

Name:	<i>Analytical Approaches to Public Fire Protection</i>
Course Description:	This course examines tools and techniques of rational decisionmaking in fire departments, including databases, statistics, probability, decision analysis, utility modeling, resource allocation, cost-benefit analysis, and linear programming.
Objectives:	<p>Unit 1: Introduction</p> <ul style="list-style-type: none"> • Describe the importance of analytical thinking. • Describe the basic elements of analytical methods. • Be able to evaluate others' research. • Define rational decisionmaking. • Recognize subjective factors that influence rational decisionmaking. <p>Unit 2: Databases</p> <ul style="list-style-type: none"> • Recognize when a database might be useful. • Identify some advantages and disadvantages of using a database. • Become familiar with the structure and use of databases. <p>Unit 3: Descriptive Statistics</p> <ul style="list-style-type: none"> • Construct and interpret graphs of functions using a spreadsheet, other computer programs, or graph paper. • Transform data that are not linear. • Combine two functions. • Write an equation for a function that approximates a stream of data. • Construct and interpret histograms for collected data. • Use the mean, median, mode, and standard deviation for a sample. • Compute proportions, percentages, and rates. • Understand and use standardized scores. <p>Unit 4: Inferential Statistics</p> <ul style="list-style-type: none"> • Use the two of the most important discrete distributions--binomial and Poisson. • Use one of the most important continuous distributions--normal. • Display collected data. • Interpret estimates made using samples. • Use random samples for estimating means and for monitoring a system on a continuing basis. • Assess quality management programs by calculating and interpreting Statistical Process Control (SPC) data. <p>Unit 5: Probability</p> <ul style="list-style-type: none"> • Compute probabilities of simple and compound events. • Apply Bayes' Theorem in decisionmaking situations. • Determine the number of possible permutations and combinations. • Develop the basic skills necessary to solve simple probability problems to make decisions in the real world.

Objectives:	Unit 6: Decision Analysis
	<ul style="list-style-type: none"> • Develop event trees to aid in decisionmaking. • Develop decision trees to aid in decisionmaking. • Combine the probabilities of various events. • Apply system analysis techniques to decisionmaking. • Apply strategic planning concepts to decisionmaking.
	Unit 7: Mathematical Modeling
	<ul style="list-style-type: none"> • Understand the concepts of mathematical modeling. • Understand how fire service managers use mathematical modeling to assist in decisionmaking. • Discuss how the ISO Fire Suppression Rating Schedule is an example of utility modeling that can be applied to the fire service. • Describe the benefits and limitations of using a mathematical function to model the relationship between multiple factors. • Define input conditions and constraints. • Make reasonable predictions about the system being modeled, using mathematical techniques.
	Unit 8: Resource Allocation
	<ul style="list-style-type: none"> • Describe considerations for fire station location, including <ul style="list-style-type: none"> - Different approaches and corresponding models for run distance and travel time. - The relation to strategic issues, such as companies in service, allocation of companies by district, location of individual companies, and the number of firefighters assigned per company. - Company workload influence on station location. - Components of response time, and pros and cons of run time as a figure of merit. - Describe data sources and methods for measuring company workload. • Estimate run distances, travel times, and company workload using graphing techniques and a hand calculator. • List several personal computer programs that can assist in the analysis of fire station location issues; describe features and applicability of the programs; and use the programs to estimate run distance, travel time, and company workload. • Assess comparative travel time and company workload estimates for alternative locations for a station and prepare recommendations supported by analysis.
	Unit 9: Cost-Benefit Analysis
	<ul style="list-style-type: none"> • Understand basic concepts of CBA's. • Understand basic assumptions of CBA. • Understand the five steps of CBA: <ol style="list-style-type: none"> 1. Conduct a risk assessment. 2. Identify assumptions, costs, and benefits. 3. Collect data. 4. Calculate costs and benefits. 5. Analyze results.

Objectives:	Unit 10: Linear Programming
	<ul style="list-style-type: none"> • Understand the concept of linear programming. • Graph linear equations. • Set up linear programming problems. • Determine the feasible region of linear programming problems. • Determine the point at which two linear equations intersect. • Apply minimum and maximum constraints to linear programming problems. • Solve fire- and EMS-related linear programming problems. <p>Unit 11: Putting It All Together</p> <ul style="list-style-type: none"> • Through a careful review of this unit and by referring back to examples and explanations in previous units as needed, the student will be able to select three distinct analytical approaches to apply to a local issue or decision in emergency services management. • By following the structure and procedures outlined for each of these three techniques, the student will be able to analyze the local decision options, gain insight into the complexity of the problem, and support a recommended solution with quantitative evidence. <p>Unit 12: Conclusion</p> <ul style="list-style-type: none"> • Understand the relationship between analytical methods and data requirements. • Identify major steps in systems thinking. • Make specific outlines for problem-solving. • Develop a process by which you can perform a step-by-step analysis of a problem.
Required Texts:	<p><i>Analytical Approaches to Public Fire Protection Course Guide</i>, National Fire Academy</p> <p><i>For All Practical Purposes: Mathematical Literacy in Today's World</i>, COMAP, W. H. Freeman and Company</p> <p><i>Fire Data Analysis Handbook</i>, U. S. Fire Administration</p>
Supporting References/ Research for Faculty and Students	<p>U. S. Fire Administration</p> <p>Publications : http://www.usfa.fema.gov/applications/publications/pubs_main.cfm</p> <p>See Fire Protection, Fire Administration, Fire Service Operations, Wildfire</p> <p><u>Applied Research:</u></p> <p>http://www.usfa.fema.gov/dhtml/inside-usfa/research.cfm</p> <p><u>Research Reports:</u></p> <p>http://www.usfa.fema.gov/dhtml/inside-usfa/r_reports.cfm</p> <p><u>Technical Reports:</u></p> <p>http://www.usfa.fema.gov/applications/publications/techreps.cfm</p> <p><u>Topical Fire Research Series:</u></p> <p>http://www.usfa.fema.gov/dhtml/inside-usfa/tfrs.cfm</p>

Supporting References/ Research for Faculty and Students	<p>Learning Resource Center: http://www.usfa.fema.gov/dhtml/inside-usfa/lrc.cfm</p> <p>National Institute for Standards and Technology http://www.fire.nist.gov: Fire Tests/Data, Software/Models, Publications, FIREDOC (under Publications)</p> <p>Current Events/News http://www.firehouse.com/ http://www.fireengineering.com/ http://www.withthecommand.com/</p>	
Assessment:	Students will be evaluated for mastery of learning objectives by methods of evaluation to be determined by the instructor.	
NFPA Standards Addressed:	Unit(s)	Description
1021-3-4.4	1	Prepare a concise report for transmittal
1021-4-4.5	1	Analyze and interpret records
1035-4-3.3	11	Project current fire and life safety issues
Chief Fire Officer Designation Competencies Addressed:	<p>www.cfainet.org</p> <p>This course provides partial fulfillment of CFOD: Competency #1 Assessment and Planning Competency #15 Fire Suppression Competency #16 Special Operations Competency #17 EMS</p>	
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