



Universidad
Politécnica
de Cartagena



Centro
Universitario
de la Defensa

General Air Force Academy

Course unit description:

**SECURITY AND DEFENSE
TECHNOLOGIES SYLLABUS**

Degree/s:

Industrial Organization Engineering Degree

Course :2018/2019

1. Subject data

Name	Security and defense technologies				
Subject area	Biology, Chemistry, Physics, Electronics				
Module	511103005				
Code	Industrial Organization Engineering Degree				
Degree programme	2009 (Decreto 269/2009 de 31 de julio)				
Curriculum	2009 (Decreto 269/2009 31st July)				
Centre	University Centre of Defence at the Spanish Air Force Academy				
Type	Compulsory				
Length of subject	Four month course	Semester	6	Course	3rd
Language	Spanish/English				
ECTS	6	Hours / ECTS	25	Total workload (hours)	150

2. Lecturer data

Lecturer in charge	Germán Rodríguez Bermúdez		
Department	Engineering and Applied Techniques		
Knowledge area	Electronic		
Office location	University Centre of Defence		
Telephone	968189925	Fax	968189970
email	german.rodriguez@ cud.upct.es		
URL / WEB	www.cud.upct.es		
Office hours	Tuesday and Thursday (12:30-14:30). Contact by Email		
Location	Office CUD / 26.		

Qualification/Degree	Phd. Automation and Electronic Engineer.		
Academic rank at UPCT			
Year of admission in UPCT			
Number of five-year periods (<i>quinquenios</i>) if applicable	1		
Research lines (if applicable)	Brain Computer Interfaces, Machine learning.		
Number of six-year periods (<i>sexenios</i>) if applicable	1		
Professional experience (if applicable)	> 14 years		
Other topics of interest	Telecommunication networks		

Lecturer in charge 2	Yesica Vicente Martínez		
Department	Science and informatics		
Knowledge area	Chemistry		
Office location	Nº36		
Telephone	968189347	Fax	
email	yesica.vicente@cud.upct.es		
URL / WEB	www.cud.upct.es		

Office hours	Tuesday and Thursday (12:30-14:30). Contact by mail
Location	

Qualification/Degree	PhD. Chemistry
Academic rank at UPCT	Teaching and research staff
Year of admission in UPCT	2017
Number of five-year periods (<i>quinquenios</i>) if applicable	
Research lines (if applicable)	Analytical Chemistry, Microextraction techniques coupled to analysis of inorganic and organic trace compounds. Synthesis and Reactivity of Heterocycles. Adsorption of pollutants. Nanoparticles.
Number of six-year periods (<i>sexenios</i>) if applicable	
Professional experience (if applicable)	> Ten years.
Other topics of interest	

Lecturer in charge 2	Francisco Javier Pérez Valderas	
Department	Engineering and Applied Techniques	
Knowledge area	Electronic Warfare	
Office location	Flight Safety office	
Telephone	968189347	Fax
email	fperval@ea.mde.es	
URL / WEB	www.cud.upct.es	
Office hours	Contact by mail	
Location		

Qualification/Degree	Spanish Air force officer (Electronic Warfare Degree)
Academic rank at UPCT	
Year of admission in UPCT	
Number of five-year periods (<i>quinquenios</i>) if applicable	

Research lines (if applicable)	
Number of six-year periods (<i>sexenios</i>) if applicable	
Professional experience (if applicable)	
Other topics of interest	Family and Sports

3. Subject description

3.1. General description

The course presents in detail nuclear biological weapons. We center our teaching on the reasons what they are used and their effects on biological systems. We give an overview of the methods of detections of weapons of mass destruction. We also explain standard protocols of evacuation and decontamination giving special importance to the differences between the three types of weapons. During the laboratory work students perform a test of agent orange used as defoliating in the Vietnam War. They also analyze the effect of UV radiation on the survival of bacteria. Then we introduce technical concepts of electronics and communication systems in order to understand the important role of guided weapons and the importance of research in protective systems and countermeasures.

3.2. How the subject contributes to a professional career

The knowledge of weapons of mass nuclear, biological and chemical destruction is one of the distinguishing aspects of a military career. It is important to understand their use, to know the weapons types and to know methodologies of protection, detection and removal.

The role of electromagnetic spectrum and its military use is a very important issue of military life. It is important to understand electromagnetic protection measures of our equipment as well measures to attack enemy equipments.

