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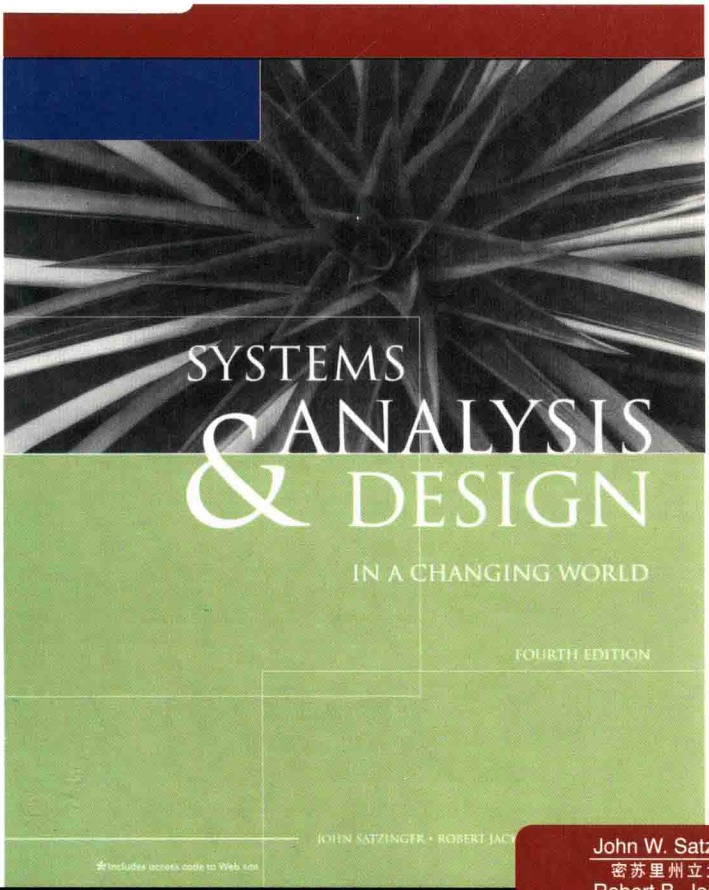
（英文版 · 第4版）



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机械工业出版社
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系统分析与设计

（英文版 · 第4版）

Systems Analysis and Design In a Changing World (Fourth Edition)

本书第4版保持了前几版广受欢迎的写作风格和组织方式，全面论述系统分析和设计领域的两大类方法——传统的结构化方法和面向对象方法，包括现代系统分析员、系统分析任务、系统设计任务及实施与支持四个部分的内容，既关注概念，又重视方法，更注重实践。全书通过具体的系统项目案例和最佳实践，完整地介绍先进的系统分析与设计方法，在承认现实世界中开发环境多变的同时，强调永久价值的基本原则。新版全面整合UML 2.0，将高级面向对象主题贯穿于全书，加强和更新了项目管理相关知识和技术方面的内容，指出在系统开发生命周期内要关注现代结构分析，关注RAD、RUP、基于Web的开发、极限编程等最新技术。

本书特色

- 用大量的案例、实例以及插图强化了关键概念。
- 每章都收录了丰富的易于操作的实践练习。
- 每章最后的练习都经过了严格的测试。
- 内容翔实，结构合理，概念清晰，重点突出，适于计算机、信息、管理及相关专业的本科生、研究生以及软件技术人员使用。

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出版者的话

文艺复兴以降，源远流长的科学精神和逐步形成的学术规范，使西方国家在自然科学的各个领域取得了垄断性的优势；也正是这样的传统，使美国在信息技术发展的六十多年间名家辈出、独领风骚。在商业化的进程中，美国的产业界与教育界越来越紧密地结合，计算机学科中的许多泰山北斗同时身处科研和教学的最前线，由此而产生的经典科学著作，不仅擘划了研究的范畴，还揭橥了学术的源变，既遵循学术规范，又自有学者个性，其价值并不会因年月的流逝而减退。

