PEOPLE'S DEMOCRATIC REPUBLIC OF ALGERIA

MINISTRY OF HIGHER EDUCATION
AND SCIENTIFIC RESEARCH

HARMONIZATION

MASTER FORMATION OFFER

ACADEMIC

Establishment	Faculty / Institute	Department
University Mohamed Khider - Biskra	**Faculty of exact, natural and life sciences**	**Comuter science Department**

Domaine : Maths – Informatics

Sector : Informatics

Speciality : Networks and Technologies of Information and Communication (NTIC)

Academic year : 2023 / 2024

الجمهورية الجزائرية الديمقراطية الشعبية

وزارة التعليم العالي والبحث العلمي

مواءمة

عرض تكوين ماستر

أكاديمي/ مهني

القسم	الكلية/ المعهد	المؤسسة
قسم الإعلام الآلي	كلية العلوم الدقيقة و علوم الطبيعة و الحياة	جامعة محمد خيضر ـ بسكرة

الميدان : رياضيات و اعلام آلي

الشعبة : اعلام آلي

التخصص : شبكات وتكنولوجيا الاعلام و الاتصال

السنة الجامعية: 2022/2021

SOMMAIRE

I –Master' identity form

1 – Formation Localization :

Faculty : faculty of exact, natural and life sciences

Department : Computer Science

2- Partnership *:

- autres établissements universitaires :

- entreprises et autres partenaires socio économiques :

- Partenaires internationaux :

* = Présenter les conventions en annexe de la formation

3 – Contexte et objectifs de la formation

A – Conditions d'accès *(indiquer les spécialités de licence qui peuvent donner accès au Master)*

En M1 :

- Licence Académique en Informatique
- Un titre reconnu équivalent

En M2 :

- Etre admis(e) en M1 + classement
- (Etude de dossier)

B – Objectives

The master's degree in Networks and Technologies of Information and Communication (NTIC) is a new futuristic training based on network technologies and Web technologies. Its goal is to provide solid training in new information and communication technologies. Currently, NICTs present a major challenge and intervene in all socio-economic sectors, particularly in communication, processing, production, training, etc. Hence the major importance of this Master. At the end of this training, students will be equipped with the necessary skills allowing them to undertake higher doctoral studies or to integrate either research laboratories as research engineers or companies working in the field of NICTs as an executive. .

The first year (M1) of this master's degree provides students with solid training in the theoretical and practical aspects of IT in the areas of mobile and cloud computing, web programming and Quality of Service and multimedia communicating systems. This step is necessary to begin the in-depth aspects of the field which will be the subject of the second year (M2).

As for the second year (M2), it aims to consolidate and deepen the different notions and knowledge in the field of networks (wired, wireless, new generations), the web and databases (network security, advanced database , BIGData). This will allow students to acquire comprehensive training in this field, allowing them to continue their doctoral studies or move towards companies operating in the field of networks and NICTs.

C – Targeted job profiles and skills

This training aims to train candidates in networks and ICT. They can use the knowledge acquired to address the most innovative research questions on the one hand in the most open areas currently in ICT such as WSN, cloud computing, cloud robotics, intelligent and distributed systems, computer science mobile. And on the other hand, be ready for current technological challenges in this area.

D- Regional and national employability potential of graduates

The research themes addressed within the research laboratory (LINFI) made it possible to promote skills in the field of RTIC research on a national scale, due to the great evolution that the country and the region are currently undergoing as well as the transformation of Algerian socio-economic society in new information and communication technologies (Smartphones, high-speed Internet, e-commerce, NFC payment, intelligent systems in industry, etc.). As a result, the benefits both in terms of training and research are expected at the regional and national level.

E – *Gateways to other specialties*

− Towards other Masters with equivalent units.

F – Training monitoring indicators

G – Supervisory capacity

30 students

4 – Moyens humains disponibles

A : Enseignants de l'établissement intervenant dans la spécialité :

Nom, prénom	Diplôme graduation + Spécialité	Diplôme Post graduation + Spécialité	Grade	Type d'intervention *	Emargement
KAZAR Okba	Ingénieur en Informatique	Doctorat d'état en Informatique	Prof	Cours, TD, TP, Encadrement	
BABAHENINI Mohamed Chaouki	Ingénieur en Informatique	Doctorat d'état en Informatique	Prof	Cours, TP, Encadrement	
Bitam Salim	Ingénieur en Informatique	Habilitation en Informatique	Prof	Cours, TD, TP, Encadrement	
TERISSA Sadek Labib	Ingénieur en électronique	Habilitation en Informatique	Prof	Cours, TP, Encadrement	
SAOULI Rachida	Ingénieur en Informatique	Habilitation en Informatique	Prof	Cours, TP, Encadrement	
DJEFFAL AbdElhamid	Ingénieur en Informatique	Habilitation en Informatique	Prof	Cours, TD, TP, Encadrement	
KAHLOUL Laid	Ingénieur en Informatique	Habilitation en Informatique	Prof	Cours, TD, TP, Encadrement	
BENNOUI Hammadi	Ingénieur en Informatique	Habilitation en Informatique	Prof	Cours, TD, TP, Encadrement	
REZEG Khaled	Ingénieur en Informatique	Habilitation en Informatique	Prof	Cours, TP, Encadrement	
AYAD Soheyb	Ingénieur en Informatique	Habilitation en Informatique	M.C.A	Cours TD, TP Encadrement	
BOUREKKACHE Samir	Ingénieur en Informatique	Habilitation en Informatique	M.C.A	Cours, TD, TP, Encadrement	
SLATNIA Siham	Ingénieur en Informatique	Habilitation en Informatique	M.C.A	Cours, TD, TP, Encadrement	

