

**HAROLD WASHINGTON COLLEGE**  
**MASTER SYLLABUS – COLLEGE CREDIT COURSE**

**1. TITLE, NUMBER, AND CLASSIFICATION:**

Name of Course:

**RASTER GEOGRAPHIC INFORMATION SYSTEMS AND REMOTE SENSING  
TECHNIQUES**

**General Course with Laboratory.**

**Department Name:** Physical Science

**Number Code** 202

**Course Number:** 0076-0202

**DIVISION:**                     College                     Continue education

**CURRICULUM:**             Liberal Arts             Pre Credit  
                                  Careers                     Community Service  
    Vocational Skills

**PROGRAM:**                     General Education  
                                  Developmental  
                                  ESL  
                                  Career Occupational

**2. COURSE TERM:** 16 Week Semester

**3. CREDIT AND CONTACT HOURS:**

(i) Credit hours 4 (ii) contact hours per week 6 (iii) types of activities

- Lecture/Discussion**
- Lab**
- Clinical/Work Experience**
- Other** (Capstone project mentoring)

**4. PREREQUISITES:**

Grade of C or better in English 101 and completion of Math 99 or equivalent placement or Consent of Department Chairperson.

## 5. CATALOG DESCRIPTION

Fundamentals and application of raster GIS, using Arc-GIS. This class will focus on modeling and analyzing spatial problems in many economic sectors and environmental fields, in which spatial data can be represented by an arrangement of pixels in a matrix such as digital elevation models and imagery. Writing assignments, as appropriate to the discipline, are part of the course. 2 hours lecture, 1 hour of discussion and 3 lab hours per week.

*Prerequisite:* Grade of C or better in English 101 and completion of Math 99 or equivalent placement or Consent of Department Chairperson.

## 6. STUDENTS FOR WHOM THE COURSE IS INTENDED:

1. This class is a regular requirement to obtain the Certificate in Basic Environmental GIS at Harold Washington College (HWC). Graduates will be able to compete in a globally-centered society and use new technology in geoinformatics. This program will also serve as a step from HWC to enrollment at four-year universities to pursue further education in GIS.
2. This class is attractive to the diverse student body at HWC and to professionals in the city that want to expand future opportunities with technology-driven skills. The students who want to enroll in this class are interested in application of scientific principals and computer modeling applied to the solution of spatial problems.

## 7. COURSE OBJECTIVES:

The Raster GIS class will be focused to achieve the following objectives:

1. Introduce students to the fundamental concepts of GIS and real-world representation, using GIS raster technology via spatial data input, topology, cartographic projections, and coordinate systems.
2. Provide students with background information and technological skills to explore, capture, manage, analyze, model, and perform spatial operations, and to find trends and patterns on the landscape. Generate meaningful results for applications that include geographic data for a raster model.
3. Equip students with the problem-solving, critical and spatial-thinking skills, and technological expertise to model, interpret and find a suitable solution to an entry-level problem or applications that require the use of raster GIS.
4. Familiarize students with different GIS resources available on the internet and in the literature (e.g. specialized data bases, peer-reviewed papers, remote sensing imagery, and GIS-models), and provide students with critical-thinking skills to recognize the quality of scholarly information.
5. Familiarize students with Arc-GIS software for data capture, analysis, modeling and representation of a raster- spatial application.

6. Mentor students as they design and successfully complete a GIS project of their choice applying the background knowledge and understanding about raster-GIS technology and techniques.
7. Provide students with basic information and methodology on the presentation of results, and for other projects in different applications and disciplines that use raster GIS.

## **8. STUDENT LEARNING OUTCOMES**

Students who satisfactorily complete the Raster GIS class will be able to:

- 1a. Summarize concepts and common operations pertinent to raster GIS.
- 1b. Differentiate between spatial and attribute data.
- 1c. Utilize raster data models for different applications in class.
- 1d. Utilize different geographic coordinate systems, datum and map projections.
  
- 2a. Apply GIS concepts and common operations to emphasize trends and patterns on the landscape for a specific raster spatial problem.
- 2b. Perform standard GIS operations, including input, editing, management, display, analysis and modeling, for the data relevant to the project.
- 2c. Manage and link spatial and descriptive information to its geographic location.
- 2d. Interpret the results obtained from the raster GIS model to create meaningful outputs for the projects.
  
