Ansys Fluent Internal Combustion Engine Tutorial

This book focuses on the two-phase flow problems relevant in the automotive and power generation sectors. It includes fundamental studies on liquid–gas two-phase interactions, nucleate and film boiling, condensation, cavitation, suspension flows as well as the latest developments in the field of two-phase problems pertaining to power generation systems. It also discusses the latest analytical, numerical and experimental techniques for investigating the role of two-phase flows in performance analysis of devices like combustion engines, gas turbines, nuclear reactors and fuel cells. The wide scope of applications of this topic makes this book of interest to researchers and professionals alike.

This book comprises select proceedings of the International Conference on Future Learning Aspects of Mechanical Engineering (FLAME 2018). The book gives an overview of recent developments in the field of thermal and fluid engineering, and covers theoretical and experimental fluid dynamics, numerical methods in heat transfer and fluid mechanics, different modes of heat transfer, multiphase transport and phase change, fluid machinery, turbo machinery, and fluid power. The book is primarily intended for researchers and professionals working in the field of fluid dynamics and thermal engineering.

Containing the proceedings of the tenth International Conference on Advances in Fluid Mechanics it follows the success of all previous conferences in the series, the first of which took place in 1996. The field of fluid mechanics is vast and has numerous, diverse applications. This book covers a wide range of topics, including basic formulations and their computer modelling as well as the relationship between experimental and analytical results. The emphasis is on new applications and research currently in progress. Topics covered include: Computational methods; Hydrodynamics; Fluid structure interaction; Multiphase flow; Bio-fluids; Electronic components; Environmental fluid mechanics; Heat and mass transfer; Industrial applications; Energy systems; Nano and micro fluids; Turbulent flow; River hydraulics; Combustion problems; Jets; Fluidics; Bubble and drop dynamics.

This book presents the proceedings of the first vehicle engineering and vehicle industry conference. It captures the outcome of theoretical and practical studies as well as the future development trends in a wide field of automotive research. The themes of the conference include design, manufacturing, economic and educational topics.

This book provides an overview of floating offshore wind farms and focuses on the economic aspects of this renewable-energy technology. It presents economic maps demonstrating the main costs, and explores various important aspects of floating offshore wind farms. It examines topics including offshore wind turbines, floating offshore wind platforms, mooring and anchoring, as well as offshore electrical systems. It is a particularly useful resource in light of the fact that most water masses are deep and therefore not suitable for fixed offshore wind farms. A valuable reference work for students and researchers interested in naval and ocean engineering and economics, this book provides a new perspective on floating offshore wind farms, and makes a useful contribution to the existing literature.

Biofuels have recently attracted a lot of attention, mainly as alternative fuels for applications in energy generation and transportation. The utilization of biofuels in such controlled combustion processes has the great advantage of not depleting the limited resources of fossil fuels while leading to emissions of greenhouse gases and smoke particles similar to those of fossil fuels. On the other hand, a vast amount of biofuels are subjected to combustion in small-scale processes, such as for heating and cooking in residential dwellings, as well as in agricultural operations, such as crop residue removal and land clearing. In addition, large amounts of biomass are consumed annually during forest and savanna fires in many parts of the world. These types of burning processes are typically uncontrolled and unregulated. Consequently, the emissions from these processes may be larger compared to industrial-type operations. Aside from direct effects on human health, especially due to a sizeable fraction of the smoke emissions remaining inside residential homes, the smoke particles and gases released from uncontrolled biofuel combustion impose significant effects on the regional and global climate. Estimates have shown the majority of carbonaceous airborne particulate matter to be derived from the combustion of biofuels and biomass. “Production of Biofuels and Numerical Modelling of Chemical Combustion Systems” comprehensively overviews and includes in-depth technical research papers addressing recent progress in biofuel production and combustion processes. To be specific, this book contains sixteen high-quality studies (fifteen research papers and one review paper) addressing techniques and methods for bioenergy and biofuel production as well as challenges in the broad area of process modelling and control in combustion processes.

