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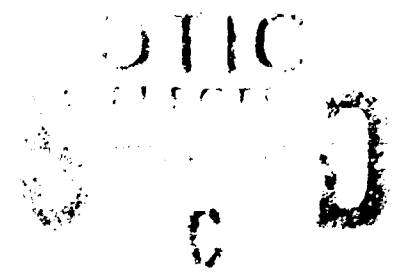
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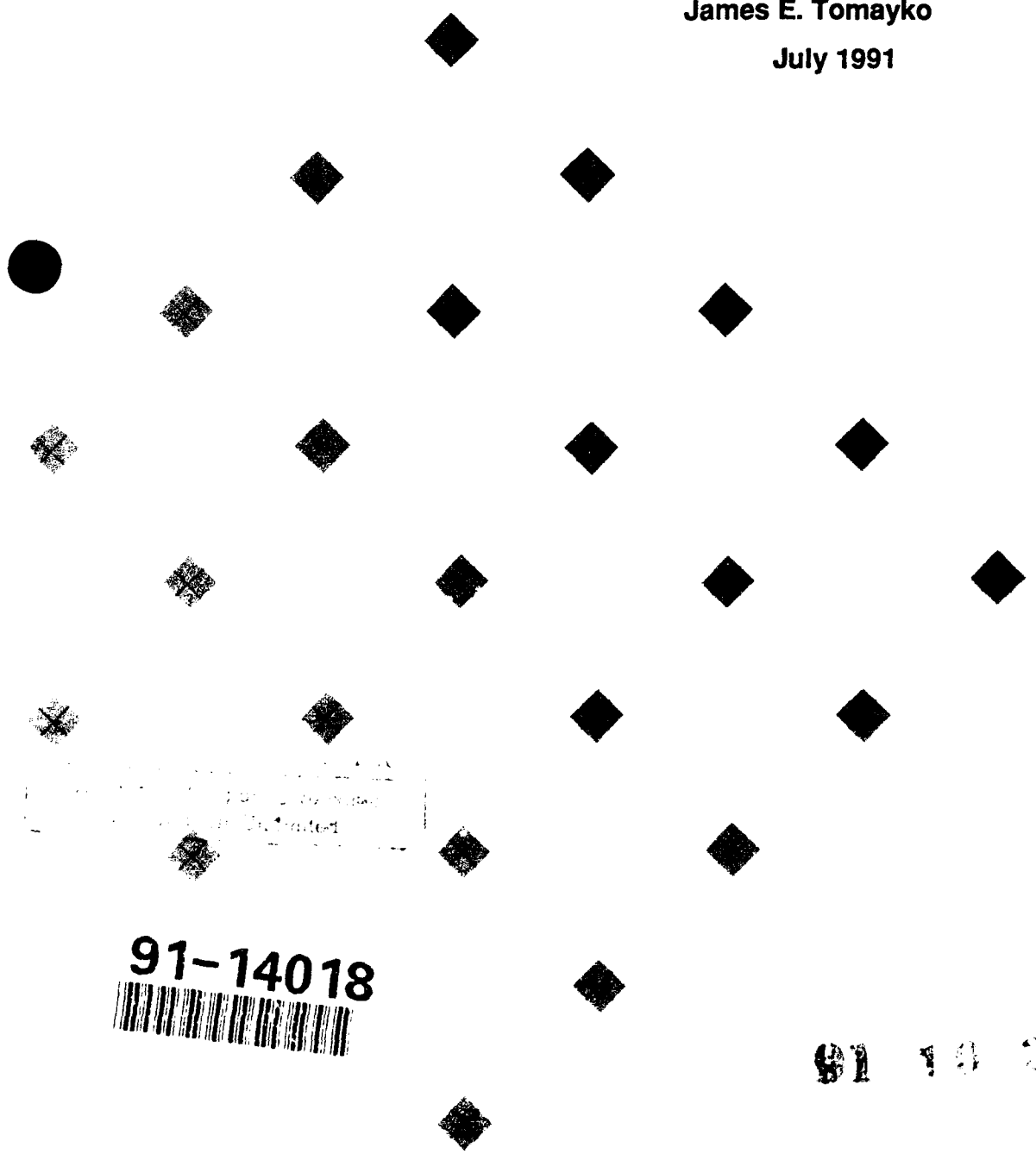
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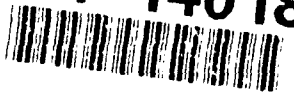
**Materials to Support Teaching  
a Project-Intensive Introduction  
to Software Engineering**