近年，在全球信息化大潮的推动下，我国的计算机产业发展迅猛，对专业人才的需求日益迫切。这对计算机教育界和出版界都既是机遇，也是挑战；而专业教材的建设在教育战略上显得举足轻重。在我国信息技术发展时间较短、从业人员较少的现状下，美国等发达国家在其计算机科学发展的几十年间积淀的经典教材仍有许多值得借鉴之处。因此，引进一批国外优秀计算机教材将对我国计算机教育事业的发展起积极的推动作用，也是与世界接轨、建设真正的世界一流大学的必由之路。

机械工业出版社华章图文信息有限公司较早意识到“出版要为教育服务”。自1998年开始，华章公司就将工作重点放在了遴选、移译国外优秀教材上。经过几年的不懈努力，我们与Prentice Hall，Addison-Wesley，McGraw-Hill，Morgan Kaufmann等世界著名出版公司建立了良好的合作关系，从它们现有的数百种教材中甄选出Tanenbaum，Stroustrup，Kernighan，Jim Gray等大师名家的一批经典作品，以“计算机科学丛书”为总称出版，供读者学习、研究及庋藏。大理石纹理的封面，也正体现了这套丛书的品位和格调。

“计算机科学丛书”的出版工作得到了国内外学者的鼎力襄助，国内的专家不仅提供了中肯的选题指导，还不辞劳苦地担任了翻译和审校的工作；而原书的作者也相当关注其作品在中国的传播，有的还专程为其书的中译本作序。迄今，“计算机科学丛书”已经出版了近260个品种，这些书籍在读者中树立了良好的口碑，并被许多高校采

用为正式教材和参考书籍，为进一步推广与发展打下了坚实的基础。

随着学科建设的初步完善和教材改革的逐渐深化，教育界对国外计算机教材的需求和应用都步入一个新的阶段。为此，华章公司将加大引进教材的力度，除“计算机科学丛书”之外，对影印版的教材，则单独开辟出“经典原版书库”。为了保证这两套丛书的权威性，同时也为了更好地为学校和老师们服务，华章公司聘请了中国科学院、北京大学、清华大学、国防科技大学、复旦大学、上海交通大学、南京大学、浙江大学、中国科技大学、哈尔滨工业大学、西安交通大学、中国人民大学、北京航空航天大学、北京邮电大学、中山大学、解放军理工大学、郑州大学、湖北工学院、中国国家信息安全测评认证中心等国内重点大学和科研机构在计算机的各个领域的著名学者组成“专家指导委员会”，为我们提供选题意见和出版监督。

这两套丛书是响应教育部提出的使用外版教材的号召，为国内高校的计算机及相关专业的教学度身订造的。其中许多教材均已为M. I. T.，Stanford，U.C. Berkeley，C. M. U. 等世界名牌大学所采用。不仅涵盖了程序设计、数据结构、操作系统、计算机体系结构、数据库、编译原理、软件工程、图形学、通信与网络、离散数学等国内大学计算机专业普遍开设的核心课程，而且各具特色——有的出自语言设计者之手、有的历经三十年而不衰、有的已被全世界的几百所高校采用。在这些圆熟通博的名师大作的指引之下，读者必将在计算机科学的宫殿中由登堂而入室。

权威的作者、经典的教材、一流的译者、严格的审校、精细的编辑，这些因素使我们的图书有了质量的保证，但我们的目标是尽善尽美，而反馈的意见正是我们达到这一终极目标的重要帮助。教材的出版只是我们的后续服务的起点。华章公司欢迎老师和读者对我们的工作提出建议或给予指正，我们的联系方法如下：

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DEDICATION

To JoAnn, Brian, and Kevin—JWS

To Anabel and my children for their continued support—RBJ

To Dee, Amelia, and Alex—SDB

PREFACE

We have been very gratified as authors to receive so many supportive and enthusiastic comments about *Systems Analysis and Design in a Changing World*. In the last few years, the field of systems analysis and design has continued to evolve and mature. Our innovative and truly balanced coverage of traditional structured approaches and newer object-oriented approaches has kept pace with changes in the field. The IS 2002 model curriculum now suggests including a balanced coverage of both traditional and objected-oriented analysis and design, something this text has supported from the very beginning. In this fourth edition, we continue to lead the way by making it feasible to cover object-oriented analysis and design in much greater depth using the latest OO models and design patterns.

