Geospatial Information Sciences Course Descriptions

GISC 5317 Computer Programming for GIS (3 semester hours) General introduction to Visual Basic and other languages with GIS related applications. Topics covered include fundamental data structures and algorithms, user-interface design, component object model, and data base management. Emphasis on rapid GIS application development with hands-on experiences. Students are expected to design and implement a project.(3-0) R

GISC 6332 (POEC 6332)GIS Applications in Criminology (3 semester hours) Examines spatial distribution of crime, criminals, and criminal justice interventions. Students conduct spatial analysis of point patterns and area-based data in studies of the locations of crime events and rates, offenders, police controlling practices, judicial districts and community corrections and how they relate to physical and social characteristics of neighborhoods. (3-0) R

GISC 6379 Special Topics in Geographic Information Sciences (3 semester hours) Topics vary from semester to semester. May be repeated for credit up to a maximum of 9 hours. Consult with adviser to determine appropriateness of topic for degree plan. (3-0) R

GISC 6380 Spatial Concepts and Organization (3 semester hours) Examines the recurring patterns of physical and human objects on the Earth's surface, the flows of circulations among them, and the spatial concepts and theories which have been advanced to help understand and explain these spatial arrangements. Provides a fundamental understanding of spatial processes, concepts, and theories. (3-0) R

GISC 6381 (PA 6381) Geographic Information Systems Fundamentals (3 semester hours) Examines the fundamentals of Geographic Information Systems and their applications. Emphasizes the concepts needed to use GIS effectively for manipulating, querying, analyzing, and visualizing spatial-based data. Industry-standard GIS software is used to analyze spatial patterns in social, economic and environmental data, and to generate cartographic output from the analysis. (3-0) Y

GISC 6382 Applied Geographic Information Systems (3 semester hours) Further develops hands-on skills with industry-standard GIS software for application in a wide variety of areas including urban infrastructure management, marketing and location analysis, environmental management, geologic and geophysical analysis and the Economic, Political and Policy Sciences. Prerequisite: GISC 6381, or equivalent with instructor's permission. (3-0) Y

GISC 6383 Geographic Information Systems Management and Implementation (3 semester hours) Management strategies for GIS are examined by presenting GIS as an integrated system of people, computer hardware, software, applications and data. Implementation is examined as a systematic process of user needs assessment, system specification, database design, application development, implementation, operation, and maintenance. Includes design of implementation plans as case studies to explore various techniques associated with each step of this process. (3-0) Y

GISC 6384 Spatial Analysis and Modeling (3 semester hours) Treatment of more advanced topics in the application of spatial analysis in a GIS environment. Topics covered include raster-based cartographic modeling, 3-d visualization, geostatistics and network analysis. Student will be acquainted with state-of–the-art software through

hands-on laboratory experiences. Prerequisite: GISC 6381. (3-0) Y

GISC 6385 GIS Theories, Models and Issues (3 semester hours) Provides an understanding of the theory, data models and associated issues (such as uncertainty) that underlie GIS and the way these are applied to, and effect, spatial analysis and spatial data management. Prerequisite: GISC 6381 and 6382, or equivalent with instructor's permission. (3-0) Y

GISC 6386 Urban and Environmental Applications of GIS/Remote Sensing. (3 semester hours) Examines the use of GIS and/or remote sensing techniques for understanding selected social phenomena (such as health, political behavior, poverty, crime) or environmental conditions (such as land use, air quality, hydrology) in urban areas and for implementing potential solutions to associated problems. Requires completion of projects and/or papers that reflect the students' mastery of   theory, research, data, and software. Prerequisites: GISC 6381 or GEOS 5325, or equivalent with instructor's permission. (3-0) R

GISC 6387 Geographic Information Systems Workshop (3 semester hours) Provides a structured laboratory experience focused on the students' substantive area of interest. Each participant develops a project which should include aspects of database design and manipulation, spatial analysis, and cartographic production. Projects may be designed in coordination with a local government, utility, business, or other entity that uses GIS in its operations and research. Prerequisites: GISC 6381 and GISC 6382. (3-0) Y

GISC 6388 GIS Application Development (3 semester hours) Provides instruction and hands-on experience in specific techniques and languages for developing application systems based on GIS concepts. Students will learn to use current generation commercial software to design and implement an application. Prerequisites: GISC 6381 and GISC 5317, or consent of instructor. (3-0) R

GISC 6389 Geospatial Information Sciences Master's Project (3 semester hours) Requires completion of an original GIS project by the student working alone or in a team. Team efforts must result in products that can be associated uniquely with each student. Projects normally continue efforts started in GISC 6387 or GISC 6386. (3-0) S

GISC 7360 GIS Pattern Analysis (3 semester hours) Examines univariate and multivariate methods for point pattern analysis, geo-statistical surface interpolations, and spatial regression models. Underlying models and processes leading to spatially clustered and spatially dispersed patterns are discussed. Course has particular relevance for local and global spatial analyses of crime, disease, or environmental patterns. Prerequisites: POEC 5313 or equivalent andGISC 6381. (3-0) R

GISC 7361 Spatial Statistics (3 semester hours) The application of statistical techniques to the explicit treatment of space (geography) in social science models. Covers indices of spatial autocorrelation, the specification of autoregressive models (Gaussian, Poisson, binomial/logistic), geostatistical modeling, spatial filtering, Bayesian map analysis, random effects in models, and imputation of missing geocoded data.Prerequisite: POEC 5316 or equivalent; GISC 7360 recommended . (3-0) R