**James E. Tomayko**

**July 1991**



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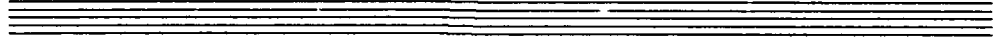
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CMU/SEI-91-EM-6

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**Materials to Support Teaching a  
Project-Intensive Introduction  
to Software Engineering**



**James E. Tomayko**

Carnegie Mellon University  
School of Computer Science and  
Software Engineering Institute

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**Software Engineering Institute**  
Carnegie Mellon University  
Pittsburgh, Pennsylvania 15213

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This document has been reviewed and is approved for publication.

FOR THE COMMANDER

  
Charles J. Ryan, Major, USAF  
SEI Joint Program Office

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# Materials to Support Teaching a Project-Intensive Introduction to Software Engineering

## Abstract

In a project-intensive introduction to software engineering at Carnegie Mellon University (CMU), students developed an interactive exhibit for the Kansas Cosmosphere and Space Center. In a similar course at The Wichita State University, students modified the original CMU project to fit new customer requirements. This package of educational materials provides the software products and documents developed by the students in these courses, along with lesson plans, exams, and other materials used by the instructors.

This educational materials package is based on an undergraduate software engineering course that I taught at Carnegie Mellon University (CMU) in the fall of 1990. The centerpiece of this project-intensive course was the development, for the Kansas Cosmosphere and Space Center, of an interactive exhibit that demonstrates orbital mechanics.

This package is a revision of the support materials for my earlier technical report, *Teaching a Project-Intensive Introduction to Software Engineering* (CMU/SEI-87-TR-20). That report contains a survey of the various types of software engineering introductory courses, a description of how to get started teaching a course that uses the class project as the central learning experience, and detailed lesson plans from a course taught at CMU in 1986. At the end of the report is an order form for 800 pages of supplementary materials, such as sample instructor's handouts and student-developed documents. This educational materials package is similar in nature.

Several SEI publications update and, hopefully, improve upon the information in the original report. For example, *Models for Undergraduate Courses in Software Engineering* (CMU/SEI-91-TR-10) by Mary Shaw and myself is a comprehensive survey of nearly all the software engineering courses taught in the United States. It contains descriptions of various styles of teaching the courses, information on the most popular texts and techniques, and advice on choosing projects and organizing student teams. This educational materials package is a detailed implementation of one of the styles. Readers will find it helpful to read either the original technical report (87-TR-20) or the Shaw and Tomayko report (91-TR-10) prior to using the materials in this package.

All the documents and software in this educational materials package (including this introduction) are available in electronic form. The set of diskettes includes three versions of students' software: a Macintosh-compatible version that demonstrates rendezvous techniques, a similar program that is MS-DOS compatible, and an MS-DOS compatible modification that demonstrates orbit changes.

The latter software was developed by a class using a prototype version of this educational materials package. In the spring of 1991, Peggy Wright of The Wichita State University taught an introductory software engineering course whose project was to modify the original CMU product to more closely fit new customer requirements. A summary of that course offering appears in this package, as well as the executable version of the modified product.

## Package Contents

The set of thirteen 3.5-inch diskettes contains the following documents and software (all documents are provided in both Word format and plain text):

Disk 1: Materials useful for the instructor, such as lesson plans for each class session, overhead slides (PowerPoint format), exams, a syllabus, activity network (MacProject format), organizational charts (MacDraw format), and other items from both the Tomayko and Wright versions of the course.

