Course Syllabus
Geographic Information Systems

March – July 2019

VI Ciclo

Menary, Wayne PhD

I. General course details

Nombre del curso:	Geographic Information Systems		
Prerrequisito:	Meteorología y Climatología	**Código:**	10345
Precedente:	-	**Semestre:**	2019-I
Créditos:	3	**Ciclo:**	VI
Horas semanales:	4 hours	**Modalidad del curso:**	Presencial
Tipo de Curso y Carreras	**Curso obligatorio:** Ingeniería en Gestión Ambiental	**Coordinador del curso:**	Mayra Arauco Livia marauco@esan.edu.pe

II. Summary

This course introduces students to the fundamentals of Geographical Information Systems (GIS) and Geospatial Technology, including cartography, remote sensing and spatial analysis. It examines the processes involved in the capture, storage, manipulation, analysis, presentation and output of digital geographical data in a GIS and provides opportunities for the development of practical skills in processing data using a leading Open Source GIS software package, Quantum GIS.

III. Course Objectives

To critically assess how GIS is currently used in environmental sciences and management and to apply the acquired knowledge of GIS tools and software to real life situations.

IV. Learning Outcomes

By the end of this course students will be able to:

- Understand the fundamental concepts of Geographic Information Science and Technology
- Demonstrate basic proficiency in the creation and acquisition of spatial data.
- Analyse the fundamentals of GIS data storage and interoperability and remote sensing.
- Apply GIS tools and techniques to resolve real life situations.
- Construct datasets for use in geo-analysis
- Execute the results of a geospatial analysis using appropriate models, terminology and visualizations.
- Evaluate types of geographic information analysis and geostatistics
- Analyse GIS innovations and industry applications.

V. Methodology

The course comprises a series of lectures, presentations and computer-based practical sessions using Quantum GIS software, with example data sets taken from a variety of fields. The computer-based practical sessions will be based on the QGIS training manual.

Students will complete a practical assignment designed to provide practical experience with the software while simultaneously illustrating and reinforcing theoretical concepts.

Contact and communication between the student and lecturer will be vía the virtual campus platform, where all the course resources will also be available.

It is strongly recommended that the student read the texts indicated in the bibliography, as well as material that will be made available to encourage students to explore topics in greater depth.

VI. Evaluation

The integrated evaluation system is continuous. The grade of the subject is obtained by averaging the continuous evaluation (50%), the partial exam (20%) and the final exam (30%).

The average grade for the continuous assessment results from the average of assessed research reports, integrative activities and creation and presentation of an individual map.

The weighting within the continuous evaluation are described in the following table:

PROMEDIO DE EVALUACIÓN PERMANENTE 50%		
Type of evaluation	**Description**	**Weighting %**
Research Reports	Independent Research Report	5
	Cartographical design (Presentation of map and summary report)	10
	Citizen Science	10
Applied Activity Assessments	Two (2) timed assessments of applied GIS problem solving	30
Project	Problem solving using GIS	40
Participation in class	Participation in class and topic activities.	5

The final average grade (FA) is obtained as follows:

$$\mathbf{FA} = (0{,}20 \times MTE) + (0{,}50 \times CEA) + (0{,}30 \times FE)$$

Where:

FA = Final Average
MTE = Mid-Term Exam
CEA = Continuous Evaluation Average
FE = Final Exam

VII. Programme Content

WEEK	*CONTENTS*	*ACTIVITIES / EVALUATION*
UNIT OF LEARNING I: Communication and Geographic Understanding. **1.** Understand the fundamental concepts of Geographic Information Science and Technology **2.** Demonstrate basic level proficiency in the creation of spatial data. **3.** Select and combine appropriate visual variables to clearly represent geospatial data and communicate map content		
1° **March 21 - 27**	**Introduction to Geographic Information Systems (GIS) & Spatial Thinking.** Read: Baerwald, Thomas J. (2010) 'Prospects for Geography as an Interdisciplinary Discipline'; Factfulness: Ten reasons we're wrong about the world and why things are better than you think	Spatial knowledge Quiz QGIS Practical I
2° **March 28 – April 03**	**Map Elements and Coordinate Systems** Read: *Chapter 2 of* Monmonier, M. (1991). How to Lie with Maps. The University of Chicago Press Chicago and London.	QGIS Practical II Evaluation N° 1 **Independent Research Report**
3° **April 04 - 10**	**Cartography and Visualization** Cartographic Principles - colour, symbology, cartographic design; Displaying Geospatial Data - creation of cartographic products by applying cartographic principles Read: Lima, M (2011). Visual Complexity. Mapping Patterns of Information	QGIS Practical III
4° **April 11 – 17**	**Citizen Science with GIS&T & Geospatial Intelligence (GEOINT)** GEOINT Data, Sources, Quality & Collection Strategies Read: *Chapters 2, 6, 19 & 21 of* European Handbook of Crowdsourced Geographic Information; Science for Environment Policy In-depth Report: Environmental Citizen Science.	QGIS Practical IV Evaluation N° 2 **Research report on Cartographical design**
UNIT OF LEARNING II: Principles of GI and Cartography. Part II provides students with the opportunity to acquire the skills and techniques required to become proficient GIS professionals. **4.** Analyse the fundamentals of GIS data storage and interoperability and remote sensing. **5.** Evaluate and apply different types of geospatial analysis techniques **6.** Construct datasets for use in geo-analysis **7.** Execute the results of a geospatial analysis using appropriate models, terminology and visualizations.		

