Preface to the 2nd Edition

Five years have passed since the first edition of this book was published. Over the five years, the world has witnessed a technological revolution headlined by an array of exciting consumer and industrial products such as the Ninentendo Wii, Apple iPod/iPad, sensor-rich smart phones, phones with cameras, new operating systems for mobile phones and apps, ebooks, WiFi, voice over IP calls, social networking, 3D animated movies, and cloud computing, to name the major ones that affect everyday living. These new entries were practically non-existent in the main stream when the first edition of this book was published in 2005. World news in 2010 is dominated by such themes as alternative energy, scarcity of resources, manufacturing outsourcing, budget and credit crisis, economic growth in some parts of the world, and reforms in financial management, health care, and education.

This book has been warmly welcomed since its first print. It is adapted in over 50 universities world wide, and has been translated into three international editions (simplified Chinese, traditional Chinese, and Korean). In preparing for the second edition, I am very encouraged by feedback from editors, students, and teachers who use this book. The objectives of the second edition is the following:

1. To strengthen the book's discussion about MEMS design, processing, and materials.
2. To update course materials by including new insights and new developments. Many changes have happened to the MEMS field. New ideas, new capabilities, and new case studies of product successes are available today. This book reflects these new trends in development.
3. To enrich this book by providing new homework problems, updated examples, figures, etc.
4. To correct known mistakes;
5. To provide an enduring infrastructure to support teaching activities and MEMS education to a broader audience.

Readers will find the following major update features:

New contents, concepts, and insight. The MEMS field has changed dramatically in the past five years. This book captures new contents (generated in academia and industry), new concepts (e.g., packaging and integration), and insights. This should provide more value for the reader.

New homework problems. New homework problems have been added to facilitate teaching and student learning. Homework solutions can be provided to teachers upon request.

Added analytical examples for design and process selection. This new edition provides teachers with new materials to discuss design and process analytically.

New beginner-friendly materials for teaching processes. Beginning students may be amazed by the array of processing related information. A number of new tables are provided to make it easier for students to climb the learning curve. These tables (in the appendix section) provide first time students a simplified summary of the most commonly encountered materials and etching methods. An easy-to-understand table summarizing their interactions is also provided.

Deeper case studies added to challenge the readers understanding about the subject. The overall structural of the book is maintained. A new chapter (Chapter 15) is added, dealing with in-depth case discussion of successful MEMS products in the market place. I believe these commercialized MEMS devices, conceived for and tested in the real-life business world, are good examples to illustrate principles of design, fabrication, and integration. A discussion of most essential fabrication technology is added in Chapter 2. The discussion is meant to provide essential and qualitative review of processing methods. Other changes can be found in various chapters, especially Chapters 1, 2, 12, 15, and 16.

A new dedicated companion website for teachers and students. The website is a permanent home to the book and will serve the readers of this book in the new era of internet and on-line communication. On this website, a reader can find supplemental chapters, supplemental teaching materials, links to resources pertaining to the MEMS field, and errata. Teachers will find teaching aid materials such as powerpoint files, figures, homework solutions, etc. The website serves a number of important purposes. It is originally driven by the desire to not make this book too large while still maintain its ability to satisfy a varied audience. It will help the user community in a way that is more enduring than a single print.

The website dedicated to this book is http://www.memscentral.com.

Chapter line-up and flow is streamlined. The chapter on optical MEMS is now moved to the website as a supplement. This and other chapters dealing with specialty topics (such as RF MEMS, BioMEMS) will be hosted in the website so that I can keep the book small and still satisfy the needs of teachers who wish to discuss about these exciting areas in class. Moving the chapters to the website also makes it possible to update frequently.

May the MEMS field continue to grow! I hope you enjoy reading and using this book.

Chang Liu
Evanston, IL
September 2010