Disk 2: The Word version of documents generated by students during development: the requirements specification, preliminary and detailed design, integration and test plans, and others.

Disk 3: The plain text version of the documents on Disk 2.

Disk 4: Documents that support controlling the development process, such as the quality assurance, configuration management, and independent verification and validation plans (Word and plain text formats).

Disk 5: The Word version of documents that support the delivery of the product: the user guides, maintenance manual, version description document, etc.

Disk 6: The plain text version of the documents on Disk 5.

Disks 7-8: Source code and resource files for the Macintosh version of the product.

Disk 9: Bitmaps used to develop the graphics in the product.

Disk 10: The executable Macintosh version of the product.

Disk 11: Source code for the PC version of the product (MS-DOS diskette format).

Disk 12: The executable PC version of the product (MS-DOS diskette format).

Disk 13: The executable PC version of the product as modified by the class at Wichita State (MS-DOS diskette format).

## **How to Use This Material**

There are three primary ways to use the materials in this package:

1. Build a course similar to the course documented here, using the student-generated documents (on Disks 2-5) as examples for your students to follow.
2. Use the requirements specification document (on Disk 2) as a basis for building a completely new version of the software.
3. Use the supplied software (on Disks 7, 8, 9, 11, and 13) as the basis for modifications and extensions.

The current version of the software does not fully meet its specifications, so one possible modification project would be to test the software against the user manual (on Disks 5-6), identify the discrepancies, and then fix them. An alternative possibility is a significant modification such as that done by Wichita State (see Wright's notes on Disk 1).

## **How to Order Diskettes**

To obtain the diskettes containing the educational materials, please send the following order form to the SEI Education Program.



## Order Form for EM-6 Diskettes

Educational materials package CMU/SEI-91-EM-6 contains the software product and documents developed by students, along with lesson plans, exams, and other materials used by the instructors in two project-intensive courses.

To receive the package, a set of thirteen 3.5-inch diskettes, complete this form and return it with \$15.00 payment to:

Education Program  
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Carnegie Mellon University  
Pittsburgh, PA 15213-3890

Checks should be made payable to **Carnegie Mellon University** and should accompany this order form.

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Curriculum Modules (\* Support Materials available)

CM-1 [superseded by CM-19]  
CM-2 Introduction to Software Design  
CM-3 The Software Technical Review Process\*  
CM-4 Software Configuration Management\*  
CM-5 Information Protection  
CM-6 Software Safety  
CM-7 Assurance of Software Quality  
CM-8 Formal Specification of Software\*  
CM-9 Unit Testing and Analysis  
CM-10 Models of Software Evolution: Life Cycle and Process  
CM-11 Software Specifications: A Framework  
CM-12 Software Metrics  
CM-13 Introduction to Software Verification and Validation  
CM-14 Intellectual Property Protection for Software  
CM-15 [no longer available]  
CM-16 Software Development Using VDM  
CM-17 User Interface Development\*  
CM-18 [superseded by CM-23]  
CM-19 Software Requirements  
CM-20 Formal Verification of Programs  
CM-21 Software Project Management  
CM-22 Software Design Methods for Real-Time Systems\*  
CM-23 Technical Writing for Software Engineers  
CM-24 Concepts of Concurrent Programming  
CM-25 Language and System Support for Concurrent Programming\*  
CM-26 Understanding Program Dependencies

Educational Materials

EM-1 Software Maintenance Exercises for a Software Engineering Project Course  
EM-2 APSE Interactive Monitor: An Artifact for Software Engineering Education  
EM-3 Reading Computer Programs: Instructor's Guide and Exercises  
EM-4 A Software Engineering Project Course with a Real Client  
EM-5 Scenes of Software Inspections: Video Dramatizations for the Classroom  
EM-6 Materials to Support Teaching a Project-Intensive Introduction to Software Engineering