5° **April 22 - 27**	**Geospatial Data Management** Geographic Data Acquisition, Geospatial Database Management, File Formats, Data Quality.	QGIS Practical V Evaluation N° 3 **Research report on Citizen Science**
6° **April 29 – May 04**	**Geospatial Analysis I:** Vector Operations, Single Layer Analysis, Multiple Layer Analysis	QGIS Practical VI
7° **May 06 - 11**	**Geospatial Analysis II:** Raster data Basic Geoprocessing with Rasters	QGIS Practical VII
8° **May 13 - 18**	**Geospatial Analysis III:** Surface Analysis, Spatial Interpolation	QGIS Practical VIII
9° **May 20 - 25**	**MID-TERM EXAMS**	
10° **May 27 – June 01**	**Understanding Remote Sensing and Aerial Photography** Read: *Chapters 1 & 2 of* Campbell (2011) Introduction to Remote Sensing.	QGIS Practical IX
11° **June 03 - 08**	**Earth Observation (EO) / Remote Sensing (RS) and Web GIS** Read: *Chapters 3 & 6 of* Campbell (2011) Introduction to Remote Sensing; Quinn, S. (2018). Web GIS.	QGIS Practical X
UNIT OF LEARNING III: GIS Analysis: Understanding Our World. **8.** Apply GIS tools and techniques to resolve real life situations. **9.** Analyse GIS innovations and industry applications.		
12° **June 10 - 15**	**Environmental Applications of GIS** Read: *Preface* of the Millennium Ecosystem Assessment, 2005. Ecosystems and Human Well-being: Synthesis. Island Press, Washington, DC.	QGIS Practical XI Evaluation N° 4 **Applied Activity Assessment I**
13° **June17 - 22**	**Energy Industry Applications of GIS** Read: South Carolina Electric & Gas Company (2001). Transmission Line Siting Report for the Proposed Westvaco-Thomas Island 115kV Transmission Line Berkeley And Charleston Counties, S.C.	QGIS Practical XII Evaluation N° 5 **Applied Activity Assessment II**

14° June 24 - 29	**Planning GIS for Emergency Management**	QGIS Practical XIII
	Read: *Chapter 2 of* Tomaszewski, B., (2014). Geographic Information Systems (GIS) for Disaster Management; *Chapter 1 of* Meier, P (2015). Digital Humanitarians: How Big Data Is Changing the Face of Humanitarian Response.	
15° July 01 - 06	**Applied Drone Mapping and Geospatial Image based Modelling and Processing**	QGIS Practical XIV
	Read: *Chapter 1 of* Douglas M. Marshall et al (2016). Introduction to unmanned aircraft systems. CRC Press.	
16° July 08 - 13	**Independent project presentations**	Evaluation N° 6 **Independent Project Presentation**

VIII. Bibliografía

- Baerwald, Thomas J.(2010) 'Prospects for Geography as an Interdisciplinary Discipline', Annals of the Association of American Geographers, 100: 3, 493 — 501.
- Campbell (2011) Introduction to Remote Sensing. 5th Edition.
- Capineri, C, Haklay, M, Huang, H, Antoniou, V, Kettunen, J, Ostermann, F and Purves, R (2016). European Handbook of Crowdsourced Geographic Information. London: Ubiquity Press.
- Douglas M. Marshall et al (2016). Introduction to unmanned aircraft systems. CRC Press.
- Graham, M, and Shelton, T (2013). Geography and the future of big data, big data and the future of geography. Dialogues in Human Geography. Vol 3, Issue 3, pp. 255 – 261
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- Menke, K. (2016). Mastering QGIS. Second Edition. Packt Publishing.
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- Rosling, H, Rosling, O & Rosling, A.R. (2018). Factfulness: Ten reasons we're wrong about the world and why things are better than you think. Sceptre Books, Hodder & Stoughton Ltd, UK.
- Science Communication Unit, University of the West of England, Bristol (2013). Science for Environment Policy In-depth Report: Environmental Citizen Science. Report produced for the European Commission DG Environment, December 2013
- South Carolina Electric & Gas Company (2001). Transmission Line Siting Report for the Proposed Westvaco-Thomas Island 115kV Transmission Line Berkeley And Charleston Counties, S.C.
- Sutton et al (2009). A Gentle Introduction to GIS. Department of Land Affairs.
- Tomaszewski, B., (2014). Geographic Information Systems (GIS) for Disaster Management.

IX. Lecturer

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