OBJECTIVES AND VISION

This text is designed for use in undergraduate and graduate courses that teach systems analysis and design. Systems analysis and design is a practical field that relies on a core set of concepts and principles, as well as what sometimes seems an eclectic collection of rapidly evolving tools and techniques. Learning analysis and design today therefore requires an appreciation of the tried-and-true techniques widely embraced by experienced analysts plus mastery of new and emerging tools and techniques that recent graduates are increasingly expected to apply on the job. It is not easy to develop information systems in today's rapidly changing environment, but the satisfaction and rewards for a job well done are substantial.

This text was developed by a team who was committed to producing an analysis and design text that was different—a text that is flexible and innovative, yet comprehensive and deep. We were guided by the belief that the text must be flexible enough to appeal to instructors emphasizing more traditional approaches to systems analysis and design and to those emphasizing the latest object-oriented techniques. At the same time, we did not want to oversimplify the problem of system development. There are many new developments affecting systems analysis and design, and we wanted to include key trends—use cases, predictive and adaptive life cycles, agile development, UML, Web development, packaged solutions, enterprise resource planning (ERP), components, and so on.

We also wanted the text to teach the key concepts and techniques, not just describe them. Therefore, we focus on fundamentals of lasting value and then show how these fundamentals apply to all development approaches. We explore both traditional structured analysis and design and object-oriented analysis and design in depth. Flexible and innovative? Comprehensive and deep? We think you will agree these objectives have been achieved with this text.

INNOVATIONS

This text is unique in its integration of key systems modeling concepts that apply to both the traditional structured approach and the newer object-oriented approach—events that trigger system use cases and objects/entities that are part of the system's problem domain. We devote one chapter to identifying use cases and modeling key objects/entities. After completing that chapter, instructors can emphasize structured analysis and design or object-oriented analysis and design, or both. The object-oriented approach is not added as an afterthought—it is assumed from the beginning that everyone should understand the key object-oriented concepts. The traditional

approach is not discarded—it is assumed from the beginning that everyone should understand the key structured concepts.

FULL COVERAGE OF OO APPROACH

The object-oriented approach presented in this text is based on the Unified Modeling Language (UML 2.0) from the Object Management Group as originated by Grady Booch, James Rumbaugh, and Ivar Jacobson. A model-driven approach to analysis starts with use cases and scenarios and then defines problem domain classes involved in the users' work. We include requirements modeling with use case diagrams, use case descriptions, activity diagrams, and system sequence diagrams. Design models are also discussed in detail, with particular attention to detailed sequence diagrams, design class diagrams, and package diagrams. Design principles and design patterns are discussed throughout. Our database design chapter covers two approaches to object persistence—a hybrid approach using relational database management and a pure approach using object database management systems (ODBMS). Instructors who emphasize the object-oriented approach will not be disappointed by the presentation and depth of coverage in this text.

FULL COVERAGE OF TRADITIONAL APPROACH

The traditional approach presented in this text is based on modern structured analysis and design as refined by Stephen McMenamin and John Palmer, Ed Yourdon, and Meilir Page-Jones. Modern structured analysis is an integrated, model-driven approach that includes event partitioning, data modeling with entity-relationship diagrams (ERDs), and process modeling with data flow diagrams (DFDs). Modern structured design is also based on event partitioning and uses the structure chart for software design. Database design using relational database management techniques is featured. Instructors who emphasize the structured approach to development will be satisfied by the presentation and depth of coverage in this text.

EMERGING TOOLS AND TRENDS

Additional concepts and techniques are included in response to the realities of system development today. First, system development and the system development life cycle (SDLC) are explicitly defined as highly iterative. Although the text is organized as a sequential series of phases, the actual development project and the project plan are iterative. Second, emerging techniques and approaches that use an iterative approach are introduced, including the Unified Process (UP), Extreme Programming (XP), Agile Modeling, and Scrum. Finally, packaged solutions and enterprise resource planning (ERP) are described as alternatives to custom development throughout the book and in detail in a separate ERP chapter available on the book's Web site.

