FLORIDA ATLANTIC UNIVERSITY

NEW/CHANGE PROGRAM REQUEST
Graduate Programs

UGPC Approval _____
UFS Approval _____
Banner _____
Catalog _____

Department Civil, Environmental and Geomatics Engineering (CEGE)

College Engineering and Computer Science

Program Name

MS in Civil Engineering (MSCV)

☐ **New Program***

☑ **Change Program***

Effective Date
(TERM & YEAR)

Spring 2025

Please explain the requested change(s) and offer rationale below or on an attachment.

- The MSCV program has three concentration areas namely "Structural/Geotechnical Engineering", "Transportation/Geomatics Engineering", and "Water Resources/Environmental Engineering". MSCV students may complete one concentration area, which includes a minimum of two core classes chosen from a list of courses for each concentration. The core course lists are modified for all three areas.

- The Department of CEGE offers over 10 cross-listed courses at the 4000/5000 and 4000/6000 levels. This catalog change will prevent students from taking these courses twice at the undergraduate and graduate levels.

- The remedial coursework requirements are clarified.

- Removing redundant information from the catalog.

*All new programs and changes to existing programs must be accompanied by a catalog entry showing the new or proposed changes.

Faculty Contact/Email/Phone

Dr. Evangelos Kaisar / ekaisar@fau.edu / 561-297-4084

Consult and list departments that may be affected by the change(s) and attach documentation

N/A

Approved by		***Date***
Department Chair	Evangelos Kaisar	
College Curriculum Chair	Francisco Presuel-Moreno Digitally signed by Francisco Presuel-Moreno DN: cn=Francisco Presuel-Moreno, o=Florida Atlantic University, ou, email=fpresuel@fau.edu, c=US Date: 2024.09.18 13:55:31 -04'00'	9/18/2024
College Dean	Raquel Assis	9/18/2024
UGPC Chair		
UGC Chair		
Graduate College Dean		
UFS President		
Provost		

Email this form and attachments to UGPC@fau.edu 10 days before the UGPC meeting.

Master's Program

Civil Engineering
Master of Science (M.S)

The mission of the Master of Science with Major in Civil Engineering program is to meet the advanced civil engineering educational needs of graduates of undergraduate programs, practicing engineers and those non-engineering professionals wishing to redirect their career paths. Graduates of the program possess these attributes or educational outcomes:

1. Ability to apply knowledge in civil engineering and related subjects significantly beyond the baccalaureate level;
2. Ability to communicate ideas and results professionally in written, oral and graphical forms;
3. Ability to independently conduct research or solve a significant practice-oriented design in civil engineering.

These educational outcomes result from successful completion of a well-planned, rigorous set of courses and a major research or design experience.

Students wishing to continue their education but not pursue a formal academic degree are welcome to take graduate courses with the appropriate technical preparation.

Admission Requirements
All students must comply with the College's admission requirements noted under the Master's Degree Program Information header. Once students meet all College requirements, applications are reviewed on a case-by-case basis. Students are normally admitted to the Master of Science in Civil Engineering program if they meet the following:

1. Possess a baccalaureate degree in Civil Engineering or a closely related engineering field. Students with non-engineering backgrounds are required to take ~~remedical~~ remedial coursework as recommended by the departmental graduate committee. Click here for additional information.
2. Have achieved a 3.0 (on a 4.0 scale) grade point average in the last 60 credits of undergraduate work;
3. Have demonstrated proficiency in both written and spoken English. Students from non-English-speaking countries are required to take an ~~Englsh~~ English language proficiency test and are expected to achieve a minimum TOEFL score of 550 on PBT (paper-based test), 79 on IBT (internet-based test) or 213 on CBT (computer-based test); 6.0 on IELTS; or 100 on Duolingo.
4. Agree to abide by the graduate admission requirements of the University as published in the University Catalog.
5. Distance Learning students must comply with the College of Engineering and Computer Science Distance Education guidelines noted under the Master's Degree Program Information header above.

Degree Requirements

The degree of Master of Science with major in Civil Engineering is awarded to the candidate who has:

1. Complied with University graduate policies and regulations;
2. Satisfied the University's graduate degree requirements; and
3. Completed the appropriate Plan of Study for the degree option selected.