BOUCHANA Belkacem	**Ingénieur en Informatique**	**Habilitation en Informatique**	**M.C.A**	**Cours, TD, TP, Encadrement**	
Sahraoui Somia	**Master en Informatique**	**Habilitation en Informatique**	**M.C.A**	**Cours, TD, TP, Encadrement**	
Bensghir Nadia	**Ingénieur en Informatique**	**Habilitation en Informatique**	**M.C.A**	**Cours, TD, TP, Encadrement**	
BOUKHLOUF Djemaa	**Ingénieur en Informatique**	**Doctorat en Informatique**	**M.C.B**	**Cours, TD, TP, Encadrement**	
Merizig Abdelhak	**Master en Informatique**	**Doctorat en Informatique**	**M.C.B**	**Cours, TD, TP, Encadrement**	
TIGANE Samir	**Ingénieur en Informatique**	**Doctorat en Informatique**	**M.C.B**	**Cours, TD, TP, Encadrement**	
Guemeida Abdelbasset	**Ingénieur en Informatique**	**Doctorat en Informatique**	**M.C.B**	**Cours, TD, TP, Encadrement**	
ABDELLI Belkacem	**Ingénieur en Informatique**	**Doctorat en Informatique**	**M.C.B**	**Cours, TD, TP, Encadrement**	
Zernadji Tarek	**Ingénieur en Informatique**	**Doctorat en Informatique**	**M.C.B**	**Cours, TD, TP, Encadrement**	
Aloui Imen	**Master en Informatique**	**Doctorat en Informatique**	**M.C.B**	**Cours, TD, TP, Encadrement**	
Ammari Asma	**Master en Informatique**	**Doctorat en Informatique**	**M.C.B**	**Cours, TD, TP, Encadrement**	
Naidji Ilyes	**Master en Informatique**	**Doctorat en Informatique**	**M.C.B**	**Cours, TD, TP, Encadrement**	
Zouai Meftah	**Master en Informatique**	**Doctorat en Informatique**	**M.C.B**	**Cours, TD, TP, Encadrement**	
Benaissa Youssra	**Master en Informatique**	**Doctorat en Informatique**	**M.C.B**	**Cours, TD, TP, Encadrement**	
MOUAKI Bennani Nawal	**Ingénieur en Informatique**	**Magister en Informatique**	**M.A.A**	**TD, TP**	
TOUIL Keltoum	**Ingénieur en Informatique**	**Magister en Informatique**	**M.A.A**	**TD, TP**	

* = Cours, TD, TP, Encadrement de stage, Encadrement de mémoire, autre (à préciser)

B : Encadrement Externe :

Etablissement de rattachement :

Nom, prénom	Diplôme graduation + Spécialité	Diplôme Post graduation + Spécialité	Grade	Type d'intervention *	Emargement

Etablissement de rattachement :

Nom, prénom	Diplôme graduation + Spécialité	Diplôme Post graduation + Spécialité	Grade	Type d'intervention *	Emargement
Jean Marie Pinon		HDR + Doctorat	**Prof**	**Cours, TD, TP, Encadrement**	
Youssef AMGHAR		HDR + Doctorat	**Prof**	**Cours, TD, TP, Encadrement**	

Etablissement de rattachement : Université INSA de Lyon

Nom, prénom	Diplôme graduation + Spécialité	Diplôme Post graduation + Spécialité	Grade	Type d'intervention *	Emargement

* = Cours, TD, TP, Encadrement de stage, Encadrement de mémoire, autre (à préciser)

5 – Moyens matériels spécifiques disponibles

A- Laboratoires Pédagogiques et Equipements : Fiche des équipements pédagogiques existants pour les TP de la formation envisagée (1 fiche par laboratoire)

Intitulé du laboratoire :

N°	Intitulé de l'équipement	Nombre	observations
01	SERVEUR HP ProLiant ML370G5 * 2 processeurs Intel Xeon Quadricoeur :.33 GHZ * RAM :6 Go * DD : 6x 140 Go * Lecteur DAT : Hp Dat 72 USB. * Ecran TFT + Clavier	06	Réseaux locaux + accès permanent internet Systèmes d'exploitation. Windows/Linux
02	Poste clients légers HP : Ecran 19 +Unité Léger +clavier +Souris	25	
03	PC HP Compaq dx 2300 dual core 1.8 ghz , Ram :1 Go ,D D :160 Go +Souris +clavier + Ecran 19``	25	
04	Dell proc dual core 1.80 Ghz Ram : 512 Mo D.D: 80 Go	25	
05	PC : HP Compaq dx 2400 dual core RAM: 1 Go DD: 160 Go écran 17``	10	
06	Armoire réseau Onduleur 3000 VA Modem ADSL 2 Mo Switch catalyst 2960 24 ports	01 01 01 05	Réseau local

Intitulé du laboratoire : Laboratoire réseau

N°	Intitulé de l'équipement	Nombre	Observations
01	PC Dell P4 3.06 Ghz Ram: 512Mo D.D: 80Go	20	
02	Laboratoire CISCO (switch, materiel de formation)		

Intitulé du laboratoire : Salles d'Informatique

N°	Intitulé de l'équipement	Nombre	Observations
01	PC Dell	25	
02	Station de calcul	02	

