

Engineering Design A Project Based Introduction 3rd Edition

This book covers some of the most popular methods in design space sampling, ensembling surrogate models, multi-fidelity surrogate model construction, surrogate model selection and validation, surrogate-based robust design optimization, and surrogate-based evolutionary optimization. Surrogate or metamodels are now frequently used in complex engineering product design to replace expensive simulations or physical experiments. They are constructed from available input parameter values and the corresponding output performance or quantities of interest (QoIs) to provide predictions based on the fitted or interpolated mathematical relationships. The book highlights a range of methods for ensembling surrogate and multi-fidelity models, which offer a good balance between surrogate modeling accuracy and building cost. A number of real-world engineering design problems, such as three-dimensional aircraft design, are also provided to illustrate the ability of surrogates for supporting complex engineering design. Lastly, illustrative examples are included throughout to help explain the approaches in a more “hands-on” manner.

Readers gain a clear understanding of engineering design as ENGINEERING DESIGN PROCESS, 3E outlines the process into five basic stages – requirements, product concept, solution concept, embodiment design and detailed design. Designers discover how these five stages can be seamlessly integrated. The book illustrates how the design methods can work together coherently, while the book’s supporting exercises and labs help learners navigate the design process. The text leads the beginner designer from the basics of design with very simple tasks – the first lab involves designing a sandwich – to the job through more complex design needs. This effective approach to the design model equips learners with the skills to apply engineering design concepts both to conventional engineering problems as well as other design problems. Important Notice: Media content referenced within the product description or the product text may not be available in the ebook version.

This second edition of Project-Based Learning (PBL) presents an original approach to Science, Technology, Engineering and Mathematics (STEM) centric PBL. We define PBL as an “ill-defined task with a well-defined outcome.” which is consistent with our engineering design philosophy and the accountability highlighted in a standards-based environment. This model emphasizes a backward design that is initiated by well-defined outcomes, tied to local, state, or national standard that provides teachers with a framework guiding students’ design, solving, or completion of ill-defined tasks. This book was designed for middle and secondary teachers who want to improve engagement and provide contextualized learning for their students. However, the nature and scope of the content covered in the 14 chapters are appropriate for preservice teachers as well as for advanced graduate method courses. New to this edition is revised and expanded coverage of STEM PBL, including implementing STEM PBL with English Language Learners and the use of technology in PBL. The book also includes many new teacher-friendly forms, such as advanced organizers, team contracts for STEM PBL, and rubrics for assessing PBL in a larger format.

Every engineer must eventually face their first daunting design project. Scheduling, organization, budgeting, prototyping, all can be overwhelming in the short time given to complete the project. While there are resources available on project management and the design process, many are focused too narrowly on specific topics or areas of engineering. Practical Engineering Design presents a complete overview of the design project and beyond for any engineering discipline, including sections on how to protect intellectual property rights and suggestions for turning the project into a business. An outgrowth of the editors’ broad experience teaching the capstone Engineering Design course, Practical Engineering Design reflects the most pressing and often-repeated questions with a set of guidelines for the entire process. The editors present two sample project reports and presentations in the appendix and refer to them throughout the book, using examples and critiques to demonstrate specific suggestions for improving the quality of writing and presentation. Real-world examples demonstrate how to formulate schedules and budgets, and generous references in each chapter offer direction to more in-depth information. Whether for a co-op assignment or your first project on the job, this is the most comprehensive guide available for deciding where to begin, organizing the team, budgeting time and resources, and, most importantly, completing the project successfully.

Engineering Design with SOLIDWORKS 2019

Chemical Engineering Design

Global Engineering

Designing the Future

Improving Engineering Design

Creativity, Engagement and Learning

Engineering Design, Planning and Management covers engineering design methodology with an interdisciplinary approach, concise discussions, and a visual format. The book explores project management and creative design in the context of both established companies and entrepreneurial start-ups. Readers will discover the usefulness of the design process model through practical examples and applications from across the engineering disciplines. The book explains useful design techniques such as concept mapping and weighted decision matrices, supported with extensive graphics, flowcharts, and accompanying interactive templates. The discussions are organized around 12 chapters dealing with topics such as needs identification and specification; design concepts and embodiments; decision making; finance, budgets, purchasing, and bidding; communication, meetings, and presentations; reliability and system design; manufacturing design; and mechanical design. Methods in the book are applied to practical situations where appropriate. The design process model is fully demonstrated via examples and applications from a variety of engineering disciplines. The text also includes end-of-chapter exercises for personal practice. This book will be of interest to product designers/product engineers, product team managers, and students taking undergraduate product design courses in departments of mechanical engineering and engineering technology. Chapter objectives and end-of-chapter exercises for instructor use Available correlation table links chapter content to ABET criteria

Introduction to Engineering Design is a practical, straightforward workbook designed to systematize the often messy process of designing solutions to open-ended problems. From learning about the problem to prototyping a solution, this workbook guides developing engineers and designers through the iterative steps of the engineering design process. Created in a freshman engineering design course over ten years, this workbook has been refined to clearly guide students and teams to success. Together with a series of instructional videos and short project examples, the workbook has space for teams to execute the engineering design process on a challenge of their choice. Designed for university students who are both motivated learners, the workbook supports creative students as they tackle important problems. Introduction to Engineering Design is designed for educators looking to use project-based engineering design in their classroom.

