

CMSE 522 Specification and Verification of Software Systems			
Department: Computer Engineering			
Instructor Information Name: Prof. Zeki Bayram E-mail: zeki.bayram@emu.edu.tr Office: CMPE 213 Office Tel: 0392 6301484			
Assistant Information No assistant.			
Meeting times and places Fridays 10:30- 13:20, Room CMPE 129			
Program Name: Software Engineering		Program Code: 29	
Course Code CMSE 522	Credits 3	Year/Semester 2025-2026 Fall	
Prerequisite(s) Graduate standing.			
Specialization Categories (For the Ph.D. qualifying Exam) B3 – INFORMATION SYSTEMS			
Catalog Description Mathematical foundations such as set theory, logic, and discrete mathematics, propositional logic, and first-order logic. Mathematical reasoning and proof techniques. Introduction to formal specification languages such as Z, VDM, and Alloy. Expressing software requirements using formal specifications. Model checking and its applications in software verification. Temporal logics such as LTL (Linear Temporal Logic) and CTL (Computation Tree Logic). Hoare logic and its use in verifying program correctness. Static analysis techniques for program verification. Abstract interpretation and data flow analysis. Verification of safety and security properties in software systems.			
Course Web Page https://staff.emu.edu.tr/zekibayram/en/teaching/cmse522			
Textbook Specification of Software Systems, V.S. Alagar and K. Periyasamy, Springer 2011			
Reference books None			

Topics Covered**(3 hours of lectures per week)**

Introduction to Specification and Verification
Abstraction
Formal Systems
Automata
Extended Finite State Machines
Propositional Logic
Predicate Logic
Temporal Logic
Set Theory and Relations
Algebraic Specification
The Z Notation
The Object-Z Specification Language

Course Learning Outcomes

Upon successful completion of the course, students are expected to have the following competencies:

(1) Specify system requirements formally and be able to prove various properties of the requirements

Assessment	Method	No	Percentage
	Midterm Exam(s)	1	45%
	Final Examination	1	45%
	Project	1	10%

Policy on makeups: For eligibility to take a makeup exam, the student should bring a doctor's report within 3 working days of the missed exam.

Policy on cheating and plagiarism: Any student caught cheating at the exams or assignments will automatically fail the course and may be sent to the disciplinary committee at the discretion of the instructor.

Prepared by: Prof. Dr. Zeki Bayram

Date Prepared: 22 September 2025