B- Terrains de stage et formation en entreprise :

Lieu du stage	Nombre d'étudiants	Durée du stage

C- Laboratoire(s) de recherche de soutien à la formation proposée :

Chef du laboratoire :
N° Agrément du laboratoire : Arrêté ministériel n°42 du 05 février 2001
Date : Avis du chef de laboratoire :

D- Projet(s) de recherche de soutien au master :

Intitulé du projet de recherche	Code du projet	Date du début du projet	Date de fin du projet
Optimisation des Performances et Services Sécurisés pour l'Internet des Objets	C00L07UN070120220006	01/01/2022	31/12/2026
Transformation digitale basée sur l'intelligence artificielle et les nouvelles technologies de l'information et de la communication.	C00L07UN070120190004	01/01/2019	31/12/2022

E- Espaces de travaux personnels et TIC :

- Espace intranet de l'université Mohamed Khider Biskra.
- Laboratoire LINFI
- Centre de calcul du département d'informatique.
- Salle visio conférence
- Centre de documentation (tous les mémoires de 2000 à 2021 : ingénieur, licence master)
- Salle de télé-enseignement pour les étudiants en fin de cycle.

Réseau sans fil (internet wifi) du département d'informatique

II – Semestrial organization sheet for teaching

1- Semester 1 :

Teaching Unit	VHS	V.H hebdomadal				Coeff	Credits	Evaluation Mode	
	14-16 sem	C	Tutorial	Lab	Other/ personal work			Continuous	Exam
Fundamental TU									
FTU1	**168h**	**4h30**	**3h**	**4h30**	**4h**	**9**	**18**		
Advanced netwoks 1	63h	1h30	1h30	1h30	1h30	3	6	50%	50%
Advanced algorithms and parallel architectures	42h	1h30	-	1h30	1h	3	6	50%	50%
Distributed systems	63h	1h30	1h30	1h30	1h30	3	6	50%	50%
Methodological TU									
MTU1	**84h**	**3h**	**-**	**3h**	**2h**	**4**	**10**		
Machine Learning	42h	1h30	-	1h30	1h	2	5	50%	50%
XML and web services	42h	1h30	-	1h30	1h	2	5	50%	50%
Transverse TU									
TTU1	**42h**	**3h**				**2**	**2**		
English 1	21h	1h30	-	-	-	1	1		**100%**
Entrepreneurship	21h	1h30	-	-	-	1	1		**100%**
Total Semestre 1	**294h**	**10h30**	**3h**	**7h30**	**6h**	**15**	**30**		

2- Semester 2 :

Teaching Unit	VHS	V.H hebdomadal				Coeff	Credits	Evaluation Mode	
	14-16 sem	C	Tutorial	Lab	Other/ personal work			Continuous	Exam
Fundamental TU									
FTU2	**105h**	**3h**	**3h**	**3h**	**2h30**	**6**	**10**		
Advanced netwoks 2	42h	1h30	1h30	1h30	1h	3	5	50%	50%
Wireless netwoks	63h	1h30	1h30	1h30	1h30	3	5	50%	50%
FTU3	**84h**	**3h**		**3h**	**2h**	**4**	**10**		
Mobile and Cloud computing	42h	1h30	-	1h30	1h	2	5	50%	50%
Quality of service and multimedia communicating systems	42h	1h30	-	1h30	1h	2	5	50%	50%
MTU3	**84h**	**3h**		**3h**	**2h**	**4**	**8**		
Advanced data bases & Big data	42h	1h30	-	1h30	1h	2	4	50%	50%
Network simulation	42h	1h30	-	1h30	1h	2	4	50%	50%
TTU2	**21h**	**1h30**				**1**	**2**		
Research methodology and tools	21h	1h30	-	-	-	1	2		100%
Total Semestre 2	**294h**	**10h30**	**3h**	**9h**	**7h**	**15**	**30**		

3- Semestre 3 :

Unité d'Enseignement	VHS	V.H hebdomadaire				Coeff	Crédits	Mode d'évaluation	
	14-16 sem	C	TD	TP	Autres			Continu	Examen
UE fondamentales									
UEF4	**147h**	**4h30**	**1h30**	**4h30**	**4h**	**9**	**18**		
Réseaux avancés 3	63h	1h30	1h30	1h30	1h30	3	6	50%	50%
Nouvelles générations des réseaux	42h	1h30	-	1h30	1h	3	6	50%	50%
Sécurité des réseaux	42h	1h30	-	1h30	1h30	3	6	50%	50%
UE méthodologique	**126h**	**4h30**		**4h30**	**3h**	**6**	**10**		
Systèmes multi-agents	42h	1h30	-	1h30	1h	2	4	50%	50%
Développement des applications réseau	42h	1h30	-	1h30	1h	2	4	50%	50%
Spécification et vérification des protocoles	42h	1h30	-	1h30	1h30	1	2	50%	50%
UE Transversale									
UET3. Anglais	**21h**	**1h30**	**-**	**-**	**-**	**1**	**2**		
Anglais 2	21h	1h30	-	-	-	1	2		**100%**
Total Semestre 3	**275h**	**10h30**	**1h30**	**9h**	**7h**	**16**	**30**		

4- Semestre 4 :

Domaine : **Maths - Informatique**
Filière : **Informatique**
Spécialité : **RTIC**

Stage en entreprise sanctionné par un mémoire et une soutenance.