International Academic Conference in Prague 2017

Issues in Computation / 2013 Edition is a ScholarlyEditions™ book that delivers timely, authoritative, and comprehensive information about Computing. The editors have built Issues in Computation: 2013 Edition on the vast information databases of ScholarlyNews.™ You can expect the information about Computing in this book to be deeper than what you can access anywhere else, as well as consistently reliable, authoritative, informed, and relevant. The content of Issues in Computation / 2013 Edition has been produced by the world’s leading scientists, engineers, analysts, research institutions, and companies. All of the content is from peer-reviewed sources, and all of it is written, assembled, and edited by the editors at ScholarlyEditions™ and available exclusively from us. You now have a source you can cite with authority, confidence, and credibility. More information is available at http://www.ScholarlyEditions.com/.

Simulations and Optical Diagnostics for Internal Combustion EnginesCurrent Status and Way ForwardSpringer Nature

Engineers and other applied scientists are frequently faced with models of complex systems for which no rigorous mathematical solution can be calculated. To predict and calculate the behaviour of such systems, numerical approximations are frequently used, either based on measurements of real life systems or on the behaviour of simpler models. This is essential work for example for the process engineer implementing simulation, control and optimization of chemical processes for design and operational purposes. This fourth in a suite of five practical guides is an engineer?s companion to using numerical methods for the solution of complex mathematical problems. It explains the theory behind current numerical methods and shows in a step–by–step fashion how to use them. The volume focuses on differential and differential–algebraic systems, providing numerous real–life industrial case studies to illustrate this complex topic. It describes the methods, innovative techniques and strategies that are all implemented in a freely available toolbox called BzzMath, which is developed and maintained by the authors and provides up–to–date software tools for all the methods described in the book. Numerous examples, sample codes, programs and applications are taken from a wide range of scientific and engineering fields, such as chemical engineering, electrical engineering, physics, medicine, and environmental science. As a result, engineers and scientists learn how to optimize processes even before entering the laboratory. With additional online material including the latest version of BzzMath Library, installation tutorial, all examples and sample codes used in the book and a host of further examples.

This e-book is a compilation of papers presented at the 5th Mechanical Engineering Research Day (MERD'18) - Kampus Teknologi UTeM,

Melaka, Malaysia on 03 May 2018.

This book focuses on combustion simulations and optical diagnostics techniques, which are currently used in internal combustion engines. The book covers a variety of simulation techniques, including in-cylinder combustion, numerical investigations of fuel spray, and effects of different fuels and engine technologies. The book includes chapters focused on alternative fuels such as DEE, biomass, alcohols, etc. It provides valuable information about alternative fuel utilization in IC engines. Use of combustion simulations and optical techniques in advanced techniques such as microwave-assisted plasma ignition, laser ignition, etc. are few other important aspects of this book. The book will serve as a valuable resource for academic researchers and professional automotive engineers alike.

This research monograph presents both fundamental science and applied innovations on several key and emerging technologies involving fossil and alternate fuel utilization in power and transport sectors from renowned experts in the field. Some of the topics covered include: autoignition in laminar and turbulent nonpremixed flames; Langevin simulation of turbulent combustion; lean blowout (LBO) prediction through symbolic time series analysis; lasers and optical diagnostics for next generation IC engine development; exergy destruction study on small DI diesel engine; and gasoline direct injection. The book includes a chapter on carbon sequestration and optimization of enhanced oil and gas recovery. The contents of this book will be useful to researchers and professionals working on all aspects on combustion.

Computational Fluid Dynamics enables engineers to model and predict fluid flow in powerful, visually impressive ways and is one of the core engineering design tools, essential to the study and future work of many engineers. This textbook is designed to explcitly meet the needs engineering students taking a first course in CFD or computer-aided engineering. Fully course matched, with the most extensive and rigorous pedagogy and features of any book in the field, it is certain to be a key text. The only course text available specifically designed to give an applications-lead, commercial software oriented approach to understanding and using Computational Fluid Dynamics (CFD). Meets the needs of all engineering disciplines that use CFD. The perfect CFD teaching resource: clear, straightforward text, step-by-step explanation of mathematical foundations, detailed worked examples, end-of-chapter knowledge check exercises, and homework assignment questions

This book presents select proceedings of the International Conference on Future Learning Aspects of Mechanical Engineering (FLAME 2018). The book discusses interdisciplinary areas such as automobile engineering, mechatronics, applied and structural mechanics, bio-mechanics, biomedical instrumentation, ergonomics, biodynamic modeling, nuclear engineering, agriculture engineering, and farm machineries. The contents of the book will benefit both researchers and professionals.

