

Green and Sustainable Manufacturing Enterprise Systems

(綠色及永續製造企業系統)

Summer 2023

Instructor: Dr. F. Frank Chen

Time: Tuesdays & Wednesdays

14:00 -15:15; 15:30 - 16:45; and 17:00-18:15

Office: BGA0321

Office Hours: Wednesdays 10:30-12:00 noon

Classroom: BGA0340

Phone: 0919-551417 (cell phone)

E-mail: ff.chen@utsa.edu

Teaching Assistant: to be announced

Required Textbooks:

- *Green Intentions: Creating a Green Value Stream to Compete and Win*, B. Wills, Productivity Press, New York, NY, 2009, ISBN: 978-1-4200-8961-5
- *Creating a Lean and Green Business System: Techniques for Improving Profits and Sustainability*, by K. Zokaei, H. Lovins, A. Wood and P. Hines, CRC Press, 2013, ISBN: 978-1-4665-7112-9

Major Reference Books:

- *Lean and Green: Profit for Your Workplace and Environment*, P. J. Gordon, Berrett-Koehler, San Francisco, CA, 2001, ISBN: 1-57675-170-8
- *Green Manufacturing: Case Studies in Lean and Sustainability*, Association for Manufacturing Excellence, Productivity Press, New York, NY, 2008, ISBN: 978-1-56327-389-6
- *The Innovative Lean Enterprise: Using the Principles of Lean to Create and Deliver Innovation to Customers*, by A. Sgroi, Jr., CRC Press, 2014, ISBN: 978-1-4822-0390-5

Grading Algorithm:

Mid-Term and Final Exam	75% (37.5% each)
Term Project Proposal & Report	15%
Term Project Presentation	10%
Class Participations and Attendance	5% (bonus)

Date

Topic(s)

2022

July 4 & 5

Introduction to Lean Manufacturing & Value Stream Mapping
 From Lean to Green and Sustainable Manufacturing
 Chapter 1 – From Lean to Green: Green Value Stream Thinking
 Chapter 2 – Understanding Your Green Value Streams
 Chapter 3 – The First Green Waste: Energy
 Term Project Instructions Distributed

July 11 & 12

Chapter 4 – The Second Green Waste: Water
 Chapter 5 – The Third Green Waste: Materials
 Chapter 6 – The Fourth Green Waste: Garbage
 Chapter 7 – The Fifth Green Waste: Transportation
 Review and Discussions

July 18 & 19 Chapter 8 – The Sixth Green Waste: Emissions
Chapter 9- The Seventh Green Waste: Biodiversity
Lecture on Success Stories and Advices
US EPA Lean and Green Supply Chain (supplemental reading)
Review and Discussions

Mid-Term Exam (July 25, 14:00-15:30)

July 25 & 26 Creating a Lean and Green Enterprise System – Parts I & II (second book)
Case Studies and Reading Assignments (to be assigned)
Review and Discussions

Term Project Proposal Due (at the beginning of class on August 1)

August 1 & 2 Case Studies and Reading Assignments (to be assigned)
Review and Discussions

August 8 **Term Project Presentations** (August 8, 14:00 – 16:45, must attend)
Review and Discussions (August 8, 17:00-18:15)
Term Project Written Report (due at the end of class on August 8, 18:15)

Final Exam (August 9, 14:00-15:30)

August 9 Review and Discussions (16:00-18:00)

Notes:

- 1) Electronic lecture notes will be provided to all students.
- 2) Instructions for term project report and presentation will be provided separately.
- 3) Supplemental readings will be provided and discussed in class, if time allows. All supplemental readings discussed will be included in the exams.
- 4) Closed-book for both exams, but four-page (one-sided) notes are allowed.
- 5) Attendance and participation in class discussions are highly desirable.

F. FRANK CHEN

Dr. F. Frank Chen is the Lutchter Brown Distinguished Chair in Advanced Manufacturing University of Texas at San Antonio where he served as the Interim Department Chair of Mechanical Engineering (2006-2007) and founded the [Center for Advanced Manufacturing and Lean Systems](#) (an Engineering/University level Center) and served as the center director (2007-2015). Before joining UTSA in 2006, he had been with Virginia Tech as the John L. Lawrence Endowed Professor of Manufacturing Systems Engineering with its Grado Department of Industrial and Systems Engineering since 1999. Dr. Chen was the founding Director and led the area of Flexible Automation and Lean Manufacturing Technologies of [the Center for High Performance Manufacturing](#) at Virginia Tech (2001-2006). Having support and participation from more than twenty faculty members at multiple universities, he established this interdisciplinary research center at Virginia Tech in 2001, with approximately \$9 million, multiple years of funding from the Virginia's Commonwealth Technology Research Fund, industry equipment and institutional matching funds. Before returning to academia in 1991, he was with Caterpillar Technical Center and held positions as a *Manufacturing Systems Engineer* in the Machining & Automation Division, a *Senior Manufacturing Systems Engineer* in the Metrology and Process Control Division, and a *Project Manager* leading a corporate research and technical services group with specialization in design and control of manufacturing cells.