3.3. Relationship with other subjects in the programme

The NBQ part requires a basical knowledge of Biology, Chemistry and Physics. The second part of the subject (electronic warfare) is related to the course "Networks and telecommunication services" of 3rd , and "Electromagnetic exploration systems" of 4th course.

3.4. Incompatibilities defined in the programme

There are no incompatibilities defined.

3.5. Recommendations to do the subject

3.6. Special provisions

Special measures, which combine studies of the subject with military training and aeronautics activities, shall be adopted. In particular, groups of cooperative work/learning of students with limited availability will be made, promoting the monitoring of learning through programming of group and planning exercises.

4. Competences and learning outcomes

4.1. Basic curricular competences related to the subject

KC3. Students must have the ability to collect and interpret important data (normally within their area of study) in order to make judgments considering relevant social, scientific or ethical issues.

4.2. General curricular competences related to the subject

GC2. Application of general technologies and fundamental subjects in the industrial domain for the solving of engineering problems.

4.3. Specific curricular competences related to the subject

SC30. Analyze topics applied to engineering and aircraft systems operations.

4.4. Transversal curricular competences related to the subject

CCC4. Effective use of information resources

4.5. Subject learning outcomes

1. Understand the physical basis of radioactivity.
2. Understand the effects of radioactivity, to know types of radioactivity and to know effects on biological systems
3. Know the protocols and personnel decontamination aparataje.
4. Understand the basics of sending and receiving signals
5. Know the different techniques of analog and digital modulation
6. Understand the fundamentals of radar
7. Understand the basics of GPS technology
8. Understand NATO standards on electronic warfare
9. Know and understand the electromagnetic measures of protection, and attack system.

5. Contents

5.1. Curricular contents related to the subject

Nuclear, Biological and Chemical defense. Electronic support systems. Electronic countermeasures. Electronic protection.

5.2. Theory syllabus (teaching modules and units)

Part 1. Nuclear biological and chemical warfare

Unit 1. Basic concepts of radioactivity and radiation

Unit 2. Effects of radiation on living organisms

Unit 3. Protection devices and decontamination of radioactive material

Unit 4. Biological weapons types and uses

Unit 5. Technologies and detection of biological agents

Unit 6. Agents of use in chemical warfare

Unit 7. Detection of chemical agents

Unit 8. Evacuation and decontamination protocols

Part 2.A. Technological concepts

Unit 9. Introduction to wave propagation.

Unit 10. Analog and digital communication systems. Modulations.

Unit 11. Introduction to antennas

Unit 12. Basic concepts of radar

Unit 13. Introduction to GPS technology

Part 2.B. Electronic Warfare

Unit 14. Doctrine

Unit 15. Electronic Surveillance (ES)

Unit 16. Electronic Attack (EA)

Unit 17. Electronic Defence (ED)

Unit 18. Electronics warfare systems into the Spanish Armed Forces and NATO

5.3. Practice syllabus (name and description of every practical)

Laboratory sessions: Four sessions of laboratory practices are developed in order to familiarize students with laboratory work and they must be aware that always involves risks. The learning objectives are:

- Know the main aspects of laboratory work. Promote human capacity to analyze and synthesize, organize and plan, solve problems and make decisions.
- To promote criticism and self-criticism and teamwork ability.
- Encourage the ability to implement theoretical knowledge.
- Educate students on the importance of waste disposal.
- Identify tools and encourage proper use.
- Apply theoretical knowledge.
- Perform practices following the explanations of the lab notebook and discourage own initiatives without consulting the lecturer.
- Prepare reports of work done, where the rationale and objectives of the practice are explained, the results are analyzed and calculations are justified.
- Train students to handle specifications, regulations and mandatory standards.

Part 1.NBQ

Practice 1. Quematical

Practice 2. Radiation

Part 2. Electronic warfare

Practice 3. Signals.

Practice 4. Introduction to RADAR.

Risk prevention

Promoting the continuous improvement of working and study conditions of the entire university community is one of the basic principles and goals of the Universidad Politécnica de Cartagena.

Such commitment to prevention and the responsibilities arising from it concern all realms of the university: governing bodies, management team, teaching and research staff, administrative and service staff and students.