EMPHASIS ON ITERATION AND ARCHITECTURE

We did not reduce the amount of attention paid to the traditional approach to development. Many instructors choose to emphasize the traditional approach, but they also now cover the object-oriented approach to varying degrees. For both the traditional and the OO approach, however, we emphasize iterative development and three-layer architecture throughout. Predictive and adaptive approaches to the SDLC are discussed in relation to both approaches.

PROJECT MANAGEMENT COVERAGE AND SOFTWARE TOOLS

Many undergraduate programs depend on the systems analysis and design course to teach project management principles. To satisfy this need, we cover project management by taking a

two-pronged approach. First, specific project management techniques, skills, and tasks are included and highlighted throughout chapters of the book. This integration teaches students how to apply specific project management tasks to the various phases and activities of the systems development life cycle, including iterative development. Second, we include a 120-day trial version of Microsoft Project 2003 Professional in the back of every book so that students can obtain hands-on experience with this important tool. Third, a fairly extensive treatment of project management concepts and principles is provided in an appendix available on the book's Web site. This information is based on the Project Management Body of Knowledge (PMBOK) as developed by the Project Management Institute—the primary professional organization for project managers in the United States.

CHANGES FOR THE FOURTH EDITION

As we began considering updates to include in the fourth edition, we focused on refining some of the presentation and pedagogy, tightening some of the examples, and updating the material to reflect ongoing changes in analysis and design theory and practice. We also made some major changes based on our current research and feedback from instructors using the book.

The balanced coverage of the structured approaches and newer object-oriented approaches remains intact. This text can be used to emphasize the traditional structured approach with data flow diagrams or use case modeling, entity-relationship diagrams, structure charts, and relational databases; to focus on the object-oriented approach with use case modeling, domain and design class diagrams, interaction diagrams, package diagrams, and state machine diagrams; or to cover and compare both approaches in depth. We expanded the coverage of use cases to include them as a requirements model for the traditional approach as well as for the object-oriented approach. More and more development teams that work with traditional approaches and architectures are finding use cases and use case descriptions useful. We did not remove the discussion of data flow diagrams, but we suggest that some instructors might cover use cases instead.

IMPROVED ORGANIZATION

We changed the organization and order of some material, and we moved some material to the book's Web site as online supplemental chapters and appendices. This change gives instructors more flexibility in designing their courses, and it also makes the book more manageable. In this edition we improved the level and flow of the first OO design chapter and then we moved the updated second chapter to the Web site. We also moved the chapter on packages and ERP to the Web site. As a result, we are able to provide more updated material in the printed book without sacrificing breadth or depth.

PREDICTIVE VERSUS ADAPTIVE APPROACHES TO THE SDLC

Another key change is the emphasis on both predictive and adaptive approaches to the SDLC as a way to define a continuum between sequential and highly iterative life cycles. Project managers should be able to tailor the SDLC to meet specific project needs.

ENHANCED OO DESIGN COVERAGE

Probably the most noticeable change in the last edition was the extensive enhancement and expansion of the coverage of the object-oriented approach. In this edition, we continue to

refine the discussion and examples to make them as accessible as possible without sacrificing depth. Chapter 11 received extensive updates to the examples. We then updated the second advanced OO design chapter but included it as a separate online supplemental chapter on the book's Web site. As a result, the OO coverage is improved and actually expanded, but it does not overshadow the traditional approach.

ENHANCED COVERAGE OF IMPLEMENTATION AND SUPPORT

In this edition, we extensively updated our chapter on implementation and support (Chapter 15). Although analysis and design courses have traditionally surveyed implementation, iterative approaches call for more emphasis on programmers, implementation and integration techniques, and testing in early iterations. Therefore, it becomes impossible to consider analysis and design without considering implementation and testing throughout the project.