This book comprises state-of-the-art advances in energy, combustion, power, propulsion, environment, focusing on the production and utilization of fossil fuels, alternative fuels and biofuels. It is written by internationally renowned experts who provide the latest fundamental and applied research innovations on cleaner energy production as well as utilization for a wide range of devices extending from micro scale energy conversion to hypersonic propulsion using hydrocarbon fuels. The tailored technical tracks and contributions are portrayed in the respective field to highlight different but complementary views on fuels, combustion, power and propulsion and air toxins with special focus on current and future R&D needs and activities. This book will serve as a useful reference for practicing engineers, research engineers and managers in industry and research labs, academic institutions, graduate students, and final year undergraduate students in mechanical, chemical, aerospace, energy, and environmental engineering.

Engineering mathematics is a branch of applied mathematics where mathematical methods and techniques are implemented for solving problems related to the engineering and industry. It also represents a multidisciplinary approach where theoretical and practical aspects are deeply merged with the aim at obtaining optimized solutions. In line with that, the present Special Issue, 'Engineering Mathematics in Ship Design', is focused, in particular, with the use of this sort of engineering science in the design of ships and vessels. Articles are welcome when applied science or computation science in ship design represent the core of the discussion.

Proceedings of the FISITA 2012 World Automotive Congress are selected from nearly 2,000 papers submitted to the 34th FISITA World Automotive Congress, which is held by Society of Automotive Engineers of China (SAE-China) and the International Federation of Automotive Engineering Societies (FISITA). This proceedings focus on solutions for sustainable mobility in all areas of passenger car, truck and bus transportation. Volume 2: Advanced Internal Combustion Engines (II) focuses on: •Flow and Combustion Diagnosis •Engine Design and Simulation •Heat Transfer and Waste Heat Reutilization •Emission Standard and International Regulations Above all researchers, professional engineers and graduates in fields of automotive engineering, mechanical engineering and electronic engineering will benefit from this book. SAE-China is a national academic organization composed of enterprises and professionals who focus on research, design and education in the fields of automotive and related industries. FISITA is the umbrella organization for the national automotive societies in 37 countries around the world. It was founded in Paris in 1948 with the purpose of bringing engineers from around the world together in a spirit of cooperation to share ideas and advance the technological development of the automobile.

The main objective of this computational study is to investigate the optimum injection and spark parameters for the direct injection spark ignition (DISI) Wankel rotary engine using diesel fuel. Currently only port fuel injected gasoline rotary engines are available in the automotive industry. Compared to reciprocating type engines rotary engine is mechanically simple, less vibrate, have higher power to weight ratio and achieve better performance at high rpm. Due to the inherent low fuel efficiency of rotary engine and increasing gas prices, application of the rotary engine in conventional automobiles is decreasing. This project seeks to introduce DISI technology to the rotary engine thus increase the fuel efficiency allowing it to be another efficient power source option for aero and automotive applications. DISI technology is the latest trend in the automobile manufacturing. This technology helped to combine benefits of both compression ignition (CI) and spark ignition (SI) engines into a single efficient internal combustion process. Multi-fuel capabilities, reduced operating pressures, and reduced compression ratios make this technology applicable for rotary engines. In this study diesel fuel, as opposed to gasoline, is introduced into the rotary engine using DISI technology. Due to high technological advancements used in DISI engines, it is expensive to experimentally incorporate this technology to a new engine. Accurately designed computational analyses can reduce both time and cost by cutting extra experimental test trials. For this computational fluid dynamics (CFD) study ANSYS FLUENT commercial software was used to integrate the DISI technology into a rotary engine model which was designed in Solidworks and meshed in GAMBIT. When creating the engine model, many parameters have to be considered. Engine geometry, injectors, and spark plugs were identified as the most important components needed to be investigated when integrating DISI technology into the rotary engine. By

