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### Mathematical Modelling with Case Studies - B Barnes, G R ...

Most mathematical studies so far have considered the particular case of a two-layer flow, in which there is exactly one interface. Francisco's PhD work focused on the strongly nonlinear, non-dispersive setting of three layers [2] and thus two interfaces, in a channel bounded by horizontal rigid walls, and also on the study of a model with the same setting but without the upper rigid lid [3] .

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### Mathematical modelling of waves in fluids

This booklet is primarily aimed at the mathematics teacher, but should also be of interest to teachers of science. It sets out a number of case studies suitable for mathematical modelling with calculus. The book starts with an explanation of the mathematical modelling process then suggests specific areas of study which include:

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## Mathematical Modelling with Calculus | STEM

Case Studies and Films Modelling Removal of Sulphur Dioxide from Flue Gas Oxford Mathematician Kristian Kiradjiev talks about his DPhil research, supervised by Chris Breward and Ian Griffiths in collaboration with W. L. Gore and Associates, Inc., on modelling filtration devices for removal of sulphur dioxide from flue gas.

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## Case Studies and Films | Mathematical Institute

This text, which serves as a general introduction to the area of mathematical modelling, is aimed at advanced undergraduate students in mathematics or closely related disciplines, e.g., students who have some prerequisite knowledge such as one-variable calculus, linear algebra and ordinary differential equations.

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## Mathematical Modelling - Concepts and Case Studies | J ...

Abstract. We propose a compartmental mathematical model for the spread of the COVID-19 disease with special focus on the transmissibility of super-spreaders individuals. We compute the basic reproduction number threshold, we study the local stability of the disease free equilibrium in terms of the basic reproduction number, and we investigate the sensitivity of the model with respect to the variation of each one of its parameters.

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Mathematical modeling of COVID-19 transmission dynamics ...

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Focusing on growth and decay processes, interacting populations, and heating/cooling problems, *Mathematical Modelling with Case Studies: A Differential Equations Approach using Maple™ and MATLAB®*, Second Edition presents mathematical techniques applicable to models involving differential equations that describe rates of change. Although the authors concentrate on models involving differential equations, the ideas used can be applied to many other areas. The book carefully details the process of constructing a model, including the conversion of a seemingly complex problem into a much simpler one. It uses flow diagrams and word equations to aid in the model building process and to develop the mathematical equations. Employing theoretical, graphical, and computational tools, the authors analyze the behavior of the models under changing conditions. They discuss the validation of the models and suggest extensions to the models with an emphasis on recognizing the strengths and limitations of each model. Through applications and the tools of Maple™ and MATLAB®, this textbook provides hands-on model building skills. It develops, extends, and improves simple models as well as interprets the results.

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Mathematical Modelling with Case Studies: Using Maple™ and MATLAB®, Third Edition provides students with hands-on modelling skills for a wide variety of problems involving differential equations that describe rates of change. While the book focuses on growth and decay processes, interacting populations, and heating/cooling problems, the mathematical techniques presented can be applied to many other areas. The text carefully details the process of constructing a model, including the conversion of a seemingly complex problem into a much simpler one. It uses flow diagrams and word equations to aid in the model-building process and to develop the mathematical equations. Employing theoretical, graphical, and computational tools, the authors analyze the behavior of the models under changing conditions. The authors often examine a model numerically before solving it analytically. They also discuss the validation of the models and suggest extensions to the models with an emphasis on recognizing the strengths and limitations of each model. The highly recommended second edition was praised for its lucid writing style and numerous real-world examples. With updated Maple™ and MATLAB® code as well as new case studies and exercises, this third edition continues to give students a clear, practical understanding of the development and interpretation of mathematical models.

Mathematical modelling is a subject without boundaries. It is the means by which mathematics becomes useful to virtually any subject. Moreover, modelling has been and continues to be a driving force for the development of mathematics itself. This book explains the process of modelling real situations to obtain mathematical problems that can be analyzed, thus solving the original problem. In this book the authors have succeeded in demonstrating just how enjoyable this subject can be. Each chapter ends with a set of exercises and some suggestions for class projects. Some projects are extensive; others are more modest. The text was designed to be suitable for a one-term course for advanced undergraduates on modelling. It

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can also be used in seminars or as preparation for mathematical modelling competitions.