EXPANDED COVERAGE OF EMERGING APPROACHES

Our text has always presented emerging concepts and approaches to analysis and design and system development. In this edition, we more fully integrate some specific methodologies within the discussion of adaptive approaches to the SDLC in Chapter 2. Then in Chapter 16, we cover the specific methodologies in more detail. The book still assumes a generic, iterative approach to the SDLC, but instructors can be sure their students are aware of many emerging techniques and methodologies. We discuss the Unified Process (UP), Extreme Programming (XP). Agile Modeling, and Scrum.

STUDENT COMPANION WEB SITE

We have created an exciting online companion for students to utilize as they work through the fourth edition of *Systems Analysis and Design in a Changing World*. In the back of this text, you will find a key code that provides full access to a robust Web site, located at www.course.com/mis/sad4. This Web resource includes the following features:

- **Practice Quizzes.** Brand new quizzes, created specifically for this text, allow users to test themselves on the content of each chapter and immediately see what questions were answered right and wrong. For each question answered incorrectly, users are provided with the correct answer and the page in the text where that information is covered. Special testing software randomly compiles a selection of questions from a large database, so quizzes can be taken multiple times on a given chapter, with some new questions included each time.
- **Case Project.** An additional case project, similar in scope and complexity to the Reliable Pharmaceuticals case found in the book will be offered, giving students the opportunity to sharpen their skills. It will have installments for each chapter as well as corresponding solutions.
- **PowerPoint Slides.** Students can view the book's PowerPoint presentations, which cover the key points from each chapter. These presentations are a useful study tool.
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  - Online Supplemental Chapter 1, Advanced Topics in Object-Oriented Design
  - Online Supplemental Chapter 2, Packages and Enterprise Resource Planning
  - Appendix A, Principles of Project Management
  - Appendix B, Project Schedules with PERT/CPM Charts

- Appendix C, Calculating Net Present Value, Payback Period, and Return on Investment
- Appendix D, Presenting the Results to Management

- **Useful Web Links.** The site offers a repository of links to various Web sites where students can find more information about systems analysis and design in industry, possible careers, and other interesting resources for further learning.

ORGANIZATION AND USE

As in the third edition, the fourth edition is organized into four parts. Because of the increased separation of traditional and OO materials for system design and the expanded coverage of OO concepts, this print edition includes 16 chapters, supported by an additional two chapters and four appendices available on the book's Web site. Depending on the approach taken by the instructor, many chapters or sections of chapters can be skipped without loss of continuity. Some chapters are entirely optional. We begin with an overview of the entire text. Later, we discuss different approaches to using the text in analysis and design courses and include suggested course outlines for instructors emphasizing either the traditional structured approach or the object-oriented approach and also for instructors teaching graduate courses on analysis and design.

PART 1: THE SYSTEMS ANALYST

Chapter 1 discusses the work of an information systems analyst, including a streamlined discussion of systems and the role of the systems analyst as a problem solver in a modern business organization. The strategic information systems plan for Rocky Mountain Outfitters is discussed, and the customer support system project is identified as the planned project ready to start development. Chapter 2 then asks, Now that we have a project, what do we have to do to get this system built? That is, what are the methodologies, models, tools, and techniques that can be used to develop systems? Predictive and adaptive approaches to the system development life cycle (SDLC) and iterative variations are introduced. We make it clear that there are a variety of approaches to system development and that today's analysts need to be familiar with all of them. Even if students specialize in one approach in their course or later in their job, they should be able to distinguish among structured, object-oriented, and other approaches in a meaningful way. Chapter 3 moves right to the heart of the course—the system development project—introduced while describing the project planning phase of the SDLC in detail. Project planning, feasibility assessment, and project management techniques are covered. Students are drawn quickly into the RMO project so that the material has a meaningful context.