	VHS	Coeff	Crédits
Travail Personnel			
Stage en entreprise			
Séminaires			
Autre (préciser)	12h/semaine, soit 144h pour le semestre	30	30
Total Semestre 4	144h	30	30

5- Récapitulatif global de la formation : (indiquer le VH global séparé en cours, TD, pour les 04 semestres d'enseignement, pour les différents types d'UE)

UE / VH	UEF	UEM	UED	UET	Total
Cours	189	126	-	105	420
TD	105	-	-	-	147
TP	210	147	-	21	336
Travail personnel	161	105	-	14	280
Autre (préciser) PFE	144	-	-	-	144
Total	809	378	-	140	1327
Crédits	52	28	-	10	**120**
% en crédits pour chaque UE	66.66%	23.33%	-	6.66%	100%

III - Detailed program by Module

Title of the Master: Networks and technologies of information and communication
Semester: S1
TU : FTU1
Module title: Advanced networks 1
Credits: 6
Coefficient: 3

Teaching Goals

This course introduces students to advanced aspects of communication networks using a top-down approach. The content of the material focuses on the two upper layers: application and transport where the network protocols of these two levels are to be studied in depth.

Recommended prior knowledge

Fundamental concepts related to computer networks.

Content:

- Communication paradigms:
    - o Client server
    - o Peer to peer
    - o Publish/Subscribe…
- Application protocols: HTTP and HTTP streaming, FTP, SIP, SMTP, DNS, CoAP, MQTT, etc.
- Study of some featured network applications:
    - o Files transfer
    - o VoIP (Voice over IP) / RoIP (Radio over IP)
    - o Instant messaging and messaging based on the Publish/subscribe model.
- Multiplexing and demultiplexing techniques.
- Transport protocols:
    - o TCP (Transmission Control Protocol),
    - o UDP (User Datagram Protocol),
    - o RTP (Real-time Transport Protocol)
    - o SCTP (Stream Control Transmission Protocol)

Evaluation Mode : Exam 50%+ Continuous Control 50%

References

- Kurose, J. F., & Ross, K. W. (2021). Computer Networking A Top-Down Approach. Peasron Editions. 2021.

- Bonaventure, O., Networking : Principles, Protocols and Practice, 3rd Edition, 2021.
- Lannone, E., Telecommunication networks, O'Reilly Edition, 2017.

Title of the Master: Networks and technologies of information and communication

Semester: S1

TU : FTU1

Module title: Advanced Algorithmics and Parallel Architectures

Credits : 6
Coefficient: 3

Teaching Goals

This course will allows students to understand the aspects relating to the types of parallelisms and the challenges in designing parallel applications. Throughout the practical works, students will acquire skills in distributed multiprocessor and multi-core parallel programming in order to evaluate the impact of message communication and data distribution on the performance of parallel calculations.

Recommended prior knowledge

Students should have knowledge of sequential resources (computer architecture and networks) and their programming in C language (data structures and algorithms).

Content

1. Introduction to parallel architectures.
2. Parallel programming models
3. Interconnection networks.
4. High performance parallel architectures

Evaluation Mode : Exam 50%+ Continuous Control 50%

References.

[1] Legrand et Y. Robert, Algorithmique Parallèle, Dunod (2004).

[2] Olivier Pironneau, Optimisation des performances et Parallélisme en C/C++ -openMP - MPI - UPC - CUDA –openCL, University of Paris VI

[3] Barbara Chapman, Gabriele Jost, Ruud van der Pas. Using OpenMP Portable Shared Memory Parallel Programming, The MIT Press,Cambridge, Massachusetts London, England (2008).

[4] Jean-Paul Sansonnet. Architectures des machines parallèles CNRS 1992.

[5] A. Legrand et Y. Robert. Algorithmique Parallèle. Dunod (2004).

[6] Philippe MARQUET. Programmation parallèle et distribuée. Université des sciences et technologies de Lille. 2008

Title of the Master: Networks and technologies of information and communication
Semester: S1
TU : FTU1
Module title: **Distributed Systems**
Credits : 6
Coefficient : 3

Teaching Goals

This course is devoted to the fundamental aspects of distributed systems and the problems posed by their design and implementation. Particular emphasis will be placed on the means to compensate for the absence of global time in asynchronous systems and also on the basic techniques for designing systems resistant to failures.

Connaissances préalables recommandées

Notions de processus, de synchronisation et de communication dans un système centralisé. Dans le cycle L du régime LMD, les étudiants ont suivi deux matières consacrées à ces concepts.

Content

- Concept of competition.
  - The different interpretations of competition.
- Time and state in a distributed system.
  - Causation and ordering of events in a distributed system;
  - Overall state of a distributed system; consistent cuts applications: save-resume algorithms, stable property detection;
  - Global scheduling by logical clocks applications: mutual exclusion, distributed queues;
  - Causal scheduling by vector clocks applications: observation, focusing;
  - Synchronization of physical clocks
- Distributed process cooperation
  - Virtual ring, insertion, removal protocols, failure management;
  - Application election algorithms: group management;
  - Termination detection algorithms. Application: distributed garbage collection.
- Fault tolerance
  - Failure hypotheses;
  - Coherence specification: linearization, sequential consistency, causal consistency;
  - Primary copy and active duplication;
  - Reliable broadcast algorithms and process group management.
- Distributed information management
  - Principles of distributed object management;
  - Implementation: virtual memory, distributed objects;
  - Large-scale dissemination;
  - Cache management, duplication, consistency;
  - Applications: P2P systems.

