

## OC 3902 -- Fundamentals of Geospatial Information and Services

**Course Objectives:** OC3902 is a graduate level course designed to provide the fundamentals of the science as well as the technology inherent to **Geospatial Information and Services (GI & S)**. The first section of the course will cover aspects of **geodesy** including the ellipsoid, geoid, gravity, datums, coordinate systems, and datum transformations. In the second phase the student will consider **mapping, charting, and projections** and their relations to geodetic datums. Sources and the collection of **geospatial data** will be covered in the third phase of the course including orthorectified imagery, the Global Positioning System (GPS) and hydrographic surveying. The fourth part of the course will cover the fundamentals of **Geographical Information Systems (GIS)** and present to the student methods of geospatial data fusion as well as spatial analysis including use of meteorological and oceanographic data. Finally the student will be exposed to the current array of **military geospatial products** available to support combat operations. The lecture series will be complimented by a series of seven laboratory exercises.

**Prerequisites:** Vector Analysis and Probability and Statistics, or consent of instructor

**Text:** No text book required.

### Reference Material (*Supplied student CD*):

- A. Defense Mapping Agency Geosciences Division, Geodesy for the layman, Rep. DMA TR 80-003, 103 pp., Defense Mapping Agency, 1983
- B. Defense Mapping Agency, Datums, Ellipsoids, grids, and grid reference systems, Tech. Man. DMA TM 8358.1, 157 pp., Defense Mapping Agency, 1990
- C. National Imagery and Mapping Agency, DoD World Geodetic System 1984, its definition relationships with local geodetic systems, Rep. NIMA TR 8350.2 3<sup>rd</sup> Ed., 175 pp., National Imagery and Mapping Agency, 1997
- D. Snyder, John P., Map projections –a working manual, Professional Paper USGS 1395, 383 pp., United States Geological Survey, 1987 (*selected excerpts*)

**Course Grading:** 30% Midterm Exam, 40% Final Exam, 30% Lab

### Course Schedule and Assignments:

#### **PART I – GEODESY (*Datums and Reference Systems*)**

## **Week 1 (1 April)**

Lecture 1: Course Administration and Introduction  
Earth's Surface – representation and generalization  
Lecturer: CDR Parsons  
Reading: None

Lecture 2: Physical Geodesy I  
Lecturer: Prof Clynych  
Reading : Text, Chapter 2, Sections 2.1- 2.3,

Lecture 3: Physical Geodesy II  
Lecturer: Prof Clynych  
Reading: Text, Chapter 2, Sections 2.4-2.12

## **Week 2 (8 April)**

Lecture 4: Physical Geodesy III  
Lecturer: Prof Clynych  
Reading : None

Lecture 5: Physical Geodesy IV  
Lecturer: Prof Clynych  
Reading: Reference C, Chapter 5

Lecture 6: Coordinate Systems: Orthogonal, Curvilinear; Geocentric, Geodetic Latitude  
Lecturer: CDR Parsons  
Reading: Text, Chapter 1 and 5, Sections 5.1-5.3

Lab 1: The Geoid

## **Week 3 (15 April)**

Lecture 7: Coordinate Systems II  
Lecturer: CDR Parsons  
Reading: None

Lecture 8: Datums  
Lecturer: CDR Parsons  
Reading: Text, Chapter 5, Section 5.4 and Classbook 1, Reference A, Chapter  
4;  
,  
and Reference B, Chapter 2

Lecture 9: Datum Transformations  
Lecturer: CDR Parsons  
Reading: Text, Chapter 5, Section 5.5

Lab 2: Datum Transformations using GEOTRANS

**Week 4 (22 April)**

***PART II – MAPPING (Map Projections)***

Lecture 10: Introduction into Projections

Lecturer: CDR Parsons

Reading: Reference A, pp 1-35

Lecture 11: Projections II

Lecturer: CDR Parsons

Reading: Reference A, pp 37-65

Lecture 12: Projections III

Lecturer: CDR Parsons

Reading: Reference A, pp 97-137, pp 154-163

Lab 3A: Map Projections

**Week 5 (29 April)**

Lecture 13: Map classes, interpretation and nomenclature

Lecturer: CDR Parsons

Reading: None

***PART III GEOSPATIAL DATA***

Lecture 14: Remote Sensing and Aerial Surveys

Lecturer: CDR Parsons

Reading: None

Lecture 15: Remote Sensing II

Lecturer: CDR Parsons

Reading: None

Lab: **MIDTERM EXAMINATION (Physical Geodesy, Mapping and Projections)**

**Proctor: CDR Parsons**

**Week 6 (6 May)**

Lecture 16: Midterm Review  
Lecturer: CDR Parsons  
Reading: None

Lecture 17: Time  
Lecturer: Prof Clynch  
Reading: Text, Chapter 3

Lecture 18: Introduction to GPS  
Lecturer: Prof Clynch  
Reading: Text Chapter 4, Chapter 7, Section 7.4

Lab 3B: Remote Sensing

### **Week 7 (13 May)**

Lecture 19: GPS II  
Lecturer: Prof Clynch  
Reading: Text Chapter 7, Section 7.6, 7.7

Lecture 20: GPS III  
Lecturer: Prof Clynch  
Reading: None

Lecture 21: GPS IV  
Lecturer: Prof Clynch  
Reading: None

Lab 4A: GPS Lab – Part 1

### **Week 8 (20 May)**

#### ***PART IV MANAGING AND ANALYZING GEOSPATIAL DATA (GIS)***

Lecture 22: GIS I  
Lecturer: CDR Parsons  
Reading: Handouts

Lecture 23: GIS II  
Lecturer: CDR Parsons  
Reading: None

Lecture 24: GIS III  
Lecturer: CDR Parsons  
Reading: None

Lab 4B: GPS Lab -- Part 2

**Week 9 (27 May – Memorial Day Holiday – Monday, 27 May )**

Lecture 25: GIS-IV  
Lecturer: CDR Parsons  
Reading: None

Lecture 26: GIS V  
Lecturer: CDR Parsons  
Reading: None

Lab 5: Data Fusion

**Week 10 (3 June)**

Lecture 27: GIS VI  
Lecturer: CDR Parsons  
Reading: Handouts

Lecture 28: Military Geospatial Products  
Lecturer: NIMC Instructor  
Reading: None

Lecture 29: GIS VII  
Lecturer: CDR Parsons  
Reading: None

Lab 6: Spatial Analysis Problem

**Week 11 (10 June)**

Lecture 30 Electronic Navigation  
Lecturer: CDR Parsons  
Reading: None

Lecture 31 METOC GIS Applications  
Lecturer: NIMC Instructor  
Reading: None

Lecture 32: Bathymetric Surveys/Course Review  
Lecturer: CDR Parsons

**Week 12 (17 June)**

**FINAL EXAMINATION      0800-1000, 17 June, SP342**