GISC 7362 GIS Network Modeling (3 semester hours) Examines the theory of network analysis and its application in Geographic Information Systems. Topics covered include graph theoretic measures of network connectivity and proofs of network properties; optimization problems including shortest path algorithms, flow algorithms, and assignment problems on networks; special solution procedures for the classic

transportation problem; procedures for linear referencing and urban travel demand modeling. The implementation of these algorithms and procedures with GIS data structures is explored using industry standard GIS software. Prerequisite: GISC 6381 or equivalent knowledge. (3-0) R

GISC 7363 Internet Mapping and Information Processing (3 semester hours) Provides a conceptual overview and hands-on experiences in Internet mapping and web-based geospatial information processing with state-of-the-art commercial software. Topics covered included client/server configuration, distributed data access and display, web-based user interaction and customization. (3-0) T

GISC 7364 (PA 7364, SOC 6364) Demographic Analysis and Modeling (3 semester hours). Examines key demographic models for population analysis, their underlying theoretical foundations, and extensions into the spatial domain. Incorporates quantitative estimation and projection techniques and their use within a geographic information systems framework. Provides a solid understanding of spatio-temporal population dynamics, either local or global, which is essential to many disciplines engaged in planning for the public and private service sectors, for transportation networks or for regional development projects. Prerequisites: POEC 5313 or equivalent. (3-0) R

GISC 7365 (GEOS 5326) Remote Sensing Digital Image Processing (3 semester hours) Introduction to remote sensing digital image processing techniques. Topics covered include principles of remote sensing and remote sensors, image visualization and statistics extraction, radiometric and geometric correction, image enhancement, image classification and change detection. Innovative image processing approaches will also be introduced. State-of-the-art commercial image processing software is used for labs and applications development. (3-0) R

GISC 7366 (GEOS 5329) Applied Remote Sensing (3 semester hours)Focuses on the application of remote sensing techniques to solving real world urban and environmental problems in areas such as urban and suburban landscape, lane use and land cover, transportation and communication, vegetation and forestry, biodiversity and ecology, water and water quality control, soils and minerals, geology and geomorphology studies. The current generation, industry standard software is used for labs and applications development. Pre-requisite: GEOS 5325 (3-0) R

GISC 7367 (GEOS 7327) Remote Sensing Workshop (3 semester hours) An independent project is designed and conducted by the student, after instructor approval. The project develops and demonstrates student's competence in using remote sensing techniques in a substantive application appropriate to his/her field of interest. Projects may be developed in coordination with a local government, utility, business, or other entity, which uses remote sensing in its operations and research. A formal presentation and a project report are required. Prerequisites: GISC 6381 and GISC 7365. (3-0) R

GISC 7368 (POEC 7368, PA 7368, SOC 7368) Spatial Epidemiology (3 semester hours) Examines the conceptual and analytic tools used to understand how spatial distributions of exposure impact on processes and patterns of disease. Emphasizes the special design, measurement, and analysis issues associated with spatial patterns of

diseases. Contemporary diseases of public health importance are addressed, and the statistical and inferential skills are provided that can be used in understanding how spatial patterns arise and their implications for intervention. Prerequisite: POEC 5313 or equivalent. (3-0) R

GISC 7384 Advanced Raster Modeling (3 semester hours) Examines advanced topics in raster modeling beyond those discussed in GISC 6384 Spatial Analysis. Prerequisite: GISC 6384 or equivalent knowledge. (3-0) R

GISC 7387 Research Design in GIS (3 semester hours) Examines issues relative to the conduct of effective and valid research in geospatial information sciences.(3-0) R

GISC 7389 GI Sciences Ph.D. Research Project Qualifier (3 semester hours) Requires completion, according to uniform guidelines established by the GI Sciences program, of a GI Sciences Research Project and its presentation to a committee of at least three GI Sciences faculty. May be repeated once in the immediate following semester. May substitute for GISC 6389 GI Sciences Master's Project. Prerequisite: completion of 24 hours of coursework in GI Sciences Ph.D. program (3-0) R

GISC 8320 Seminar in Spatial Analysis (3 semester hours) Examines selected topics in spatial analysis or GI Science. (May be repeated for credit when topics differ). (3-0) R.

GISC 8V01 Independent Study in GIS (1-9 semester hours) Provides faculty supervision for a student's individual study of a topic agreed upon by the student and the faculty supervisor. Prerequisite: Consent of instructor. (May be repeated for credit.) ([1-9]-0) S

GISC 8V27 Internship in GIS (1-9 semester hours) Provides faculty supervision for a student's internship, which must be related to GIS. ([1-9]-0) S

GISC 8V29 Research in GIS (1-9 semester hours) Provides faculty supervision of research conducted by a student. Prerequisite: Consent of instructor. (May be repeated for credit.) ([3-9]-0) S

GISC 8V99 Dissertation (3-9 semester hours) Provides faculty supervision of a student's dissertation research. Prerequisite: Consent of instructor. (May be repeated for credit.) ([3-9]-0) S

Additional Courses

Additional courses relevant to degrees in geospatial information sciences are available in other degree programs in the School of Sciences, in the Department of Computer Science, and in the Department of Geosciences. See the Geospatial Information Sciences degree requirements for listings of these courses.