Plan of Study

A Plan of Study is a set of courses and a thesis or project activity chosen and completed in a sequence that meets the needs and interests of the individual student and the degree requirements and other stipulations of the University, College of Engineering and Computer Science and the department. There is no requirement for master's students to be full-time, nor is there an on-campus service requirement. The Plan of Study must be approved by the student's supervisory committee and the department no later than the end of the student's second semester in the program, regardless of the number of credits earned.

Degree Options

There are two degree options: Master of Science with Major in Civil Engineering with thesis and Master of Science with Major in Civil Engineering, courses only.

M.S. Civil Engineering with Thesis

(A total of 30 credits required.)

1. Requires 6 credits of Master's Thesis, and
2. Requires 24 credits of approved coursework (5000 level or higher) with the following constraints:
    a. At least half of the total credits shall be designated as 6000-level courses or above;
    b. At least half of the total credits must be from CEGE courses;
    c. Cross-listed courses are offered at the 4000/5000 and 4000/6000 levels. Students may not enroll in the 5000/6000 level course if they have completed the corresponding 4000 level course.
    d. Successful completion of any remedial course(s) determined by the departmental graduate program committee and/or the thesis supervisory committee.
3. Must complete one semester of CGS 5937, Graduate Seminar (0 credits) with grade of Satisfactory ("S").

M.S. Civil Engineering (courses only)

(A total of 30 credits required.)

1. Requires 30 credits of approved coursework (5000 level or higher) with the following constraints:
    a. At least half of the credits included in any master's degree program shall be designated as 6000-level courses.

b. At least half of the total credits shall be from CEGE courses.

c. Cross-listed courses are offered at the 4000/5000 and 4000/6000 levels. Students may not enroll in the 5000/6000 level course if they have completed the corresponding 4000 level course.

d. Successful completion of any remedial course(s) determined by the departmental graduate program committee.

2. Must complete one semester of CGS 5937, Graduate Seminar (0 credits) with grade of Satisfactory ("S").

Program Concentrations

Areas of concentration include:

- Structural/Geotechnical Engineering
- Transportation/Geomatics Engineering
- Water Resources/Environmental Engineering

Master of Science with Major in Civil Engineering students may complete one concentration, which includes a minimum of two core classes chosen from a list of courses for each concentration. Note: No more than 3 credits of Directed Independent Study may be applied toward the degree. All course selections must be part of an approved plan of study. All Master of Science with Major in Civil Engineering students must complete one semester of a 0-credit graduate seminar course.

Structural/Geotechnical Engineering Core	
Soil Stabilization and Geosynthetics	CEG 6124
Advanced Structural Analysis	CES 6106
Finite Element Methods in Civil Engineering*	CES 6119
Bridge Design	CES 6325
Structural Dynamics	CES 6585
Prestressed Concrete	CES 6715
Advanced Foundation Engineering	CEG 6105
Advanced Steel Structures	CES 6607

* Introduction to Finite Element Methods, (EGM 5351) is an acceptable substitute.

Transportation/Geomatics Engineering Core	
Thermal Infrared Remote Sensing	SUR 6387C
Advanced Unmanned Aerial System Mapping	SUR 6502
~~Intelligent Transportation Systems~~	~~TTE 6272~~
Maritime Freight Operations	TTE 6508
Sustainable Public Transportation	TTE 6651
Highway Engineering	TTE 6815
Transportation System Analysis	TTE 6501
Terrestrial Laser Scanning	CEG 6304C
Transportation and Supply Chain Systems	TTE 6507

Water Resources/Environmental Engineering Core	
Open Channel Hydraulics	CWR 6235
Dynamic Hydrology	CWR 6525
Water Resource System Engineering	CWR 6818
Air Pollution and Control	ENV 6115
Water Supply and Treatment	ENV 6418
Wastewater Engineering	ENV 6507
Sustainability and Pollution Prevention	ENV 6932
Solid Waste Management	ENV 6356

~~**Note:** Credits of Directed Independent Study may be applied toward the degree with the approval of the department. All course selections must be part of an approved plan of study. All Master of Science with Major in Civil Engineering students must complete one semester of a 0-credit graduate seminar course.~~

Business Minor

Students electing to complete a Business minor must follow the College of Engineering and Computer Science guidelines for the Business minor noted above.

Thesis Supervision

All M.S.C.V. students in the thesis option must select a supervisory committee. The supervisory committee must contain at least three members. The student's advisor will review and approve the

student's plan of study. The chair of the committee and at least one of the other members must be chosen from the department faculty with expertise in the area of concentration chosen by the student. The third member may be chosen from the department faculty or from outside the department in accordance with the University guidelines established in the Graduate Governance document. The third member may be a professional from the practicing engineering community. All members of the committee should have doctoral degrees.