using a readily available rotary engine, direct injector, and spark plug, the number of parameters for the optimization process were reduced. The most important parameters were picked to evaluate the optimum single injection and spark locations. Full factorial experimental design was used to estimate the sensitivity of different combinations of parameters. This was followed by a statistical sensitivity study using JMP 800 commercial software to determine the most and least sensitive parameters to analyze for the optimum setup of single injection rotary engine combustion. Contour plots of fuel consumption, CO2 generated, equivalence ratio, average temperatures, and pressures were used to support the results. The feasibility of multiple injections was also studied by means of their power outputs and fuel efficiencies. Optimum locations, amounts of fuel, number of orifices and orientations of orifices were included when evaluating optimum lead (second) injector. Similar studies were carried out to check the applicability of a third injector. From the results it can be observed that a dual injection setup provided optimum performance from the DISI rotary engine.

Multiphase flows are found in all areas of technology, at all length scales and flow regimes and can involve compressible or incompressible linear or nonlinear, fluids. However, although they are ubiquitous, multiphase flows continue to be one of the most challenging areas of computational mechanics, with numerous problems as yet unsolved. Advanced computational and experimental methods are often required to solve the equations that describe such complex problems. The many challenges that must be faced in solving them include modelling nonlinear fluids, modelling and tracking interfaces, dealing with multiple length scales, characterising phase structures, and treating drop break-up and coalescence. It is important to validate models, which calls for the use of expensive and difficult experimental techniques.This book presents contributions on the latest research in the techniques for solving multiphase flow problems, presented at the seventh in a biennial series of conferences on the subject that began in 2001. Featured topics include: Flow in porous media; Turbulent flow; Multiphase flow simulation; Image processing; Heat transfer; Atomization; Interface behaviour; Oil and gas applications; Experimental measurements; Energy applications; Biological flows; Micro and macro fluids; Compressible flows.

Hydrogen is proposed by many to be the fuel of the future as it is the key ingredient in a transition from a fossil fuel-based economy toward a zero carbon emission and sustainable energy economy. Hydrogen can serve as an efficient energy carrier for hydrogen-based technologies (e.g., fuel cells and hydrogen internal combustion engine) and lead to substantial reduction of greenhouse gas emissions and great environmental benefits. Hydrogen can be produced by a variety of technologies (e.g., steam methane reforming (SMR), coal gasification, biomass gasification, electrolysis, partial oxidation, solar thermal cracking) from fossil (e.g., natural gas), non-fossil (e.g., biogas) and non-carbon (e.g., water) sources, which highlights the great potential and flexibility of a hydrogen-based economy. Additionally, hydrogen is a key feedstock for the petroleum refining and fine chemical manufacturing industries. With current state-of-the-art technology, hydrogen is produced almost exclusively from fossil fuels by SMR. At SMR-based hydrogen plants, the reformers are the most expensive equipment in terms of the maintenance and operating costs, and thus, even a small improvement in the reformer thermal efficiency to lower operating costs of the reformer without compromising the expected service life of the reformer is expected to allow the plants to achieve a significant profit. Motivated by these considerations, a systematic framework for creating and simulating a computational fluid dynamics (CFD) model for an industrial-scale reformer at an SMR-based hydrogen plant and, subsequently, a framework for designing and evaluating a real-time furnace balancing scheme are developed in this dissertation. Specifically, a CFD model for an industrial-scale reformer is created in ANSYS Fluent, which is used to improve our understanding of the physiochemical processes in the tube side and the furnace side of the reformer as well as their thermal interactions during the catalytic conversion of methane. Then, a furnace balancing scheme is developed to optimize the reformer input at the nominal total furnace-side feed (FSF) flow rate that minimizes the inherent variability in the outer tube wall temperature (OTWT) distributions along the reforming tube length. Subsequently, a statistical-based model identification is developed to create a computationally efficient and robust model for the OTWT distribution as a function of the FSF distribution, total FSF flow rate and interactions among neighboring reforming tubes so that the optimized reformer input can be identified in real-time. Finally, a real-time furnace-balancing scheme is developed to optimize the reformer input such that the reformer thermal efficiency is maximized without compromising the expected service life of the reformer.