Evaluation Mode: 50% Exam + 25% Practical work + 25% Personal work

References

1. Guerraoui R., Rodrigues L., *Reliable Distributed Programming*, Springer, 2006.
2. Tanenbaum A. S., Van Steen M., *Distributed Systems - Principles & Paradigms*, Prentice Hall, 2002 .
3. Mullender S. (editor), *Distributed Systems*, 2nd ed. , Addison-Wesley, 1993.
4. Singhal M., Shivaratri N. G., *Advanced Concepts in Operating Systems*, McGraw-Hill, 1994 .
5. Barbosa V. C., *Introduction to Distributed Algorithms*, MIT Press, 1996.
6. Hoare C.A.R., *Communicating Sequential Process* , Prentice Hall Intern. 2004.
7. Silberschatz A. & Peterson J.L., *Operating System Concepts* , Addison-Wesley, 1983.

Title of the Master: Networks and technologies of information and communication **Semester:** S1

TU : MTU1

Module title: **XML et web services**

Credits : 5

Coefficient : 2

Teaching Goals

This course provides theoretical and practical knowledge of Web technologies such as the Semantic Web and Web services. Students will be led to understand the techniques underlying these technologies.

Recommended prior knowledge

Basic notions of XML programming (DSS subject, S6 of the license)

Content

1. Reminder of the XML language and its development technologies
2. Service-oriented architecture
3. Standard Web Services (SOAP)
4. REST Web Services
5. Microservices Architecture

Evaluation mode: Exam 50% + Continuous Assessment 50%

References.

- Bouguettaya, Athman; Sheng, Quan Z.; Daniel, Florian,Web Services Foundations, ISBN 978-1-4614-7518-7, springer 2014

- Bouguettaya, Athman; Sheng, Quan Z.; Daniel, Florian, Advanced Web Services, ISBN 978-1-4614-7535-4, springer 2014

- Hubert Kadima et al, Les Web services - Techniques, démarches et outils : XML-WSDL-SOAP-UDDI-Rosetta-UML ISBN-13: 978-2100065585, 2003

- Cyril Vincent, XML et les services Web, editeur Eni Eds, 2003

Title of the Master: Networks and technologies of information and communication
Semester: S1
TU : MTU1
Module title: **Machine Learning**
Credits : 5
Coefficients: 2

Teaching Goals

This course allows students to acquire the basic concepts of machine learning in order to apply them

Recommended prior knowledge

Basic background in artificial intelligence

Content

- Neural networks
- AI and deep learning
- Bayesian networks
- Hidden Markov chains
- Applications of machine learning in communication networks

Evaluation method: Exam 50% + Continuous Assessment 50%

References

-A. Cornuéjols, L. Miclet, Y. Kodratoff . Apprentissage artificiel - Concepts et algorithmes. Eyrolles 2002 (1ère edition).

- P. Naïm, P. Wuillemin, P. Leray, O. Pourret, A. Becker. Réseaux bayésiens. Eyrolles2007 (3e édition).

- Goodfellow, I., Bengio, Y., Courville, A., & Bengio, Y. (2016). Deep learning. Cambridge : MIT press. (Vol. 1).

- Stephen Marsland. MACHINE LEARNING, An Algorithmic Perspective. Chapman & Hall/CRC. 2015.

- Welch, L. R. (2003). Hidden markov models and the baum-welch algorithm.

IEEE Information Theory Society Newsletter , 53(4), 10- 13.

Title of the Master: Networks and technologies of information and communication

Semester: S1

TU : TTU1

Module title: English 1

Credits : 1

Coefficient : 1

Teaching objectives

English 1 represents the first part of the English language in this course. It introduces the first notions of English in order to standardize the levels of students

Recommended prior knowledge

A technical English module was followed during cycle L of the system (LMD).

Content

Evaluation method: Exam 33% + Continuous Assessment 67%

References.

Title of the Master: Networks and technologies of information and communication

Semester: S1

TU : TTU1

Module title: Entrepreneurship

Credits : 1

Coefficients : 1

Teaching objectives

Upon successful completion of this course, the student is expected to have acquired an overview of creation processes, support for business creation and skills relating to the risks linked to entrepreneurial action, as well as skills relating to allowing you to carry out a market study, to analyze existing offers from competitors and to determine a strategy specific to your company…..

Content

1. Context of entrepreneurship: (the entrepreneur, the characteristics favorable to entrepreneurship, the various forms of entrepreneurship, etc.)
2. Market study: (analysis of competitors' existing offers, etc.)
3. Synthesis of market knowledge and choice of targets.
4. Business plan: (formalization of the idea into the project, analysis of the process and approach to business creation)
5. Strategic positioning of the offer
6. Marketing Mix
7. Introduction to human resources management and management of relationships with stakeholders (customers, bankers, government, etc.)
8. Innovation and new business development strategy.

Evaluation mode: 50% Exam + 50% TD

References :

1. Tixier D., Mathe H. et Colin J., La logistique d'entreprise - vers un management plus compétitif, Dunod (Gestion Sup), 1998.
2. Cohen R. , Concevoir et lancer un projet, Eyrolles (Editions d'Organisation), 2006.

Title of the Master: Networks and technologies of information and communication

Semester: S2

TU : FTU 2

Module title: Advanced networks 2

Credits : 5
Coefficient: 3

Teaching goals

The content of this subject is a continuation of that of the Advanced Networks 1 subject where advanced concepts relating to IP networks and routing, in particular, are studied.