The Thesis
The master's thesis is a comprehensive original work that contributes to the understanding of an engineering problem.

The thesis is presented at an oral defense, the time and date of which must be approved by the supervisory committee. A minimum of two weeks prior to the anticipated defense, the written thesis must be delivered to the supervisory committee in the format described in a document titled, Requirements and Guidelines for Graduate Theses and Dissertations, that is available from the FAU Graduate College.

The supervisory committee determines the format of the defense and, in private consultation at the completion of the oral defense, whether or not the defense was successful and the thesis is acceptable in scope and quality.

Students are expected to provide updates on their progress each semester, both written and oral. A progress report is required to record a satisfactory progress grade for thesis credits. It is expected that, at a minimum, one peer-reviewed paper will be submitted as part of the thesis option. At a minimum, one presentation or poster at a conference is also expected.

Non-Thesis Supervision
M.S.C.V. students in the courses-only option will select a department faculty member with expertise in their chosen area of concentration to be the program supervisor who reviews and approves the student's plan of study.

Transfer Credits
A maximum of 9 credits of graduate-level work earned at FAU as an undergraduate or while in non-degree status at FAU and a maximum of 6 credits transferred from another regionally or nationally accredited institution may be used to satisfy M.S. with Major in Civil Engineering degree requirements subject to the following restrictions:

1. The student must present a transcript identifying the course in which the student earned a grade of "B" or better, along with a catalog/course description.
2. The course must not have been counted toward any other graduate degree awarded or to be awarded to the student.
3. The course is relevant to the student's approved Plan of Study.

4. No credit earned ten or more years before the degree is awarded may be counted toward the M.S. with Major in Civil Engineering degree program. Credits transferred into or applied to the program are considered as earned in the first semester of enrollment.

Professional Licensing

Engineering is a regulated profession, and many civil engineers become licensed Professional Engineers (P.E.) through a process of examination and certification of engineering experience. Since undergraduate experience and training varies considerably among graduate students, students should contact the Florida Board of Professional Engineers for specific information about eligibility to sit for the licensing examinations. Note that completion of a master's degree in Engineering is not sufficient to qualify students from non-engineering backgrounds for licensure in Florida, and such students may not refer to themselves as "engineers" in Florida in accordance with CH 287.055 F.S. Where there are questions, students are asked to contact the Florida Board of Professional Engineers directly. The Florida Board of Professional Engineers' address is:

Florida Board of Professional Engineers
2507 Callaway Road, Suite 200
Tallahassee, Florida 32303-5268
850-521-0500 (Telephone)
850-521-0521 (Fax)
www.fbpe.org/

Financial Aid

Full-time students may be considered for a graduate assistantship, which provides part-time employment in the department. Full or partial tuition waivers may also be awarded to graduate assistants. The number of assistantships is limited, and they are awarded on the basis of the technical area of interest, the student's experience and academic record. Interested students should contact the department. Other financial aid opportunities also may be available through the University. Contact the FAU Financial Aid Office for more information.

Civil, Environmental and Geomatics Engineering

The Department of Civil, Environmental and Geomatics Engineering requires the following remedial coursework for students with non-engineering backgrounds:

1. EGN 3311, Statics;
2. EGN 3331, Strength of Materials;
3. Two civil and/or environmental engineering courses in the relevant concentration area as determined by the departmental graduate program committee or the ~~graduate~~ thesis supervisory committee;
4. Any other course(s) dictated by the departmental graduate program committee or the ~~graduate~~ thesis supervisory committee.

Civil, Environmental and Geomatics Engineering Graduate Courses

Civil Engineering Project Management (CCE 5036) 3 credits
This is a course in which planning, design, document preparation, bidding, big tabulation, construction management, cost estimation, conflict resolution and scheduling for civil engineering projects are covered. Students may not enroll in this course if they have completed CCE 4031.

Advanced Foundation Engineering (CEG 6105) 3 credits
Rigid and flexible earth retaining structures; shallow and deep foundations; laterally loaded piles; sheet-pile walls, braced excavations, cellular cofferdams, and buried culverts; consolidation settlement, stress distribution, elastic settlement, load bearing capacity; seepage and dewatering of foundation excavations. Students may not enroll in this course if they have completed CEG 4012.