The UPCT Service of Occupational Hazards (*Servicio de Prevención de Riesgos Laborales de la UPCT*) has published a "Risk Prevention Manual for new students" (*Manual de acogida al estudiante en materia de prevención de riesgos*), which may be downloaded from the e-learning platform ("Aula Virtual"), with instructions and recommendations on how to act properly, from the point of view of prevention (safety, ergonomics, etc.), when developing any type of activity at the University. You will also find recommendations on how to proceed in an emergency or if an incident occurs.

Particularly when carrying out training practices in laboratories, workshops or field work, you must follow all your teacher's instructions, because he/she is the person responsible for your safety and health during practice performance. Feel free to ask any questions you may have and do not put your safety or that of your classmates at risk.

5.4. Theory syllabus in english (teaching modules and units)

Part 1. Nuclear biological and chemical warfare

Unit 1. Basic concepts of radioactivity and radiation

Unit 2. Effects of radiation on living organisms

Unit 3. Protection devices and decontamination of radioactive material

Unit 4. Biological weapons types and uses

Unit 5. Technologies and detection of biological agents

Unit 6. Agents of use in chemical warfare

Unit 7. Detection of chemical agents

Unit 8. Evacuation and decontamination protocols

Part 2.A. Technological concepts

Unit 9. Introduction to wave propagation

Unit 10. Analog and digital communication systems. Modulations

Unit 11. Introduction to antennas

Unit 12. Basic concepts of radar

Unit 13. Introduction to GPS technology

Part 2.B. Electronic Warfare

Unit 14. Doctrine

Unit 15. Electronic Support Measures (ESM)

Unit 16. Electronic Counter Measures (ECM)

Unit 17. Electronic Protection Measures (EPM)

Unit 18. Armament and equipments in the Spanish Armed Forces and NATO

5.5. Detailed description of learning goals for every teaching module

Part 1. Nuclear biological and chemical warfare

Unit 1. Basic concepts of radioactivity and radiation (1)

Unit 2. Effects of radiation on living organisms (2)

Unit 3. Protection devices and decontamination of radioactive material (3)

Unit 4. Biological weapons types and uses (1,2,3)

Unit 5. Technologies and detection of biological agents (1,2,3)

Unit 6. Agents of use in chemical warfare (1,2,3)

Unit 7. Detection of chemical agents (1,2,3)

Unit 8. Evacuation and decontamination protocols (1,2,3)

Part 2.A. Technological concepts

Unit 9. Introduction to wave propagation (4)

Unit 10. Analog and digital communication systems. Modulations (5)

Unit 11. Introduction to antennas (4)

Unit 12. Basic concepts of radar (6)

Unit 13. Introduction to GPS technology (7)

Part 2.B. Electronic Warfare

Unit 14. Doctrine (8)

Unit 15. Electronic Support Measures (ESM) (8,9)

Unit 16. Electronic Counter Measures (ECM) (8,9)

Unit 17. Electronic Protection Measures (EPM) (8,9)

Unit 18. Armament and equipments in the Spanish Armed Forces and NATO (8,9)

7. Assessment method

7.1. Assessment Criteria

Activity	Type		Assessment methods and criteria	Weighting (%)	Assessed Learning Outcomes
	Summative	Formative			
Written examination Part 1. (20 % final note)	■		Theoretical-practical and/or theoretical questions: Test question about Part 1.(NBQ).	20%	1,2,3
Written examination Part2.A.(20 % final note)	■		Theoretical-practical and/or theoretical questions: Test question about Part 2.A.(Technological concepts).	20%	4,5,6,7
Written examination. Part 2.B.(20 % final note)	■		Theoretical-practical and/or theoretical questions: Test question about Part 2.B (Electronic warfare).	20%	8,9
Laboratory sessions (20 % final note)	■	■	Evaluates participation in laboratory, teamwork, presentations, capacity for innovation, critical evaluation of exposed presentations.	20%	2,4,5,6
Work (20% final note)	■	■	Evaluate an oral presentation. Capacity for innovation and critical evaluation of exposed presentations.	20%	1,2,3,4,5,6,7,8,9

It is necessary to obtain at least a score of 5 points of 10 in Part 1 and Part 2. If the score is lower the student will fail the course

As set forth in article 5.4 of the *Reglamento de las pruebas de evaluación de los títulos oficiales de grado y de máster con atribuciones profesionales (UPCT)*, students in the special circumstances listed in the article 5.4 are entitled to a comprehensive assessment test, upon justified request which must be granted by the Department. This does not exempt them from carrying out compulsory tasks included in the teacher's guide of the subject (official syllabus).