- 3a. Demonstrate the cartographic skills needed to generate suitable outcomes for specific problems.
- 3b. Represent natural landscape components using raster features.
- 3c. Select different types of raster-spatial operations and models to show patterns on the landscape.
  
- 4a. Identify and apply different ways to retrieve and to input raster data and imagery into a GIS project.
- 4b. Access different databases to retrieve raster, imagery and attribute information for the final project.
- 4c. Use information, methods, and GIS models reported in the literature to apply to a particular spatial problem.
- 4d. Use spatial analysis techniques to combine raster geographic data.
  
- 5a. Use GIS software and technology to represent, model and solve spatial problems in real-world applications.
- 5b. Recognize both the potential and limitations of GIS software for raster applications.
  
- 6a. Summarize the purpose, research question, spatial extent, and analyses to be performed on their final capstone project.
- 6b. Identify the project's information needs: the type and sources of raster spatial and attribute data and the project results and outputs.

- 6c. Formulate effective methodology for the final project by selecting logical steps for spatial analysis.
- 6d. Assess the accuracy and validity of the results obtained in their final project.
  
- 7a. Generate appropriate graphics and maps representing the geographic location and the tendency and patterns of the data.
- 7b. Write an executive report explaining the outputs and findings.
- 7c. Deliver a Power Point Presentation discussing the methodology, findings and results of the project.

## **9. SUGGESTED TOPICAL COURSE OUTLINE:**

- Week 1. Introduction to Raster GIS** - Applications, components, history, operations, spatial data, and attribute data.
- Week 1. Coordinate Systems** - Datum, map projections, coordinate systems and their relation to raster data.
- Week 2. Raster Data Model** – Elements, types, and structure of raster data, compression, conversion and integration of raster and vector data.
- Week 2. Data Input** – GIS raster data resources, remotely sensed data.
- Week 3. Geometric transformation:** Type of transformations, errors, and resampling.
- Week 4. Attribute Data Management** – GIS attribute data and its relation with raster data.
- Week 4. Raster Data Display and Cartography** – Map generation and design.
- Week 5. Raster Data Exploration** – Descriptive statistics, and attribute, spatial and raster data query and management.
- Week 6. Raster Data Analysis** – Local, zonal, neighborhood and distance operations. Comparison of vector and raster-based data analysis.
- Week 7. Terrain Mapping** - Using DEM, slope and aspect, DEM vs. TIN
- Week 8. Viewsheds and watersheds** – Viewshed and watershed analysis and applications.
- Week 9. Spatial Interpolation** – Elements and methods of spatial interpolation.
- Week 10. Geocoding and segmentation** – Concepts and applications.
- Week 11. Path Analysis and Network Applications.**
- Week 12. Raster-GIS Models and Modeling** – Elements of GIS modeling, raster based index and binary models.
- Week 13 – 16 Mentoring Capstone Project.** Embedded performance task or final project consists of a capstone experience. Each student will develop a raster GIS model to represent and resolve an entry-level-spatial problem for an application of his/her choice.

## **10. SUGGESTED TEXTS AND MATERIALS USED:**

- 1) Introduction to Geographic Information Systems, 4th Edition, 2008, by Kang-tsung Chang, McGraw Hill, 450 p.  
ISBN 978-0-07-305115-4

- 2) GIS Tutorial, Workbook for ARC-View 9, 2005, by Wilpen L. Gore and Kristen S. Kurland, ESRI Press, 352 p.  
ISBN 13:978-1-58948-127-5

**11. AMOUNT OF WRITING REQUIRED:**

Laboratory reports, executive report for the final project, and short answer essays questions.

**12. METHODS OF EVALUATION: (Direct and indirect)**

<b>Item</b>	<b>Percentage</b>	<b>Scale</b>
1) Quizzes	15%	<b>A</b> = 90 -100% <b>B</b> = 80 – 89% <b>C</b> = 70 – 79% <b>D</b> = 60 – 69%
2) Final Exam	20%	
3) Laboratories	30%	
4) Capstone Assignment	30%	
<u>5) Participation</u>	<u>5%</u>	
<b>TOTAL</b>	<b>100%</b>	

**13. AUTHORIZED SIGNATURE AND FILE DATE:**

DEPARTMENT AND CAMPUS

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Physical Science Department  
Harold Washington College