Soil Stabilization and Geosynthetics (CEG 6124) 3 credits
Soil chemistry, mineralogy, and properties; techniques of soil reinforcement, soil improvement, and soil treatment; chemical stabilization; mechanical stabilization; designing with geosynthetics; foundations and pavement applications. Students may not enroll in this course if they have completed CEG 4122.

Pavement Analysis and Design (CEG 6129) 3 credits
Stresses and strains in flexible and rigid pavements, materials characterization, pavement performance, mechanistic design principles, AASHTO design method, pavement rehabilitation. Students may not enroll in this course if they have completed CEG 4126.

Terrestrial Laser Scanning (CEG 6304C) 3 credits
This course gives an introduction to applications of terrestrial laser scanning systems in geosciences, engineering, urban planning, forestry, architecture, emergency planning and forensics. Students may not enroll in this course if they have completed CCE 4514C.

Structural Health Monitoring (CES 5164) 3 credits
Prerequisite: CES 3102C with minimum grade of "C"
This course explores the theory and applications of structural health monitoring, which is a new technology to diagnose the state of structural conditions based on sensor data and novel data analytics approaches. This course covers various important topics, including sensing technology, signal processing, machine learning and optimization. Students are expected to gain a deep understanding of sensor-embedded structural maintenance systems and to learn how visualize and process sensor data.

Nonlinear Behavior of Structures (CES 5527) 3 credits
This course provides an introduction to the fundamental concepts used to analyze the

nonlinear behavior of structures under static loading conditions. Displacements, member forces and collapse conditions are studied considering equilibrium in the deformed configuration and linear-elastic, perfectly plastic material behavior. Assignments require the development of computer programs written in MATLAB (or Excel) and their solutions verified using nonlinear modeling capabilities of MASTAN2. Students may not enroll in this course if they have completed CES 4526.

Advanced Building Design (CES 5583) 3 credits

Prerequisite: CES 3102C

This course covers the fundamental concepts to determine the wind and seismic forces used in the design of buildings. Using the provisions of ASCE 7, wind and seismic force magnitudes, distributions and direction are determined for typical buildings. Wind forces are studied for the MWFRS and for components and cladding. Dynamic analysis of SDOF and MDOF building models are studied. Load transfer through the diaphragm to the lateral force resisting system is studied to determine member forces, drift and torsion. Students may not enroll in this course if they have completed CES 4225.

Advanced Structural Analysis (CES 6106) 3 credits

Review of matrix-force and displacement methods and their applications to civil structures.

Finite Element Methods in Civil Engineering (CES 6119) 3 credits

Variational principles, weighted residual methods, convergence criteria, shape functions for one-, two-, and three-dimensional elements, isoparametric elements, and applications to structural and geotechnical engineering. Students may not enroll in this course if they have completed EGM 5351.

Bridge Design (CES 6325) 3 credits

Planning, design, and construction of bridges. Discussion of bridge types and factors affecting the selection of type: concrete versus steel, prestressed, composite, segmental concrete bridges; design issues and techniques; detailed case study of a particular bridge; recent technological developments in bridge engineering.

Structural Dynamics (CES 6585) 3 credits

Response of lumped parameter systems to dynamic loading: formulation and solution of problems of one or more degrees of freedom for discrete systems, modal analysis, numerical integration, and transform techniques. Response of continuous systems. Introduction to earthquake engineering: response spectra, energy absorption capacity of structures, estimation of damping, seismic design, seismic codes, and soil-structure

interaction. Wind effects on structures and hurricane-resistant design. Blast-resistant design. Approximate design methods.

Advanced Steel Structures (CES 6607) 3 credits
Review of basic steel design; beam columns; interaction formulas; first-order and second-order moments; eccentric bolted and welded connections; moment resisting connections; composite construction; effective flange width; shear connectors; composite beams with formed steel deck; plate girder proportions; AISC requirements; flexure-shear interaction.

Advanced Reinforced Concrete (CES 6706) 3 credits
Analysis and design of two-way slabs, floor systems, deep beams, shear walls and footings. Limit state, yield line and deflection analysis. Continuity, tall buildings, seismic, and hurricane-resistant design. Torsion.

Prestressed Concrete (CES 6715) 3 credits
Behavior, analysis and design of pretensioned and post-tensioned concrete structures. Flexural, shear, bond and anchorage zone design. Partial prestressing strength, serviceability and structural efficiency of beams, slabs, tension and compression members. Frameworks and bridges.