This book offers a guide to understanding models of vortex rings, starting from classical ones (circular vortex filament, Hill and Norbury-Fraenkel inviscid models) to very recent models incorporating viscous effects and realistic shapes of the vortex core. Unconfined and confined viscous vortex rings are described by closed formulae for vorticity, stream function, translational velocity, energy, impulse and circulation. Models are applied to predict the formation number of optimal vortex rings and to describe two-phase vortex ring-like structures generated in internal combustion engines. The book provides a detailed presentation of analytical developments of models, backed up by illustrations and systematic comparisons with results of direct numerical simulations. The book is useful for graduate students in applied mathematics, engineering and physical sciences. It is a useful reference for researchers and practising engineers interested in modelling flows with vortex rings.

This book provides an introduction to basic thermodynamic engine cycle simulations, and provides a substantial set of results. Key features includes comprehensive and detailed documentation of the mathematical foundations and solutions required for thermodynamic engine cycle simulations. The book includes a thorough presentation of results based on the second law of thermodynamics as well as results for advanced, high efficiency engines. Case studies that illustrate the use of engine cycle simulations are also provided.

This book consists of selected peer-reviewed papers presented at the NAFEMS India Regional Conference (NIRC 2018). It covers current topics related to advances in computer aided design and manufacturing. The book focuses on the latest developments in engineering modelling and simulation, and its application to various complex engineering systems.

Finite element method/finite element analysis, computational fluid dynamics, and additive manufacturing are some of the key topics covered in this book. The book aims to provide a better understanding of contemporary product design and analyses, and hence will be useful for researchers, academicians, and professionals.

A Gasoline Direct Injection (GDI) engine enables an increased fuel efficiency and higher power output than a conventional Port Fuel Injection (PFI) system. By injecting pressurized fuel straight into each cylinder of an internal-combustion engine, the degree of fuel atomization is increased, as well as the fuel vaporization rate. In order to further harness the effects of direct injection, ethanol is implemented as a fuel. The cooling effect of ethanol fuel droplets changing to vapor inside the combustion chamber facilitates a higher compression ratio, thus increasing engine power and efficiency. Three dimensional computational simulation is used to investigate the feasibility of ethanol and gasoline-ethanol mixtures as a fuel over varying compression ratios in a GDI engine. ANSYS Workbench is used to build a dynamic mesh of the varying compression ratio models, in conjunction with SolidWorks modeling software. To simulate flow physics, fuel injection, and combustion in the engine, ANSYS Fluent is employed. A parametric study of the effect of spark timing and compression ratio under ethanol operation at cruise RPM is performed. Additionally, a dual-injector gasoline-ethanol setup is implemented for the GDI engine and the effects of injection timing and mixture fraction of fuel is analyzed. Both ethanol and bi-fuel operation settings are found to provide significantly higher horsepower than the stock GDI engine. The dual-injector, bi-fuel operation is found to provide a specific fuel consumption comparable to the stock engine while providing substantially higher output. The results yield a promising fuel delivery strategy which can be appealing to many direct injection engine applications.

Industrial Applications of High-Performance Computing: Best Global Practices offers a global overview of high-performance computing (HPC) for industrial applications, along with a discussion of software challenges, business models, access models (e.g., cloud computing), public-private partnerships, simulation and modeling, visualization, big data analysis, and governmental and industrial influence. Featuring the contributions of leading experts from 11 different countries, this authoritative book: Provides a brief history of the development of the supercomputer Describes the supercomputing environments of various government entities in terms of policy and service models Includes a case study section that addresses more subtle and technical aspects of industrial supercomputing Shows how access to supercomputing matters, and how supercomputing can be used to solve large-scale and complex science and engineering problems Emphasizes the need for collaboration between companies, political organizations, government agencies, and entire nations Industrial Applications of High-Performance Computing: Best Global Practices supplies computer engineers and researchers with a state-of-the-art supercomputing reference. This book also keeps policymakers and industrial decision-makers informed about the economic impact of these powerful technological investments.