Certain basic modeling skills can be applied to a wide variety of problems. It focuses on those mathematical techniques which are applicable to models involving differential equations. Models in three different areas are considered: growth and decay process, interacting populations and heating/cooling problems. The main mathematical technique is solving differential equations, while the range of applications and mathematical techniques presented provides a broad appreciation of this type of modeling. This book contains three general sections: Compartmental Models, Population Models and Heat Transfer Models. Within each section, the process of constructing a model is presented in full detail. Applications and case studies are integral to this text, and case studies are included throughout. This is a useful course text, and basic calculus and fundamental computing skills are required.

Over the past decade there has been an increasing demand for suitable material in the area of mathematical modelling as applied to science, engineering, business and management. Recent developments in computer technology and related software have provided the necessary tools of increasing power and sophistication which have significant implications for the use and role of mathematical modelling in the above disciplines. In the past, traditional methods have relied heavily on expensive experimentation and the building of scaled models, but now a more flexible and cost effective approach is available through greater use of mathematical modelling and computer simulation. In particular, developments in computer algebra, symbolic manipulation packages and user friendly software packages for large scale problems, all have important implications in both the teaching of mathematical modelling and, more importantly, its use in the solution of real world problems. Many

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textbooks have been published which cover the art and techniques of modelling as well as specific mathematical modelling techniques in specialist areas within science and business. In most of these books the mathematical material tends to be rather tailor made to fit in with a one or two semester course for teaching students at the undergraduate or postgraduate level, usually the former. This textbook is quite different in that it is intended to build on and enhance students' modelling skills using a combination of case studies and projects.

This lively, fascinating book is the first of its kind on Schubert. It appears at a time when interest in Schubert's life and compositions is greater than ever, and its publication coincides with the celebration of the bicentenary of Schubert's birth in 1797. The book opens with a chronicle of the composer's life, followed by more than 300 biographical entries on Schubert's friends and acquaintances, and on the numerous persons with whom he became associated through his music. There are also articles on later "Schubertians" who have greatly enriched our knowledge of his life and works [Publisher description].

This volume presents thirteen different case studies, ranging from cooking of cereal to the analysis of epidemic waves in animal populations.

This book is intended to be a useful contribution for the modern teaching of applied mathematics, educating Industrial Mathematicians that will meet the growing demand for such experts. It covers many applications where mathematics play a fundamental role, from biology, telecommunications, medicine, physics, finance and industry. It is presented in such a way that can be useful in Modelation, Simulation and Optimization courses, targeting master and PhD students. Its content is based on many editions from

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the successful series of Modelling Weeks organized by the European Consortium of Mathematics in Industry (ECMI). Each chapter addresses a particular problem, and is written in a didactic way, providing the description of the problem, the particular way of approaching it and the proposed solution, along with the results obtained.

Exploring Mathematical Modeling in Biology through Case Studies and Experimental Activities provides supporting materials for courses taken by students majoring in mathematics, computer science or in the life sciences. The book's cases and lab exercises focus on hypothesis testing and model development in the context of real data. The supporting mathematical, coding and biological background permit readers to explore a problem, understand assumptions, and the meaning of their results. The experiential components provide hands-on learning both in the lab and on the computer. As a beginning text in modeling, readers will learn to value the approach and apply competencies in other settings. Included case studies focus on building a model to solve a particular biological problem from concept and translation into a mathematical form, to validating the parameters, testing the quality of the model and finally interpreting the outcome in biological terms. The book also shows how particular mathematical approaches are adapted to a variety of problems at multiple biological scales. Finally, the labs bring the biological problems and the practical issues of collecting data to actually test the model and/or adapting the mathematics to the data that can be collected. Presents a single volume on mathematics and biological examples, with data and wet lab experiences suitable for non-experts. Contains three real-world biological case studies and one wet lab for application of the mathematical models. Includes R code templates throughout the text, which are also available through an online repository, along with the necessary data files to complete all projects and labs.

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An undergraduate text focussing on mathematical modelling stimulated by contemporary industrial problems.

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