This title contains information for first year engineering students to build quadcopters and to fly them under RC control and to perform a cargo delivery mission under autonomous control. It also contains many chapters of introductory information for engineering students. As the world becomes increasingly globalized, today’s companies expect to hire engineers who are effective in a global business environment. Although you can find many books covering globalization, most of them are aimed at business, management, or social sciences. Developed with engineers in mind, Global Engineering: Design, Decision Making, and Communication covers the theory, models, and decision making projects for incorporating globalization into engineering work. Written by a multidisciplinary team of experts in industrial, mechanical, and manufacturing engineering and organizational communications, this book is a primer on how to improve designs, make better decisions, and communicate more effectively in an international working environment. The contents of the book reflect the authors’ multidisciplinary perspective and their experience in working on projects around the world. The book presents globalization as a phenomenon that is widely complex and their engineering functions. It uses a case study format to explore system improvement projects and real industrial projects, ranging from design to supply chain and logistics problems. This case study format allows for a natural presentation of critical technical and non-technical concepts and their complex interactions. The challenge that engineers face in a global environment results from the need to be aware of interdependencies and to be able to determine which ones are most important in each situation. Unique in its focus on engineering, this book provides a framework for how to better design, make decisions, and communicate in the new era of global competition.

Design Thinking Research

Translation, Prototyping, and Measurement

Engineering Design

STEM Project-Based Learning

Engineering Instruction for High-Ability Learners in K-8 Classrooms

Project Management for Engineering Design

"Civil engineering is a profession that has a distinct focus on the design of infrastructure systems. There are major differences between the characteristics of the infrastructure design problems that civil engineers solve and the problems examined by other engineering disciplines, which tend to emphasize the design of smaller items produced for short term use. Beginning students in civil engineering should be made aware of these distinctions and the types of systems civil engineers design so that they can begin to think about the problems associated with them. This is the starting point for evolving into professional civil engineers whose area of expertise is design of the civil works infrastructure that supports modern societies."--
SOLIDWORKS 2019 and Engineering Graphics: An Integrated Approach combines an introduction to SOLIDWORKS 2019 with a comprehensive coverage of engineering graphics principles. Not only will this unified approach give your course a smoother flow, your students will also save money on their textbooks. What's more, the exercises in this book cover the performance tasks that are included on the Certified SOLIDWORKS Associate (CSWA) Examination. Reference guides located at the front of the book and in each chapter show where these performance tasks are covered. The primary goal of SOLIDWORKS 2019 and Engineering Graphics: An Integrated Approach is to introduce the aspects of Engineering Graphics with the use of modern Computer Aided Design package - SOLIDWORKS 2019. This text is intended to be used as a training guide for students and professionals. The chapters in this text proceed in a pedagogical fashion to guide you from constructing basic shapes to making complete sets of engineering drawings. This text takes a hands-on, exercise-intensive approach to all the important concepts of Engineering Graphics, as well as in-depth discussions of parametric feature-based CAD techniques. This textbook contains a series of sixteen chapters, with detailed step-by-step tutorial style lessons, designed to introduce beginning CAD users to the graphics language used in all branches of technical industry. This book does not attempt to cover all of SOLIDWORKS 2019's features, only to provide an introduction to the software. It is intended to help you establish a good basis for exploring and growing in the exciting field of Computer Aided Engineering.

The practice of design thinking has become widespread over the last several years, and an increasing number of individuals and institutions have come to recognize its innovative power. However, its success story has also meant that the term has evolved into something of an overused, or even misused, buzzword. The demand for an in-depth, evidence-based understanding of the way design thinking works has grown accordingly. This challenge is addressed by the Hasso Plattner Design Thinking Research Program. Summarizing the outcomes of the research program's 12th year, this book presents a broad range of scientific insights gained by researchers at the Hasso Plattner Institutes in Potsdam, Germany and Stanford University in California, in the course of their investigations, experiments and studies. Special focus is placed on the impact, accessibility and measurability of design thinking. The contributing authors seek to establish common ground, conduct modelling, and develop essential toolkits. The expanding field of neuroscience is also addressed in contributions that explore the neural basis for creativity and nonverbal actions. The results of this rigorous academic research are not meant to be discussed exclusively within the scientific community; they will hopefully find their way to those who seek to promote innovation through collaboration, be it at businesses or in society.