Recommended prior knowledge

Knowledge acquired in the course Advanced Networks 1

Content

- Rminder on IPv4
- Routing in IP networks:
    - o Distance vector protocols
    - o Link-state protocols
    - o Inter AS (Autonomous system) routing: BGP protocol
    - o Multicast routing
- The IPV6 and ICMPv6 protocols
- Managing the coexistence of IPv4 and IPv6 networks
    - o The tunneling technique
    - o Coexistence based on gateways.
- Mobility in IP networks with the MIP (Mobile IP) protocol.
- The NDN (Named Data Networking) concept.

Evaluation mode: Exam 50% + Continuous Assessment 50%

References. *(Livres et polycopiés, sites internet, etc).*

- Kurose, J. F., & Ross, K. W. (2021). Computer Networking A Top-Down Approach. Peasron Editions. 2021.
- Bonaventure, O., Networking : Principles, Protocols and Practice, 3rd Edition, 2021.

- Lannone, E., Telecommunication networks, O'Reilly Edition, 2017.

Title of the Master: Networks and technologies of information and communication
Semester: S2
TU : FTU 2
Module title: Wireless networks
Credits : 5
Coefficient: 3

Teaching goals

Wireless networks are becoming more and more essential in our daily life, hence the importance of this course, which allows students to acquire solid notions in this area. the WSNs will be fully detailed.

Recommended prior knowledge

Computer networks concepts.

Content

- Wireless transmission techniques, propagation of electromagnetic waves, coverage, etc.
- Modulation and multiplexing techniques TDMA, FDMA, CDMA, OFDM, etc.
- Spread spectrum techniques (FHSS, DSSS, etc.)
- Concurrent access techniques to the wireless communication medium (CSMA/CA)
- Typology of wireless networks: cellular and Ad hoc
- Routing in Ad hoc wireless networks: proactive protocols, reactive protocols, hybrid protocols

Evaluation mode: Examination 50% + Continuous Assessment 50%

References.

- Sachan V. K.. Wireless Cellular Communications: Principles, Designs and Applications, Paperback Edition. 2020

- Blokdyk, G. Wireless Local Area Network A Complete Guide, Paperback Edition. 2021

- Kurose, J. F., & Ross, K. W. Computer Networking A Top-Down Approach. Peasron Editions. 2021

- Lannone, E. Telecommunication networks, O'Reilly Edition. 2017.

Title of the Master: Networks and technologies of information and communication
Semester: S2
TU : FTU 3
Module title: **Mobile and cloud computing**

Credits : 5
Coefficients : 2

Teaching goals

The objective of this subject is to introduce students to everything related to Mobile Computing, Cloud Computing and Cloud robotics.

Recommended prior knowledge

Computer systems, computer networks

Content de la matière.

- Mobility systems
- Mobile network applications
- Communicating objects
- Cloud computing
- Cloud robotics

Evaluation mode: Examination 50% + Continuous Assessment 50%

References.

- Cloud Computing Bible , Barrie Sosinsky, Wireless, 2007
- Systemes d'information mobiquitaires ingenierie des systemes, Serge Miranda, 2011, Hermes
- Cloud robotics : google App Engine.

Title of the Master: Networks and technologies of information and communication
Semester: S2
TU : FTU 3

Module title: **Quality of service and multimedia communicating systems**

Credits : 5
Coefficients : 2

Teaching goals

This course presents:

- Implementation of ToIP architecture,

- Introduction of quality of service in the network

Recommended prior knowledge

Computer Networks.

Content

- Multimedia communicating systems
  - Principles and architectures
  - Streaming and ToIP systems
  - RTP/RTCP, SIP, RTSP protocols
- Quality of service
  - Principles and mechanisms
  - Classification, scheduling, queue management, congestion control, admission control, routing with QoS
  - IntServ, DiffServ protocols

Evaluation mode: Examination 50% + Continuous Assessment 50%

References.

- Jean François Susbielle Internet, Multimedia et temps réel, Eyrolles 2000
- Jean Louis Melin, Qualité de service sur IP, Eyrolles 2001
- R. Steinmetz, Multrimedia : Computing, Communications and Applications ,
   Prentice Hall 1995,

Title of the Master: Networks and technologies of information and communication
Semester: S2
TU : MTU 2
Module title: **Advanced Databases & Big data**

Credits : 4

Coefficients : 2

Teaching objectives.

This module allows students to master the major standards of SQL3 and ODMG object/relational databases as well as the management of real-time unstructured data with Hadoop.

Recommended prior knowledge

Fundamental knowledge of databases

Content :

- Modelization
- OO concepts in databases
- Object-Relational systems: Application to ORACLE/Object
- Query languages, characteristics of OQL
- Object-oriented relational, extensions from SQL to SQL3
- Introduction to distributed databases
- Functional architecture of a distributed DBMS
- Introduction to parallel databases
- Data placement, and sources of parallelism
- Methods for parallelizing relational operators
- BIG DATA

Evaluation mode: Exam 50% + Continuous Assessment 50%

References :

Connolly T., Begg C., Strachan A. (2004): Database Systems A Practical Approach to Design, Implementation and Management
- Gardarin, G. Bases de Données Objet et Relationnel, Eyrolles(2001)
- Godin, R: Systèmes de gestion de bases de données par l'exemple Loze-

Dion, Montréal,, 2006
- Melton, J. Simon A. SQL 1999: Understanding Relational Language Components Morgan Kaufmann Publishers, 2001

Title of the Master: Networks and technologies of information and communication
Semester: S2
TU : MTU 2
Module title: **Network Simulation**
Credits : 4
Coefficients : 2

Teaching objectives:

-Introduce students to network simulation and its principles.
-Teach students the types of network simulators and the approach to follow for a good simulation of networks and communication protocols.

