

Computational Fluid Dynamics Applications in Mechanical Engineering (Series 6)

Editors:

Nofrizalidris bin Darlis
Muhammad Faiz bin Md Shakhiah
Nadia Shaira binti Shafii

Abstract: This sixth series, Computational Fluid Dynamics Applications in Mechanical Engineering, places a special emphasis on biomedical engineering applications. It provides an in-depth exploration of the fundamental principles and practical implementations of CFD within the biomedical domain. Furthermore, this book highlights how computational modeling serves as a vital tool for understanding fluid behavior in physiological systems and for advancing the design and optimization of biomedical devices. Covering topics such as blood flow simulation, respiratory airflow analysis, and fluid–structure interaction in prosthetics and implants, the book integrates theoretical foundations with case-based applications. Emphasis is placed on the interdisciplinary nature of CFD, bridging engineering, biology, and medicine to foster innovation in healthcare technology. This volume serves as an essential reference for biomedical engineering students, researchers, and professionals seeking to apply computational techniques to enhance biomedical research, diagnostics, and device development.

Keywords: Computational fluid dynamics, mechanical engineering, biomedical engineering, respiratory airflow analysis, computational modeling.

SERIES 6

Computational Fluid Dynamics Applications

In Mechanical Engineering



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Applications of Computational Fluid Dynamics in Mechanical Engineering – Series 6

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CHAPTER 1

MIDDLE CEREBRAL ARTERY ANEURYSM COIL POROSITY ANALYSIS ON STENOSIS FORMATION USING CFD MECHANICS

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CHAPTER 2

CFD STUDY OF TISSUE ENGINEERING SCAFFOLD

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2.0 INTRODUCTION

In the tissue engineering field, bone tissue engineering (BTE) is regarded as a potential strategy for the development and growth of new bone tissues. To promote cell growth and the transfer of nutrients, bone scaffolds should have an interconnected pore structure and mechanical characteristics close to those of the surrounding tissues [1]. The goal of tissue engineering is to create innovative biofunctional tissues as well as to rejuvenate and heal diseased or damaged tissue. In 2017, there were over 22.3 million orthopedic surgical procedures conducted globally; by 2022, that number is expected to surpass 28.3 million [2].

CHAPTER 3

TEMPERATURE ANALYSIS IN A CENTRIFUGE USING NUMERICAL TECHNIQUE

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CHAPTER 4

THREE-DIMENSIONAL (3D) RECONSTRUCTION AND FLUID FLOW SIMULATION THROUGH THE RADIOCEPHALIC ARTERIOVENOUS FISTULA WITH LOCALIZE STENOSIS

Nadia Shaira Shafii^{1,5}, Fakhreez Irfan Ikhwan¹, Nurulnatisya Ahmad³, Kahar Osman^{2,5}, Muhammad Faiz Md Shakhiah¹ and Nofrizalidris Darlis⁴*

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CHAPTER 5

HYPERTENSION OF MIDDLE CEREBRAL ANEURYSM

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CHAPTER 6

NUMERICAL HEAT TRANSFER ANALYSIS AND THERMAL OPTIMIZATION OF INFANT INCUBATOR SYSTEMS

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