PART 2: SYSTEMS ANALYSIS TASKS

Part 2 moves ahead with systems analysis techniques. Chapter 4 describes the activities of the analysis phase of the SDLC in more detail. Then it focuses on investigating system requirements, including gathering information and interviewing system owners and users. Chapter 5 covers modeling system requirements—using our approach, which includes event partitioning and modeling objects/entities, as described earlier. Chapter 6 continues requirements modeling using the traditional approach, including data flow diagrams (DFDs), data flow definitions, and process descriptions. Some information engineering models and techniques are also discussed. Chapter 7 continues the discussion begun in Chapter 5 using the object-oriented approach to

requirements. Instructors can simply choose to emphasize Chapter 6 or Chapter 7 to focus the course on either the traditional or the object-oriented approach, or both. Chapter 8 presents an overview of technical environments that affect the generation of alternative system solutions. Then, a comprehensive guide to generating and evaluating alternatives is presented, including the reality that a packaged solution is always a viable option.

PART 3: SYSTEMS DESIGN TASKS

Chapter 9 introduces systems design and discusses the activities of the systems design phase of the SDLC in more detail. Details of the technological environment that affect design are reviewed, including networks, client/server architecture, and three-layer design. Chapter 10 discusses the traditional approach to design, including the latest thinking on three-layer designs. Chapter 11 and Online Supplemental Chapter 1 (available on the book's Web site) address object-oriented design. Chapter 11 teaches students how to design the interaction details for each use case—use case realization. Implementation issues for the three-layer design architecture are also discussed. Online Supplemental Chapter 1 discusses more advanced design patterns and design principles, including OO design for enterprise-level and Web-based systems. Additionally, state transitions and the state machine diagram are discussed in detail. Instructors can simply choose to emphasize Chapter 10 or Chapter 11 to focus the course on either the traditional or the object-oriented approach, or both. More depth in OO design can be provided by covering Online Chapter 1 in addition to Chapter 11. Chapter 12 covers database design—relational, hybrid, and object-oriented databases. Chapter 13 covers user interfaces and human-computer interaction, and we include general principles and concepts of dialog design in addition to using UML diagrams to model the dialog. Chapter 14 discusses system interfaces, with particular attention to system controls and system security.

PART 4: IMPLEMENTATION AND SUPPORT

Systems implementation is increasingly technology specific, and because of the diverse development environments in the real world, we decided to streamline the discussion of implementation. Chapter 15 provides an overview of implementation and support that addresses traditional technology and object technology. We also include a comprehensive discussion of some emerging approaches to system development in Chapter 16, including the Unified Process (UP), Extreme Programming (XP), Agile Modeling, and others. Similarly, although packaged solutions are discussed as viable alternatives throughout, we include a detailed discussion of packages and enterprise resource planning (ERP) in Online Supplemental Chapter 2, including specific examples from SAP.

DESIGNING YOUR ANALYSIS AND DESIGN COURSE

As discussed earlier, there are many approaches to teaching analysis and design courses, and the objectives of the course differ considerably from college to college. In some IS departments, the analysis and design course is a capstone course where students apply the material learned in prior database, telecommunications, and programming courses to a real analysis and design project. In other IS departments, analysis and design is used as an introduction to the field of system development, taken prior to more specialized courses. Some IS departments offer a two-course sequence emphasizing analysis in the first semester and design and

implementation in the second semester. Some IS departments have only one course that covers both analysis and design.

The design of the analysis and design course, always difficult, is complicated even more by the choice of emphasizing either the traditional structured approach or the newer object-oriented approach, again depending on local curriculum priorities. Additionally, the more iterative approach to development, in general, has made choices about sequencing the analysis and design topics more difficult. For example, with iterative development, a two-course sequence cannot be divided into analysis and then design as easily.

Given these issues, it is not practical to offer sample syllabi that will work for all of these options. The objectives, course content, assignments, and projects have too many variations. What we can offer are some suggestions for using the text in various approaches to the course.

TRADITIONAL ANALYSIS AND DESIGN COURSE

A traditional analysis and design course provides coverage of both systems analysis and systems design activities and tasks using structured analysis and structured design, with database design, input/output/controls design and dialog (interface) design. It is usually assumed the project will use custom development, including Web development. The course emphasizes the SDLC, project management, information gathering, and management reporting. One-semester courses are usually limited to completing some prototypes of the user interface to give students closure. Sometimes this course is spread over two semesters, with some implementation of an actual system going on in the second semester for a more complete development experience.

