strategic decision making in the context of complex environments and competitive dynamics.

### PRE-REQUISITES

None

### PROGRAM

IS Strategy / management, system integration  
Digital Marketing  
French Language (FLE)

### ASSESSMENT MODALITIES

		<b>Coefficients</b>				<b>ECTS</b>
		Work shop	Continuous assessment	Project	Final exam	3
	CF21	50%			50%	
	CF22					

<b>Unit 14</b> <b>Code: DPAG</b>	<b>Data Project for Agriculture &amp; Food Science</b>		<b>Coordinator</b> <b>S. TAÏBI</b> <b>J. DANTAN</b>	

## TRAINING OBJECTIVES

Practical project whose subject is offered by either the teaching staff or a partner company.

## PRE-REQUISITES

All units

## PROGRAM

Practical project whose subject is offered by either the teaching staff or a partner company.

- Building a decision making tool for smart agriculture
- Development of innovative IT software

Duration : 4 hours per week.

The subjects are proposed by companies. A poster presentation session is schedule during a "colloquium". The students present their results and they share and interact with a team of professionals and participants

For their assessment, students have also to present a document.

		Coefficients				ECTS
		Oral Presentation	Continuous assessment	Project	Final exam	6
DPAG		50%		50%		

## PARTNERSHIP

ACTA

Agro Edi Europe

CAPSEINE

COOP de France,

Chambres d'Agriculture de Normandy

DEFISOL/INVIVO,

Inventiv IT

ISAGRI

IUNG Polish National Research Institute

MIXSCIENCE- AVRIL

PROAGRICA

SODIAAL UNION