COURSE SYLLABUS

Subject: Sensor and Data Acquisition	**Academic field: Space and Aeronautics**
Lecturer: Jean-Paul RUDANT	
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Academic year: 2015-2016	

COURSE DESCRIPTION :

Credit points	03	
Level	Undergraduate	
Teaching time Location	University of Science and Technology of Hanoi	
Time Commitment	Lecture	Hrs 15
	Exercises	Hrs 15
	Practicals	Hrs project with oral presentation 6
	Total	Hrs 36
Prerequisites	General scientific skills	
Recommended background knowledge	. Calculus (vectors, derivative, integral, trigonometry, geometry 2D and 3D) Basis in mechanics and electromagnetism (Wave propagation, polarization, Fresnel Laws)	
Subject description:	The course starts with a general overview of remote sensing applications with different illustrations consisting in images acquired by different spaceborne sensors. The chapter I is focused on general properties of optical and radar sensors, acquisition modes, resolution, geometry Chapter2 is focused on optical sensors and data, with discussion about spectral signatures and presentation of several sensors; with numerous applications. Extension wil be done on LIDAR system Chapter2 is focused on radar sensors and data, with discussion about backscattering , polarimetry, interferometry; presentation of several sensors, with numerous application	
Objectives & Out-come	(Knowledge &/ Skills gained via the course) The objective is to give the basis of general interpretation of remote sensed data, in Optical and microwaves domains. These objectives will be assessed by an oral presentation on a remote sensing subject (focalized on sensor or application) and an final control	
Assessment/ Evaluation	Attendance/Attitude	%10
	Exercise(s)	% 10
	Practicals	30 oral presentation
	Mid-term test	%
	Final exam	%50
Prescribed Textbook(s)		

COURSE CONTENTS & SCHEDULE

Class	Contents	Hours			Ref./Resources	Assignment(s)
		Lect.	Exr.	Prc.		
Ch 1	Chapter1 **Generality : approche comparée des télédétections optique et radar** 1-Quelques propriétés des Ondes électromagnétiques, domaines spectraux optiques et radar Longueurs d'onde et polarisation, ondes cohérentes 2-Trajectoires aériennes et orbitales des capteurs, référentiels 3-Génération des images , Géométrie des images (dont effets du relief) 4- Nature de l'Enregistrement (capteur), quelles informations sur la surface terrestre 5 Résolutions (spatiale, spectrale, radiométrique, temporelle) 6-Accès au relief 7-Restitution, visualisation des images	4	4			
Ch 2	**Zoom on Optical images and LIDAR system** <u>Images :</u> Puissance reçue par le capteur Luminance et reflectance, surfaces lambertiennes Effets atomosphériques Résolution spatiale Signatures spectrales Quelques instruments Optical sensors Landsat, SPOT, Ikonos <u>LIDAR system (</u>Light Detection and Ranging) Full wave system Clouds points	4	4			
Ch 3	**Zoom on radar images** Backscattering coefficient Speckle Radar Geometry, relief effects, soil geometry Polarimétrie Interférométrie Paramètres de surface et paramètres système influençant la réponse radar Presentation of radar sensors, ERS, JERS, Radarsat, Palsar	10	10			

Notes:

- Abbreviation: Lect. (lecture), Exr. (Exercise), Prc. (Practise).
- Exercises may include assignment, reports, student's presentation, homework, class exercises ...for each class sessions
- Practicals mostly refer to Lab- work or outside practice such as field trip.

Reference Literature:

[1]. W. G. Rees, « Physical Principle of Remote Sensing », ed. Cambridge, 2012

[2]. C. Elachi, J. van Zyl, « Introduction to the Physics and Techniques of Remote Sensing », ed. J. Wiley & sons, 2006

[3]. J. Campbell, R. Wynne, « Introduction to Remote Sensing », ed. Guilford Press, 2011

[4]. T. Lillesand, R. Kieffer, J. Chipman, « Remote Sensing and Image interpretation », ed. John Wiley & sons, 2008

[5] D. Massonnet , J.C. Souyris, "Imaging with synthetic apperture radar » , EPFL Press, 2008 Imagery"

Webgraphy

Website education from ESA ,

Esa School Atlas and CDROM on French Guiana

https://earth.esa.int/web/guest/eo-education-and-trainingweb/eo-edu/esa-school-atlas

CDROM English-French   French Guiana though the clouds, La Guyane a travers les nuages

Canadian remote sensing website

www.ccrs.nrcan.gc.ca/ccrs/learn/tutorials