For this approach to the analysis and design course, a reasonable outline would omit chapters and sections detailing OO, current trends, and packages (these concepts are introduced throughout the text, however, so students will still be familiar with them). Additionally, because of the amount of material to cover, the appendices detailing project management, financial feasibility, scheduling, and presentations might be omitted.

A suggested outline for a course emphasizing the traditional approach follows:

Chapter 1: The World of the Information Systems Analyst
Chapter 2: Approaches to System Development
Chapter 3: The Analyst as a Project Manager
Chapter 4: Beginning the Analysis: Investigating System Requirements
Chapter 5: Modeling System Requirements
Chapter 6: The Traditional Approach to Requirements
Chapter 8: Evaluating Alternatives for Requirements, Environment, and Implementation
Chapter 9: Moving to Design
Chapter 10: The Traditional Approach to Design
Chapter 12: Designing Databases (skip OO design sections)
Chapter 13: Designing the User Interface (skip UML examples)
Chapter 14: Designing System Interfaces, Controls, and Security (skip OO sections)
Chapter 15: Making the System Operational (skip OO sections)

OBJECT-ORIENTED ANALYSIS AND DESIGN COURSE

This course is similar to the coverage of both analysis and design in the traditional course, except that object-oriented models and techniques are emphasized exclusively. Object-oriented analysis and object-oriented design, with database design, input/output/controls design and dialog (interface) design, are covered. It is usually assumed the projects will use custom development,

including Web development. The course emphasizes iterative development with three-layer architecture, project management, information gathering, and management reporting. One-semester courses are usually limited to completing some prototypes of the user interface to give students closure. Sometimes this course is spread over two semesters, with some implementation of an actual system going on in the second semester for a more complete development experience. Iterative development is usually emphasized.

For this approach to the analysis and design course, a reasonable outline would omit chapters and sections detailing structured analysis and structured design. The Current Trends chapter might be included to cover components and iteration, but packages probably would not be covered. Additionally, because of the amount of material to cover, the appendices detailing project management, financial feasibility, scheduling, and presentations might be omitted.

A suggested outline for a course emphasizing object-oriented development follows:

Chapter 1: The World of the Information Systems Analyst
Chapter 2: Approaches to System Development
Chapter 3: The Analyst as a Project Manager
Chapter 4: Beginning the Analysis: Investigating System Requirements
Chapter 5: Modeling System Requirements
Chapter 7: The Object-Oriented Approach to Requirements
Chapter 8: Evaluating Alternatives for Requirements, Environment, and Implementation
Chapter 9: Moving to Design
Chapter 11: The Object-Oriented Approach to Design: Use Case Realization
Online Supplemental Chapter 1: Advanced Topics in Object-Oriented Design
Chapter 12: Designing Databases
Chapter 13: Designing the User Interface
Chapter 14: Designing System Interfaces, Controls, and Security
Chapter 15: Making the System Operational
Chapter 16: Current Trends in System Development

TRADITIONAL COURSE WITH IN-DEPTH ANALYSIS AND PROJECT MANAGEMENT

Some courses delve more deeply into systems analysis methods and emphasize project management. Sometimes these courses are graduate courses, and sometimes they assume design and implementation are covered in more technical courses. In some cases, it might be assumed that packages are likely solutions rather than custom development, so defining requirements and managing the process are more important than design activities.

The appendices covering project management, financial feasibility, scheduling, and presentations should be included. Chapters on detailed design might be omitted. The packages/ERP chapter (Online Supplemental Chapter 2) might be included, if appropriate.

A suggested outline for courses emphasizing the traditional approach, with in-depth coverage of analysis and project management follows:

Chapter 1: The World of the Information Systems Analyst
Chapter 2: Approaches to System Development
Chapter 3: The Analyst as a Project Manager
Online Appendix A: Principles of Project Management
Online Appendix B: Project Schedules with PERT/CPM Charts