A pump is a mechanical device that converts mechanical energy into hydraulic energy. The aim of the current work is to examine the behavior of fluid flow inside a rotary sliding vane pump and assessing the performance by studying the effect of change of the rotational speed, number of vanes and the radial clearance gap size between vane tips and stator surface on the performance of the pump. The commercial finite-volume solver ANSYS Fluent was used to build a 3D model of the pump and simulate the flow behavior in it with an additional C-language source code for the description of the dynamic mesh motion. Pump flow was studied using lubricating oil, 5W-30, as the working fluid. Several computational configurations were used for the numerical simulation.

The Kurdistan region of Northern Iraq is one of the emerging areas in the Middle East, rich in oil, gas and mineral resources as well as underground water. However, until recently the political and security issues were such that the region was unable to take advantage of these resources. Nowadays Kurdistan is emerging as one of the fastest developing areas in the Middle East with its universities playing a major role in this process.This book contains the proceedings of the First International Conference on Petroleum and Mineral Resources, held at Koya University in Kurdistan, Iraq. Topics covered include Petroleum Exploration; Drilling and Well Design; Gas Production; Petrochemical Engineering; Geological Structures; Metal Ore Extraction; Resource and Production Engineering; Multiphase Flow; Processing of Oil and Gas; Hydrocarbon Transportation; Pipelines; Field Support Facilities; Project Development and Management; Safety Management; Environmental Management; Operation Economics and Investment; Regulations and Legislation; Corrosion, Infrastructure Protection

???????

This book highlights the important need for more efficient and environmentally sound combustion technologies that utilise renewable fuels to be continuously developed and adopted. The central theme here is two-fold: internal combustion engines and fuel solutions for combustion systems. Internal combustion engines remain as the main propulsion system used for ground transportation, and the number of successful developments achieved in recent years is as varied as the new design concepts introduced. It is therefore timely that key advances in engine technologies are organised appropriately so that the fundamental processes, applications, insights and identification of future development can be consolidated. In the future and across the developed and emerging markets of the world, the range of fuels used will significantly increase as biofuels, new fossil fuel feedstock and processing methods, as well as variations in fuel standards continue to influence all combustion technologies used now and in coming streams. This presents a challenge requiring better understanding of how the fuel mix influences the combustion processes in various systems. The book allows extremes of the theme to be covered in a simple yet progressive way.

In a book that will be required reading for engineers, physicists, and computer scientists, the editors have collated a number of articles on fluid mechanics, written by some of the world’s leading researchers and practitioners in this important subject area.

As the combustion engine looks set to remain the dominant energy conversion unit in vehicle powertrains in the medium term, either in combination with electrical components or on its own, attention will need to be paid to continue improving its efficiency in the future. The high development depth of today's combustion engines means that it is becoming increasingly difficult to achieve significant efficiency improvements by simple means. On the search for these improvements, the focus has shifted to inner-engine processes, for instance charge cycles including the charging system, the mixture formation including injection, combustion and kinematic conversion of the energy within the fuel. Our 2nd conference 'Engine processes' aims to offer all developers a platform to discuss the latest technological developments in the field of inner-engine process control, and encourage new paths to be taken. We believe that the program for this conference is a sound foundation for this endeavour. Da der Verbrennungsmotor auch mittelfristig die dominierende Energiewandlungseinheit im Antriebsstrang von Kraftfahrzeugen sein wird, entweder im Verbund mit elektrischen Komponenten oder aber als alleiniger Antrieb, muss der Verbesserung von dessen Wirkungsgrad auch in Zukunft erhebliche Aufmerksamkeit zu Teil werden. Aufgrund der hohen Entwicklungstiefe, die heutige Verbrennungsmotoren aufweisen,