Written for introductory courses in engineering design, this text illustrates conceptual design methods and project management tools through descriptions, examples, and case studies.

Introduction to Engineering

Engineering Education

How Engineering Builds Creative Critical Thinkers in the Classroom

Chemical Engineering Design Project

Engineering Design with SOLIDWORKS 2021

Managing Engineering Design

Engineering design is a fundamental problem-solving model used by the discipline. Effective problem-solving requires the ability to find and incorporate quality information sources. To teach courses in this area effectively, educators need to understand the information needs of engineers and engineering students and their information gathering habits. This book provides essential guidance for engineering faculty and librarians wishing to better integrate information competencies into their curricular offerings. The treatment of the subject matter is pragmatic, accessible, and engaging. Rather than focusing on specific resources or interfaces, the book adopts a process-driven approach that outlasts changing information technologies. After several chapters introducing the conceptual underpinnings of the book, a sequence of shorter contributions go into more detail about specific steps in the design process and the information needs for those steps. While they are based on the latest research and theory, the emphasis of the chapters is on usable knowledge. Designed to be accessible, they also include illustrative examples drawn from specific engineering sub-disciplines to show how the core concepts can be applied in those situations.

This book shows educators how to encourage creativity, communication, innovation, and collaboration in students by incorporating engineering design process thinking into existing coursework. Strategies for supporting engineering practices that foster creative problem-solving and critical thinking are among the topics discussed.

Engineering Instruction for High-Ability Learners in K-8 Classrooms is an application-based practitioners’ guide to applied engineering that is grounded in engineering practices found in the new Next Generation Science Standards (NGSS) and the Standards for Engineering Education. The book presents and summarizes examples of integrating engineering into existing and newly designed curriculum. The book specifies necessary components of engineering curriculum and instruction, recommends appropriate activities to encourage problem solving, creativity, and innovation, and provides examples of innovative technology in engineering curriculum and instruction. Additionally, authors discuss professional development practices to best prepare teachers for engineering instruction and provide recommendations to identify engineering talent among K-8 students. Finally, the book includes a wealth of resources, including sample lesson and assessment plans, to assist educators in integrating engineering into their curriculum and instruction.

Engineering Design with SOLIDWORKS 2019 is written to assist students, designers, engineers and professionals. The book provides a solid foundation in SOLIDWORKS by utilizing projects with step-by-step instructions for the beginner to intermediate SOLIDWORKS user featuring machined, plastic and sheet metal components. Desired outcomes and usage competencies are listed for each project. The book is divided into five sections with 11 projects. Project 1 – Project 6: Explore the SOLIDWORKS User Interface and CommandManager, Document and System properties, simple and complex parts and assemblies, proper design intent, design tables, configurations, multi-sheet, multi-view drawings, BOMs, and Revision tables using basic and advanced features. Additional techniques include the edit and reuse of features, parts, and assemblies through symmetry, patterns, configurations, SOLIDWORKS 3D ContentCentral and the SOLIDWORKS Toolbox. Project 7: Understand Top-Down assembly modeling and Sheet Metal parts. Develop components In-Context with InPlace Mates, along with the ability to import parts using the Top-Down assembly method. Convert a solid part into a Sheet Metal part and insert and apply various Sheet Metal features. Project 8 – Project 9: Recognize SOLIDWORKS Simulation and Intelligent Modeling techniques. Understand a general overview of SOLIDWORKS Simulation and the type of questions that are on the SOLIDWORKS Simulation Associate – Finite Element Analysis (CSWA-FEA) exam. Apply design intent and intelligent modeling techniques in a sketch, feature, part, plane, assembly and drawing. Project 10: Comprehend the differences between additive and subtractive manufacturing. Understand 3D printer terminology along with a working knowledge of preparing, saving, and printing CAD models on a low cost printer. Project 11: Review the Certified SOLIDWORKS Associate (CSWA) program. Understand the curriculum and categories of the CSWA exam and the required model knowledge needed to successfully take the exam. The author developed the industry scenarios by combining his own industry experience with the knowledge of engineers, department managers, vendors and manufacturers. These professionals are directly involved with SOLIDWORKS every day. Their responsibilities go far beyond the creation of just a 3D model.