Recommended prior knowledge

Good knowledge of networks and communication protocols.

Content

- Network emulation
    - Concept of emulation in networks
    - Difference between emulation and simulation in the context of networks
- Typology of network simulators
    - Open source vs private
    - Time driven vs event-driven (discrete event simulation)
    - Generic (ex: NS, OMNET, JSIM,...) vs platform-dependent (ex: tossim, cooja,,..)
- Network simulation steps (specification of the simulation scenario, launch and visualization of the simulation, results filtering scripts, interpretation of the results)
- Queuing theory
- Network traffic generation models
- Node mobility models

Evaluation mode: Exam 50% + Continuous Assessment 50%

References. *(Livres et polycopiés, sites internet, etc).*
- M. A. Niazi , '' Modeling and Simulation of Complex Communication Networks'', Institution of Engineering and Technology, 2019.
- K. Chen, ''Évaluation de performances par simulation et analyse - applications aux réseaux informatiques'', Editions iSTE, 2014.
- R. M. Fujimoto, G.Riley et K. Perumalla, ''Network Simulation'', Morgan and Claypool Publishers, 2006.

Title of the Master: Networks and technologies of information and communication
Semester: S2
TU: MTU 2
Module title: **Methodology and research tools**

Credit: 2
Coefficients: 1

Teaching objectives

Introduce the student to the main research methods, to correctly carry out a research project, and to know how to communicate the results of the research

Recommended prior knowledge

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Content

- Expression techniques
- Research methods
- Search tools

Evaluation method: Exam 33% + Continuous Assessment 67%

References.

Labasse B., « La communication scientifique ; principes et méthodes », Pôle Universitaire de Lyon, 2001

- Salvador Juan. « Méthodes de recherche en sciences socio-humaines : Approche critique des techniques », Presses Universitaires de France (PUF), 1999, p304.

Title of the Master: Networks and technologies of information and communication
Semester: S3
TU: FTU 4
Module title: Advanced Networking 3

Credits : 6

Coefficient: 3

Teaching objectives.

The objective of this course is to allow students to study advanced concepts relating to network management, as well as a range of important protocols operating at the data link layer.

Recommended prior knowledge

Knowledge acquired from advanced networks 1 and advanced networks 2 modules.

Content :

- Network management with SNMP (Simple Network Management Protocol).
- Virtual local networks vLANs
- NAT (Network Address Translation) and PAT (Port Address Translation) techniques.
- The ARP and RARP protocols
- PPP, HDLC, CSMA/CD, LLD protocols
- The STP (Spanning Tree Protocol) and MPLS (Mutli-Protocol Label Switching) protocols.

Evaluation mode: Exam 50% + Continuous Assessment 50%

References :

- Kurose, J. F., & Ross, K. W. (2021). Computer Networking A Top-Down Approach. Peasron Editions. 2021.
- Bonaventure, O., Networking : Principles, Protocols and Practice, 3rd Edition, 2021.
- Lannone, E., Telecommunication networks, O'Reilly Edition, 2017.

Title of the Master: Networks and technologies of information and communication
Semester: S3
TU: FTU 4
Module title: New generations of networks

Credits : 6

Coefficient: 3

Teaching objectives.

This course presents the new generations of communication networks, their applications, as well as the advanced concepts related to them.

Recommended prior knowledge

Basic knowledge of wireless communication networks

Content :

- SDN software-defined networks
- Network functionality virtualization (NFV).
- Wireless sensor networks,
- VANETs and FANETs networks,
- LPWAN networks (Lora, SigFox, NB-IoT...),
- 4/5/6 G cellular mobile networks and beyond
- WiFi 6 technology

Evaluation mode: Exam 50% + Continuous Assessment 50%

References

- Kurose, J. F., & Ross, K. W. (2021). Computer Networking A Top-Down Approach. Peasron Editions. 2021.

- Bonaventure, O., Networking : Principles, Protocols and Practice, 3rd Edition, 2021.

- Lannone, E., Telecommunication networks, O'Reilly Edition, 2017.

Title of the Master: Networks and technologies of information and communication
Semester: S3
TU: FTU 4
Module title: **Network security**

Credits : 6

Coefficient: 3

Teaching objectives

The objective of teaching this subject is to introduce students to the field of communications network security by studying different aspects relating to vulnerabilities, threats and security countermeasures.

Recommended prior knowledge

Basic knowledge of computer security and communications networks.

Content :

- Vulnerabilities and attack patterns targeting each layer in the TCP/IP model

    • Attacks on Ad hoc and cellular wireless networks
    • Security countermeasures:

- Security protocols Diffie-Hellman, TLS, DTLS, HIP, IPsec,...
- Intrusion detection systems
- Trust management mechanisms,
- Firewalls,
- Access control techniques, ...

