College of Engineering

Department of Civil Engineering

CE 572 Computer Applications in Civil Engineering

Credit and Contact hours	3/ 3 (Lectures), 0 (Tutorials), 0 (Laboratory)
Required, or Elective	Required for a MSCE degree
Course Description	Problem solving programs: Spreadsheet and MATLAB. Mathematical programs: numerical integration, solution of differential and nonlinear equations. Statistical programs: analysis, modeling and testing of data. Logical and optimization programs. Database, artificial intelligence and expert system programs. Applications to all civil engineering disciplines. Project.
Prerequisites or Co-requisites	None
Course Learning Outcomes	Students completing this course successfully will be able to <table><tr><th>Course Learning Outcomes</th><th>Related Program Outcomes</th></tr><tr><td>**CLO1**: Recognize computer-based mathematical, statistical, optimization techniques, and expert systems methodology for solving civil engineering problems.</td><td>**K1**</td></tr><tr><td>**CLO2**: Apply numerical and statistical methods, as well as Optimization techniques and Expert systems for solving various real-life Civil Engineering problems.</td><td>**S1**</td></tr><tr><td>**CLO3**: Solve Civil Engineering related problems by making their mathematical models and using various Mathematical, Statistical, and Optimization programs.</td><td>**S1**</td></tr><tr><td>**CLO4**: Produce improved solutions for more complex engineering problems using Expert System.</td><td>**C2**</td></tr></table>
Student Outcomes related to this Course	**K1**. Recognize advanced engineering knowledge, concepts and techniques to identify, interpret and analyze complex and real-life engineering problems. **S1**. Provide solution for complex and real-life engineering problems through critical thinking and using modern engineering tools and identify its impact on social and ethical issues.

	C2. Design novel advanced Civil Engineering systems and evaluate its performance and effectiveness for engineering practice and its impact on society.

Topics Covered	List of Topics	Related CLOs
	1. Course Description and Introduction to MATLAB	CLO1
	2. Overview of Matrices and Determinants	CLO1
	3. Numerical Integration	CLO3
	4. Solution of Differential Equations	CLO3
	5. Descriptive Statistics	CLO3
	6. Probability Distributions	CLO2
	7. Determination of Probability Distributions	CLO2
	8. Linear Inequalities and Modeling of Decision-Making Problems	CLO2
	9. Fundamentals of Optimization and Linear Programing	CLO3
	10. Linear and Nonlinear Optimization using MATLAB	CLO3
	11. Introduction to Artificial Intelligence	CLO4
	12. Expert system Applications	CLO4

Textbook(s) and Other Required Material	T. Young and M. J. Mohlenkamp (2017). Introduction to Numerical Methods and MATLAB Programming for Engineers., Ohio University, Athens: http://www.math.ohiou.edu/courses/math3600/book.pdf - S.M. Ross (2009). Probability and Statistics for Engineers and Scientists, Fourth Edition, Academic Press, Canada. - Messac (2015). Optimization in Practice with MATLAB for Engineering Students and Professionals, Cambridge University Press, USA. - Samuel J. Biondo (1990) Fundamentals of Expert Systems Technology: Principles and Concepts, Intellect Books.

Grading System	Assignments 15% Mini Project and Oral Presentation 15 % Midterm Exam 30% Final Exam 40%

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