**SSL 3106 REMOTE SENSING AND GIS IN AGRICULTURAL LAND USE**

**Lecturer** Dr. Lukman Nagaya Mulumba

**Course Type**: **CORE (B LUM III.)**

**Course Credits (CU)**: **3 CU (45 Contact Hours per semester)**

**Course Duration**: **15 weeks**

1. **COURSE DESCRIPTION**

Basic principles of geographic and land information systems and their use in spatial analysis and information management.

**2. Course Objectives**

The course is designed to give students an understanding of geographic information systems, their capabilities, uses, and limitations. Relevant applications are demonstrated in the computer laboratory portion.

**3. Recommended References**

T. Bernhardsen, 1999. Geographic Information Systems – An introduction, 2nd edition, John Wiley & Sons, Inc.

**4. COURSE CONTENT, METHODS OF INSTRUCTION, TOOLS AND EQUIPMENT REQUIRED**

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| **WEEK/TOPIC** | **CONTENT** | **METHOD OF INSTRUCTION / Time allocated** | **TOOLS / EQUIPMENT NEEDED** |
| 1. Introduction | * Definitions of GIS and RS * Importance and Applications of GIS * Data characteristics * Data integration. * Users of GIS | 1.5 hrs interactive lecture  3 hr practical session | LCD projector, desktop Computers,  Arcview GIS software Chalk / BB or Markers / Flip charts |
| 1. Introduction to spatial data | * Spatial elements - * Spatial measurement levels * Spatial location and reference * Review of spatial location and reference * Spatial relationships * GIS data models * Attribute data | 1.5 hrs interactive lecture  3 hr practical session | LCD projector, desktop Computers,  Arcview GIS software Chalk / BB or Markers / Flip charts |
| 1. Maps & map analysis | * Map elements and their properties * Real and virtual maps * Map projections, distortions and transformations * Mapping principles applied to digital maps and spatial analysis * Coordinate systems | 1.5 hrs interactive lecture  3 hr practical session | LCD projector, desktop Computers,  Arcview GIS software Chalk / BB or Markers / Flip charts |
| 1. Raster GIS | * Raster data and its characteristics * Advantages and disadvantages of raster mapping systems * Raster functions | 1.5 hrs interactive lecture  3 hr practical session | LCD projector, desktop Computers,  Arcview GIS software Chalk / BB or Markers / Flip charts |
| 1. Vector GIS | * Vector data and its characteristics * Advantages and limitations of vector mapping systems * Topology * Vector GIS capabilities * Vector applications * connectivity | 1.5 hrs interactive lecture  3 hr practical session | LCD projector, desktop Computers,  Arcview GIS software Chalk / BB or Markers / Flip charts |
| 1. Spatial databases | * Basic file structures * Data structures – relational, hierarchical, network * Integration of spatial, attribute and topological data | 1.5 hrs interactive lecture  3 hr practical session | LCD projector, desktop Computers,  Arcview GIS software Chalk / BB or Markers / Flip charts |
| 1. Data in GIS - Acquisition | * Digitizing * Scanning * Surveying * GPS data * Photogrammetry * Metadata | 1.5 hrs interactive lecture  3 hr practical session | LCD projector, desktop Computers,  Arcview GIS software, Chalk / BB or Markers / Flip charts |
| 1. Data in GIS – editing, data quality | * Accuracy vs. precision * Measurement of logical consistency * Completeness; lineage; timeliness, attribute data accuracy, available tools, sources of error. | 1.5 hrs interactive lecture  3 hr practical session | LCD projector, desktop Computers,  Arcview GIS software Chalk / BB or Markers / Flip charts |
| 1. Data in GIS -storage | * Geometric * Attribute * Distributed * SQL * Database design * User interfaces | 1.5 hrs interactive lecture  3 hr practical session | LCD projector, desktop Computers,  Arcview GIS software Chalk / BB or Markers / Flip charts |
| 1. Data in GIS – Remote sensing | * Electromagnetic spectrum * Images – aircraft and satellite * Radiometric and geometric correction * Supervised vs. unsupervised classification | 1.5 hrs interactive lecture  3 hr practical session | LCD projector, desktop Computers,  Arcview GIS software Chalk / BB or Markers / Flip charts |
| 1. GIS capabilities | * Spatial objects, measurements and models * Application of measures * Proximity & contiguity analysis * Map data retrieval and search; map overlay; classification and reclassification * Neighborhood functions * Cartographic alegebra * Logic & geometric operations * Hydrologic modeling | 1.5 hrs interactive lecture  3 hr practical session | LCD projector, desktop Computers,  Arcview GIS software Chalk / BB or Markers / Flip charts |
| 1. GIS implementation | * Requirement analysis & system design * Time & cost analysis for data, hardware and software * Cost/benefit analysis of GIS * Choosing hardware & software * Operation & maintenance | 1.5 hrs interactive lecture  3 hr practical session | LCD projector, desktop Computers,  Arcview GIS software Chalk / BB or Markers / Flip charts |
| 1. GIS visualization | * Data to display * Cartographic instruments * Map symbols * Potentials and limitations | 1.5 hrs interactive lecture  3 hr practical session | LCD projector, desktop Computers,  Arcview GIS software Chalk / BB or Markers / Flip charts |
| 1. GIS applications | * Geography/human resources * Geology * Environment | 1.5 hrs interactive lecture  3 hr practical session | LCD projector, desktop Computers,  Arcview GIS software Chalk / BB or Markers / Flip charts |
| 1. The future of GIS | * Technological developments * New applications * Data access * Research and Development | 1.5 hrs interactive lecture  3 hr practical session | LCD projector, desktop Computers,  Arcview GIS software Chalk / BB or Markers / Flip charts |

**5. SUMMARY OF TIME NEEDED**

Interactive lectures covering theory 22.5 hrs

Computer lab practicals 45 hrs

**6. OVERALL COURSE EVALUATION**

Continuous Assessment Test 25%

Labs 15%

Final examination 60%.