    • Advanced concepts in network security

- Economic cryptography,
- Distributed security and Blockchain, …

Evaluation mode: Exam 50% + Continuous Assessment 50%

References.
- Joseph Migga Kizza, Guide to Computer Network Security, Editor: Springer, 2017.
- Jhon Vacca, Computer and Information Security Handbook, Editor: Elsevier, 2017.
- Kurose, J. F., & Ross, K. W. (2021). Computer Networking A Top-Down Approach. Peasron Editions. 2021.

Title of the Master: Networks and technologies of information and communication
Semester: S3
TU: MTU 3
Module title: **Multi-agent systems**

Credits : 4

Coefficient : 2

Teaching objectives

The agent paradigm has become an essential tool for modeling distributed intelligent systems. It defines the dimensions of the multi-agent paradigm (Agent, Environment, Interaction, Organization and User), as well as the architectures, formalisms and techniques based on MAS for the modeling and resolution of complex problems using the implementation work of collective intelligence, decentralized control, self-organization solutions, self-adaptation, etc. The student will have another vision than single-expertise artificial intelligence.

Recommended prior knowledge

Knowledge acquired in subjects: artificial intelligence and parallel systems.

Content :
- Distributed artificial intelligence
- State of the art on SMA
- Agent topology
- Mode of communication in SMAs
- SMA Architecture and Platform
- Protocols in SMA (DynCNET, etc.)
- SMA via networks

Evaluation mode:

Final exam (50%), practical work (25%), an oral presentation with report submitted (25%)

References :

1. Weyns, Danny. Architecture-based design of multi-agent systems. Springer Science & Business Media, 2010.
2. Russell, Stuart J., and Peter Norvig. "Artificial Intelligence-A Modern Approach, Third Int. Edition." (2010).
3. Weiming Shen, Douglas H.Nome and Jean-Paul Barthès. "Multi-Agent Systems for Concurrent Intelligent Design and Manufacturing", Taylor and Farncis (2001).
4. Jacques Ferber, Les systèmes multi agents: vers une intelligence collective, InterEdition,1995.

Title of the Master: Networks and technologies of information and communication
Semester: S3
TU: MTU 3
Module title: Development of network applications

Credits : 4

Coefficient: 2

Teaching objectives.

The main objective of teaching this subject is to enable the student to acquire the basic knowledge necessary for the development of network applications.

Recommended prior knowledge

Knowledge acquired from advanced networks 1 and advanced networks 2 modules.

Contenu de la matière :

- Introduction to network applications
- Network application architectures
    - Client server architecture
    - Peer-to-peer architecture
    - Service-oriented architecture
- Identification of network application requirements
    - Quality of service
    - Security
- Design of network applications
- MVC architecture
- Mechanisms for processing data in networks
- Middleware & API

Evaluation mode: Exam 50% + TP 50%

References :

1. E. Greenberg, Network Application Frameworks: Design & Architecture, Edited by Addison-Wesley , 1999.

2. D. G. Messerschmitt, Networked Applications: A Guide to the New Computing Infrastructure (The Morgan Kaufmann Series in Networking. Edited by: Morgan Kaufmann. 1999

3. L. Chao. Networking Systems Design and Development, Edited by CRC Press, 2010.

Title of the Master: Networks and technologies of information and communication
Semester: S3
TU: MTU 3
Module title: Protocol specification and verification
Credits : 2
Coefficient: 1

Teaching objectives

This course allows the student to know the importance of formal techniques in the development of communication protocols. It describes the use of such techniques in the life cycle relating to the world of communication protocols (Protocol Engineering).

Recommended prior knowledge

Life cycle concepts of Software Engineering.

Content :

1. Introduction:
    • Reminder: communication protocol development cycle.
    • Limitations of testing protocol implementations.
2. Formal modeling and verification:
    • Introduction to formal methods.
    • Systems specification and property specification
    • Specification languages: Automata, RdP, Algebra
    • Verification techniques: Model-checking, Verifiable properties, Decidability problem.
    • Case study: Alternating Bit Protocol, CSMA/CA, CSMA/CD
    • Diagnosis of protocol implementations.
3. Formal verification tools
    • Qualitative vs. quantitative verification and statistical model checking
    • Verification Tools: Uppaal, SPIN, ProVerif

Evaluation method: Examination 50% + Continuous Assessment 50%
References
● Gregor v. Bochmann : Protocol Engineering: An Historical Perspective. Hartmut König : « Protocol Engineering », Springer, 2003.
● Carl. A. Sunschine : « Formal Methods for communication protocol : specification anVerification », The Rand Publication Series, 1979.
● Carl. A. Sunschine et al. : « Specification and Verification of Communication Protocols in AFFIRM Using State Transition Models », IEEE TRANSACTIONS ON SOFTWARE ENGINEERING, VOL. SE-8, NO. 5, pp : 460-489, SEPTEMBER 1982.
● S. Htite, R. Dssouli et A.R. Ghedamsi : « Diagnostic Automatique avec l'outil MFDT », Actes de CFIP'97, pp. 287-300, Editions Hermès, 1997.

Title of the Master: Networks and technologies of information and communication
Semester: S3
TU: MTU 3
Module title: English 2

Credits : 2

Coefficient: 1

Teaching objectives.

This English class is meant to recapitulate the concepts acquired during S1 and S2 by addressing the students' various gaps in reading, writing and pronunciation. More or less advanced aspects of the English language can be covered.

Recommended prior knowledge

English 1 and English 2

Content :

Advanced English

Evaluation mode: Exam 33% + Continuous Assessment 67%

References :

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V- Agreements or conventions

NO