Design and Analysis for Engineering Data (CGN 5716) 3 credits
Prerequisites: Basic course in statistics or permission of instructor
Course covers development of hypothesis and thesis-driven data analysis via applications of the basic principles of experimental design to analysis of engineering data, computational algorithms for sample size optimization, analysis of variance for experiments with a single factor, multi-variate analysis.

Special Topics in Civil Engineering (CGN 5935) 3 credits
Prerequisite: Permission of instructor
Study relating to specialized topics associated with civil engineering.

Graduate Seminar (CGN 5937) 0 credit
Prerequisite: Graduate standing
The objective is to encourage and enhance graduate student participation in technical seminars or presentations deemed appropriate by the department for graduate students. This course requires participation of graduate students in a minimum of five technical seminars or presentations in one semester. *Grading: S/U*

Infrastructure Maintenance and Management (CGN 6616) 3 credits
The course involves evaluating infrastructure systems (water, sewer, stormwater, roads, bridges, rail, power) to identify concepts on repair, replacement and maintenance, including dollars to spend on same.

Directed Independent Study (CGN 6905) 1-3 credits
Prerequisite: Permission of instructor
Study of topics in civil engineering relating to the special needs and interests of individual students.

Special Topics (CGN 6930) 1-3 credits
Prerequisite: Permission of instructor
Topics in civil engineering.

Master's Thesis (CGN 6971) 1-10 credits

Advanced Research (CGN 7978) 1-9 credits
Prerequisite: ~~Permisson~~ Permission of department
~~Course~~ The course covers research that is relevant to the student's course of study in the Ph.D. program. This course requires oversight by the student's advisor who can assess the student's performance at the end of the semester. This course can be taken prior to admission to candidacy for the doctoral degree and may be repeated in multiple semesters. *Grading: S/U*

Dissertation - Transportation and Environmental Engineering (CGN 7980) 1-15 credits
Prerequisite: Permission of department
Grading: S/U

Stormwater Modeling and Management (CWR 5308) 3 credits
The course presents a comprehensive view of stormwater modeling and management with an emphasis on current modeling techniques and design practices. The course provides an in-depth review of fundamentals of hydrology along with spatial analysis tools required for effective stormwater modeling and management. Students may not enroll in this course if they have completed CWR 4307.

Groundwater Flow (CWR 6125) 3 credits
Infiltration; Capillarity; Groundwater and Aquifers; Anisotropy; Groundwater motion; Darcy's law, Dupuit-Forcheimer's law; Potential flow; Flow nets; Conformal mapping; Unsaturated flow; Diffusion and dispersion; Well hydraulics, Theis equation; Drainage; Salt water intrusion; Legal doctrines; Economics of groundwater.

Open-Channel Hydraulics (CWR 6235) 3 credits
Review of basic hydraulics: Continuity, momentum and energy balance; Uniform and steady flow; Non-uniform flow; Critical flow; Gradually-varied flow; Surface profiles; Chezy's and Manning's formulas; Laminar and turbulent flow; Velocity distribution; Unsteady flow; Rapidly varying flow; Flood routing; Design of open-channels.

Dynamic Hydrology (CWR 6525) 3 credits
Dynamics and statistics of principal hydrometeorological processes; Hydrologic cycle; Precipitation, Infiltration; Evapotranspiration; Surface runoff; Percolation; Groundwater motion; Storm water management; Hydrologic modeling; Water budget; Hydrologic time series, Stochastic analysis; ARARMA models.

Water Resource System Engineering (CWR 6818) 3 credits
Nature of water resource systems; Systems analysis, Objective functions; Optimal policy analysis; Linear programming; Dynamic programming; Political and economic objectives; Water resource subsystems; Deterministic and stochastic parameters; Large-scale, multi-objective projects; Water allocation; Supply and demand; Hierarchical modeling of water resource systems.

Modeling Methods in Water Resources and Environmental Engineering (EES 6025) 3 credits
Classification of PDEs; fundamentals of numerical analysis; numerical stability, consistency, and convergence; method of characteristics; variational principles; finite differences; finite elements; integral-boundary element method; applications to water resource and environmental engineering problems.

Energy Engineering (EGN 5735) 3 credits
This course provides an overview of renewable energy technology and outlines the basic principles of solar electricity, solar water heating, wind power, marine renewable energy, micro-hydro, biomass and heat pumps and their application in urban and rural environments. In addition, the fundamentals of conventional power generation (fossil fuel nuclear, etc.) are discussed.