7.2. Control and monitoring methods (optional)

Monitoring of learning will take place through any of the following mechanisms:

- Issues raised in class and collaborative learning in pairs in lecture and practical class.
- Supervision during classroom work sessions and review team of problems proposed to be solved in teams.
- Involvement in team work and practical class.

Review of reports of laboratory.

- Follow activities in virtual classroom by student

Written tests

8. Bibliography and resources

8.1. Basic bibliography

- 21st Century complete guide to bioterrorism, biological and chemical weapons, germs and germ warfare, nuclear and radiation terrorism military manuals and federal documents with practical emergency plans, protective measures, medical treatment and survival information. US Government. 2001 CD-ROM
- Detección e identificación de material nuclear y radiológico. Estado del arte y tendencia futura. Ministerio de Defensa. Gobierno de España. Informe-SOPT-04
- Detección e identificación de agentes de guerra biológica. Estado del arte y tendencia futura. Ministerio de Defensa. Gobierno de España. Informe-SOPT-06
- Detección e identificación de agentes de guerra biológica. Estado del arte y tendencia futura. Ministerio de Defensa. Gobierno de España. Informe-SOPT-11
- Electronic communication systems. A complete course, Third Edition. Willian Schweber. Prentice Hall.
- Modern Electronic communication Sixth Edition. Gary M. Miller. Prentice Hall.
- Principios de guerra alacrónica. AFP 51-3 de la USAF traducido por el CGEA/EM. 01 de Septiembre de 1.978.
- Medidas de apoyo electrónico. Escuela de Transmisiones. Madrid 1.993.
- Medidas de protección electrónica. Escuela de Transmisiones. Madrid 1.993.
- The encyclopedia of air power. HAMLYN Aerospace. London 1.981.
- Jane's: All the world aircraft 1.995-96. Edited by PAUL JACKSON.
- Jane's: Radar and electronic warfare systems 1.995-96. Edited by BERNARD BLAKE.
- Jane's: Military Communications 1.990-91. Eleventh edition. Edited by JOHN WILLIAMSON.
- Jane's: Fight ships 1.997-98. One hundredth edition. Edited by Captain RICHARD SHARPE RN.
- Introduction to airborne radar. GEORGE W. STIMSON. HUGHES AIRCRAFT COMPANY. California, 1.983.
- Introduction to electronic warfare. D. CURTIS SCHLEHER. ARTECH HOUSE. London 1986.
- Applied ecm. Volúmenes I y II. LEROY B. VAN BRUNT. EW ENGINEERING. Virginia, 1.978.
- ATP-44(B): Electronic warfare in air operations NATO edition.
- Guía ilustrada de las técnicas y equipos de guerra electrónica. DOUG RICHARDSON. EDITORIAL SAN MARTÍN. Madrid 1.985.
- Journal of electronic defense. Nov-94, Ene-95, Jun-95, Sep-95, Suplemento Ene-96, Feb-96, Abr-96 y Jul-96.
- International electronic countermeasures handbook. Edited by BERNARD BLAKE. First Edition 1.996. HORIZON HOUSE.

International electronic countermeasures handbook. Edited by F.P. "BUCK" DUBE. Second Edition 1.999. HORIZON HOUSE.

8.2. Supplementary bibliography

- Protecting building occupants and operations from biological and chemical airborne threats [electronic resource] : a framework for decision making. National Research Council (U.S.). Committee on Protecting Occupants of DOD Buildings from Chemical and Biological Release. National Academies Press,
- Sensor systems for biological agent attacks [electronic resource] : protecting buildings and military bases. ebrary, Inc. National Academies Press,
- Handbook of chemical and biological warfare agents. Ellison, Hank D.2000.

ISBN:0849328039

- Electronic intelligence: The Analysis of Radar Signals. RICHARD G. WILEY. Edición 1.982. ARTECH HOUSE.
- Antenna applications reference guide. RICHARD C. JOHNSON and HENRY JASIK. GEORGIA INSTITUTE OF TECHNOLOGY. ATLANTA, GEORGIA 1.989.
- Electronic warfare receiving systems. DENNIS D. VACCARO. ARTECH HOUSE. London 1993.
- Radar vulnerability to jamming. ROBERT N. LOTHES and RICHARD G. WILEY. ARTECH HOUSE. Norwood 1.

8.3. On-line resources and others

<https://aulavirtual.upct.es>