Make and Test Projects in Engineering Design

Designing for Competitive Advantage

A Project-based Experience in Engineering Methods

Principles, Practice and Economics of Plant and Process Design

An Object-oriented Approach

Integrating Information Into the Engineering Design Process

Cornerstone Engineering Design combines a wide range of topics such as design, engineering design, project management, team dynamics and project-based learning into a single introductory work. The text focuses particularly on conceptual design, providing a brief, and yet comprehensive introduction to design methodology and project management for students early on in their careers.

Project-Based Software Engineering is the first book to provide hands-on process and practice in software engineering essentials for the beginner. The book presents steps through the software development life cycle and two running case studies that develop as the steps are presented. Running parallel to the process presentation and case studies, the book supports a semester-long software development project. This book focuses on object-oriented software development, and supports the conceptualization, analysis, design and implementation of an object-oriented project. It is mostly language-independent, with necessary code examples in Java. A subset of UML is used, with the notation explained as needed to support the readers’ work. Two running case studies a video game and a library check out system show the development of a software project. Both have sample deliverables and thus provide the reader with examples of the type of work readers are to create. This book is appropriate for readers looking to gain experience in project analysis, design implementation, and testing.

Engineering Graphics with SOLIDWORKS 2021 is written to assist students, designers, engineers and professionals who are new to SOLIDWORKS. The book combines the fundamentals of engineering graphics and dimensioning practices with a step-by-step project based approach to learning SOLIDWORKS. The book is divided into four sections with 11 projects. Project 1 – Project 6: Explore the history of engineering graphics, learning with project-based learning environment and highlighting the best of each. It is intended to accompany students in their first full design project—from idea to product—throughout one twelve-week term. The pace, depth and breadth are ideal for novice design students, combining individual and team assignments and learning through the four phases of 4Ds of design: discover, define, develop and deliver. Examples of successful product designs are given throughout the book, as a motivation for the novice designer, along with up-to-date references.

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Engineering Design Process

STEM Project-Based Learning

Risk Mechanics Through Project-Based Learning

Cambridge Handbook of Engineering Education Research

Sustainable Ecological Engineering Design

SOLIDWORKS 2019 and Engineering Graphics

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The book helps students acquire design skills as they experience the activity of design by doing design projects. It is equally suitable for use in project-based first-year courses, formal engineering design courses, and capstone project courses.

Through research and proven practice, the aim of the International Conference of Sustainable Ecological Engineering Design for Society (SEEDS) is to foster ideas on how to reduce negative impacts on the environment while providing for the health and well-being of society. The professions and fields of research required to ensure buildings meet user demands and provide healthy enclosures are many and diverse. The SEEDS conference addresses the interdependence of people, the built and natural environments, and recognizes the interdisciplinary and international themes necessary to assemble the knowledge required for positive change.

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Through research and proven practice, the aim of the International Conference of Sustainable Ecological Engineering Design for Society (SEEDS) is to foster ideas on how to reduce negative impacts on the environment while providing for the health and well-being of society. The professions and fields of research required to ensure buildings meet user demands and provide healthy enclosures are many and diverse. The SEEDS conference addresses the interdependence of people, the built and natural environments, and recognizes the interdisciplinary and international themes necessary to assemble the knowledge required for positive change.

Engineering Design with SOLIDWORKS 2021 is written to assist students, designers, engineers and professionals. The book provides a solid foundation in SOLIDWORKS by utilizing projects with step-by-step instructions for the beginner to intermediate SOLIDWORKS user featuring machined, plastic and sheet metal components. Desired outcomes and usage competencies are listed for each project. The book is divided into five sections with 11 projects. Project 1 – Project 6: Explore the history of engineering graphics, learning with project-based learning environment and highlighting the best of each. It is intended to accompany students in their first full design project—from idea to product—throughout one twelve-week term. The pace, depth and breadth are ideal for novice design students, combining individual and team assignments and learning through the four phases of 4Ds of design: discover, define, develop and deliver. Examples of successful product designs are given throughout the book, as a motivation for the novice designer, along with up-to-date references.

Make and test projects are used as introductory design experiences in almost every engineering educational institution world wide. However, the educational benefits and costs associated with these projects have been seldom examined. Make and Test Projects in Engineering Design provides a serious examination of the design of make and test projects and their associated educational values. A taxonomy is provided for the design of make and test projects as well as a catalogue of technical information about unconventional engineering materials and energy sources. Case studies are included based on the author’s experience of supervising make and test projects for over twenty-five years. The book is aimed at the engineering educator and all those planning and conducting make and test projects. Up until now, this topic has been dealt with informally. Make and Test Projects in Engineering Design is the first book that formalises this important aspect of early learning in engineering design. It will be an invaluable teaching tool and resource for educators in engineering design.

Engineering Design Process

STEM Project-Based Learning