Water and Wastewater Treatment (ENV 5510) 3 credits
Prerequisites: CWR 3201C or equivalent, ENV 3001C or equivalent, and permission of instructor
This course introduces students to the principles and design of physical, chemical and biological treatment systems for potable and wastewater applications. Students may not enroll in this course if they have completed ENV 4514.

Hydraulic Systems Engineering (ENV 5565C) 3 credits
This class ~~is~~ outlines the concepts behind the design of piping and pumping stations. The class includes a review of hydraulics and piping networks, pipe materials, pump selection, multiple pump systems, sewer pumping networks and pump station design and appurtenances.

Special Topics in Environmental Engineering (ENV 5935) 3 credits
Prerequisite: Permission of instructor
Study relating to specialized topics associated with environmental engineering.

Air Pollution and Control (ENV 6115) 3 credits
Review of air quality and air pollution problems. Sources, characteristics, and effects of specific air pollutants; Lower atmospheric motion dynamics; Dispersion and interaction of pollutants in the atmosphere; Smog effects; Air quality standards and regulations; Air pollution control methods; Acid rain. Students may not enroll in this course if they have completed ENV 4112.

Solid Waste Management (ENV 6356) 3 credits
Quantities and composition of refuse; Municipal and industrial solid waste disposal methods; Sanitary landfills; Incineration; Grinding and composting of refuse; Energy recovery from solid wastes; Hazardous waste; Optimization techniques to solid waste operation and management. Students may not enroll in this course if they have completed ENV 4341.

Water Supply and Treatment (ENV 6418) 3 credits
Bacteriological, chemical, and physical water quality standards; distribution systems; water treatment theory and design; aeration; coagulation and flocculation; sedimentation; filtration; disinfection; softening; membranes.

Contamination of Aquatic Sediment (ENV 6441) 3 credits
Prerequisites: ENV 3001C
Topics include: cohesive sediments, settling, re-suspension, aggregation, flocculation, pollutant adsorption/desorption; partitioning of chemicals, sediment toxicity assessment, bioassays/bioassessments, aquatic sediment sampling.

Wastewater Engineering (ENV 6507) 3 credits
Wastewater characterization, collection, and pumping. Physical unit operations and biological treatment unit process design including screening, sedimentation, filtration, activated sludge, disinfection, sludge digestion, and sludge disposal.

Environmental Systems and Processes (ENV 6668) 3 credits
Physical, chemical, and biological processes, reactor theory, particle transport, mass transfer, mixing, advection, dispersion, diffusion, sorption, phase transfer. Students may not enroll in this course if they have completed ENV 4053.

Sustainability and Pollution Prevention (ENV 6932) 3 credits
This course introduces students to the principles of engineering sustainability, life cycle cost analysis, pollution prevention and environmental resource management of

infrastructure planning and design. Students may not enroll in this course if they have completed ENV 4072.

Offshore Structures (EOC 6431) 3 credits
(See Ocean and Mechanical Engineering courses, this section)

Special Topics in Geomatics Engineering (SUR 5935) 3 credits
Prerequisite: Permission of instructor
Study relating to specialized topics associated with geomatics engineering.

Digital Photogrammetry and Image Interpretation (SUR 6335C) 3 credits
This course provides students with an advanced understanding of digital photogrammetric principles and their applications. This includes the techniques for calibration of digital cameras, extraction of point and linear features and 3D reconstruction of visible surfaces. The course also enables students to independently implement the digital photogrammetric concepts throughout projects, such as calibration of mobile phone camera and 3D surface reconstruction from stereoscopic images. Students may not enroll in this course if they have completed SUR 4331C.

Thermal Infrared Remote Sensing (SUR 6387C) 3 credits
Prerequisite: GIS 4035C with minimum grade of "C" or permission of instructor
Temperature is one of the most important physical variables. Temperature information with an appropriate spatial and temporal coverage is a key to addressing most of the environmental challenges on both local and regional scales. Measuring temperature remotely by thermal infrared is a new technology, which has found a wide area of applications. In this course, students learn the basic theory of sensors and data processing and analysis. They also investigate new applications of thermal infrared remote sensing on civil infrastructure and environmental systems monitoring. Students may not enroll in this course if they have completed SUR 4384.