wird es immer schwerer, deutliche Wirkungsgradverbesserungen auf einfachem Weg zu erreichen. Auf der Suche nach diesen Verbesserungen rücken die innermotorischen Prozesse immer mehr in den Fokus, hierzu zählen der Ladungswechsel inkl. Aufladesystem, die Gemischbildung inkl. Einspritzung, die Verbrennung sowie die kinematische Wandlung der im Kraftstoff gebundenen Energie. Unsere 2. Tagung „Motorische Prozesse“ soll nun allen Entwicklern als Austauschforum zu neuesten technologischen Entwicklungen auf dem Gebiet der innermotorischen Prozessführung dienen und dazu anregen neue Wege zu beschreiten. Wir sind überzeugt, mit dem vorliegenden Tagungs-Programm hierzu einen sehr guten Beitrag leisten zu können.

With regard to both the environmental sustainability and operating efficiency demands, modern combustion research has to face two main objectives, the optimization of combustion efficiency and the reduction of pollutants. This book reports on the combustion research activities carried out within the Collaborative Research Center (SFB) 568 “Flow and Combustion in Future Gas Turbine Combustion Chambers” funded by the German Research Foundation (DFG). This aimed at designing a completely integrated modeling and numerical simulation of the occurring very complex, coupled and interacting physico-chemical processes, such as turbulent heat and mass transport, single or multi-phase flows phenomena, chemical reactions/combustion and radiation, able to support the development of advanced gas turbine chamber concepts

The field of chemical engineering is in constant evolution, and access to information technology is changing the way chemical engineering problems are addressed. Inspired by the need for a user-friendly chemical engineering text that demonstrates the real-world applicability of different computer programs, Introduction to Software for Chemical Engineers acquaints readers with the capabilities of various general purpose, mathematical, process modeling and simulation, optimization, and specialized software packages, while explaining how to use the software to solve typical problems in fluid mechanics, heat and mass transfer, mass and energy balances, unit operations, reactor engineering, and process and equipment design and control. Employing nitric acid production, methanol and ammonia recycle loops, and SO2 oxidation reactor case studies and other practical examples, Introduction to Software for Chemical Engineers shows how computer packages such as Excel, MATLAB®, Mathcad, CHEMCAD, Aspen HYSYS®, gPROMS, CFD, DEM, GAMS, and AIMMS are used in the design and operation of chemical reactors, distillation columns, cooling towers, and more. Make Introduction to Software for Chemical Engineers your go-to guide and quick reference for the use of computer software in chemical engineering applications.

This book aims to show how hemodynamic numerical models based on Computational Fluid Dynamics (CFD) can be developed. An approach to fluid mechanics is made from a historical point of view focusing on the Navier-Stokes Equations and a fluid-mechanical description of blood flow. Finally, the techniques most used to visualize cardiac flows and validate numerical models are detailed, paying special attention to Magnetic Resonance Imaging (MRI) in case of an in vivo validation and Particle Image Velocimetry (PIV) for an in vitro validation.

This volume comprises the proceedings of the 42nd National and 5th International Conference on Fluid Mechanics and Fluid Power held at IIT Kanpur in December, 2014.The conference proceedings encapsulate the best deliberations held during the conference. The diversity of participation in the conference, from academia, industry and research laboratories reflects in the articles appearing in the volume. This contributed volume has articles from authors who have participated in the conference on thematic areas such as Fundamental Issues and Perspectives in Fluid Mechanics; Measurement Techniques and Instrumentation; Computational Fluid Dynamics; Instability, Transition and Turbulence; Turbomachinery; Multiphase Flows; Fluid?Structure Interaction and Flow?Induced Noise; Microfluidics; Bio?inspired Fluid Mechanics; Internal Combustion Engines and Gas Turbines; and Specialized Topics. The contents of this volume will prove useful to researchers from industry and academia alike.

This book comprises research studies of novel work on combustion for sustainable energy development. It offers an insight into a few viable novel technologies for improved, efficient and sustainable utilization of combustion-based energy production using both fossil and bio fuels. Special emphasis is placed on micro-scale combustion systems that offer new challenges and opportunities. The book is divided into five sections, with chapters from 3-4 leading experts forming the core of each section. The book should prove useful to a variety of readers, including students, researchers, and professionals.