Advanced Unmanned Aerial System Mapping (SUR 6402) 3 credits
Covers the fundamental components of small unmanned aerial systems (sUAS) and how they are used to produce high resolution, spatially accurate, planimetric maps and 3-D models of the terrain. Students may not enroll in this course if they have completed SUR 4503C.

Traffic Signal Systems (TTE 6259) 3 credits
This course teaches students about advanced concepts of traffic signal systems that are currently used in the U.S. Students design, evaluate and optimize various components of

traffic signal operations both for individual intersections and coordinated traffic signal systems.

Intelligent Transportation Systems (TTE 6272) 3 credits
Provides instruction on topics related to intelligent transportation systems, including theoretical fundamentals of systems engineering, traffic flow theory, architecture of telecommunications networks, freeway and arterial management and other topics related to ITS.

Transportation System Analysis (TTE 6501) 3 credits
Concepts of operations research using various models to optimize holistic operations of transportation systems from the perspectives of sustainability, resilience, environmental impacts and robustness are discussed. Programming model development and optimizations based on mathematical interpretations of descriptive problems are also covered.

Highway Traffic Characteristics and Measurements (TTE 6505) 3 credits
This course instructs students on the concept of advanced traffic operations including the characteristics of functional relationships between traffic modeling and travel demand forecasting. Students evaluate transportation scenarios and design solutions to improve traffic operations.

Transportation and Supply Chain Systems (TTE 6507) 3 credits
A study of engineering decision problems for transportation and supply chain systems, relying primarily on the quantitative methods of operations research. Topics include an introduction to the components of logistics systems, such as suppliers, customers, inventory, orders and freight transportation systems and the interactions between these components; a thorough coverage of models and solution techniques for the design and control of logistics systems, primarily network and network-based optimization models; and study in the application of such models and solution techniques.

Maritime Freight Operations (TTE 6508) 3 credits
Addresses important transportation modeling techniques for maritime freight transport. Mathematical models are used to represent transportation problems, and commercial computer software packages are used to evaluate and investigate modern freight transportation systems.

Sustainable Public Transportation (TTE 6651) 3 credits
Designed to outline the principles of transit systems in the urban transportation arena, functional relationships that govern bus and rail transit, and issues associated with

unbalanced flow and lane control, transportation system management and railroad economics and policies.

Highway Engineering (TTE 6815) 3 credits
Route selection including environmental impacts, vertical and horizontal alignment, intersection design, evaluation of subgraded soil strengths, and pavement design, drainage, and overlay design. Students may not enroll in this course if they have completed TTE 4810.

Masoud Jahandar Lashaki

From: Masoud Jahandar Lashaki
Sent: Monday, September 23, 2024 3:22 PM
To: Yalan Liu
Subject: RE: Catalog Changes

Sounds good, thank you!

Masoud

From: Yalan Liu <yalanliu@fau.edu>
Sent: Monday, September 23, 2024 3:21 PM
To: Masoud Jahandar Lashaki <mjahandarlashaki@fau.edu>
Cc: Fred Bloetscher <fbloetsc@fau.edu>; Hongbo Su <suh@fau.edu>
Subject: Re: Catalog Changes

Good afternoon Masoud,

We discussed this matter in today's college UPC meeting and it was approved by the committee. Please let me know if this approval is sufficient for us to proceed, or if there are any other steps we need to take.

Best,
Yalan

~**********~

Yalan Liu, PhD
Assistant Professor
Civil, Environmental and Geomatics Engineering
College of Engineering and Computer Science
Florida Atlantic University

From: Masoud Jahandar Lashaki <mjahandarlashaki@fau.edu>
Sent: Friday, September 13, 2024 4:43 PM
To: Yalan Liu <yalanliu@fau.edu>
Cc: Fred Bloetscher <fbloetsc@fau.edu>; Hongbo Su <suh@fau.edu>
Subject: Catalog Changes

Hi Yalan,

The attached documents show the catalog changes we approved today at our faculty meeting. Could you please take them to the College UPC for review and approval?

Thank you for your time and consideration.

Best regards,

Masoud

Masoud Jahandar Lashaki, Ph.D.

Assistant Professor and Graduate Program Director

Department of Civil, Environmental and Geomatics Engineering (CEGE)

Florida Atlantic University

Main Office: 101 N Beach Road, SeaTech Campus, Room 202; Dania Beach, FL 33004

Second Office: 777 Glades Road, Building 36 (EG), Room 216; Boca Raton, FL 33431