His current research interests include lean tools and concepts for product development, healthcare, government/public sectors and R&D operations, design and operation of energy efficient buildings, intelligent manufacturing, and enterprise integration and transformation. As the author or co-author of over 300 technical papers and reports (110 appeared in refereed, archived journals), Dr. Chen was an associate editor of *SME Journal of Manufacturing Systems* (2008-2015) and has served in the editorial board of the *International Journal of Advanced Manufacturing Technology* where he also served as an editor or co-editor of two special issues on neural network and Petri nets applications in manufacturing and design. Dr. Chen has also served as editor and special issue editor for *Flexible Services and Manufacturing Journal* and editor of three special issues for the *International Journal of Robotics and Computer-Integrated Manufacturing*. His book entitled [Trends in Supply Chain Design and Management: Technologies and Methodologies](#) (Springer Series in Advanced Manufacturing, 454 pages, ISBN: 1846286069) has appeared in March 2007. He serves as the editor of Book Collections on *Enterprise Engineering and Sustainability* area for the Momentum Press. Dr. Chen also served as conference co-chair (2011) and chair (2014) of the International Conference on Flexible Automation and Intelligent Manufacturing (FAIM).

Dr. Chen demonstrated prolific research careers in both industry and academia. He received the *Distinguished Services Award* from VP-Technical Services of Caterpillar Inc. in 1991. As one of the nine NSF nominated engineering professors in the nation who received the [1996 Presidential Faculty Fellows \(PFF, combined with first PECASE\) Award](#) from President Clinton at the White House, Dr. Chen has served as a principal investigator of over \$16 million externally funded research projects and equipment grants sponsored by agencies such as National Science Foundation, Caterpillar Inc., Air Force Office of Scientific Research, Army Research Office, Defense Advanced Research Projects Agency, and more recently Sandia National Laboratories and Office of Naval Research since 1991. Dr. Chen was instrumental in re-activating the Central Illinois IIE Chapter 080 and served as the chapter V.P. and Chairman of Technical Program Committee in 1990-1991. Dr. Chen has supervised 32 PhD students and postdoctoral researchers and 65 MS students so far. He has served in many research proposal review panels for organizations such as NSF, Ireland Science Foundation, Louisiana Department of Education, Texas Higher Education Coordinating Board, and Taiwan Ministry of Education. He was also a keynote speaker at several international conferences and as a distinguished lecturer at many institutions including a visiting chair professorship at [National Tsinghua University](#) (Taiwan), [National Taiwan University of Science and Technology](#), and [Tunghai University](#). As an effective educator/researcher, he received the [College of Engineering Awards for Excellence in Research](#) at UTSA and at Virginia Tech, the [Top Grant Producers Award](#) from FIU President, [Best Teaching Award](#) from the Lean Division of the IISE, [Teacher of the Year Award](#) from IIE Student Chapter at FIU, and the [Award for Excellence in Teaching](#) (as a graduate instructor) from the Mathematics Department at University of Missouri.

Dr. Chen received the B.E. (Industrial Engineering) from Tunghai University (in Taiwan) and the M.S. and Ph.D. degrees in industrial engineering from the University of Missouri-Columbia. He is a member of American Society of Engineering Education (ASEE), a Fellow of Institute of Industrial and Systems Engineers (IISE Fellow-2019), and an elected Fellow of Society of Manufacturing Engineers (FSME-2011).

陳鳳山教授簡介

陳鳳山博士現任美國德克薩斯州大學聖安東尼校區傑出講座教授 (Lutcher Brown University Distinguished Chair Professor) 並創立跨院際的校級「先進製造與精實系統研究中心(Center for Advanced Manufacturing and Lean Systems)」, 2007-2015。2006年任教德州大學之前, 陳教授是美國維吉尼亞理工大學(Virginia Tech - VPI&SU) 著名的工業與系統工程系特聘講座教授 (John L. Lawrence Endowed Professor)和跨校的「高性能製造中心 (The Center for High Performance Manufacturing)」的創建者與主任。該中心匯聚來自維吉尼亞州4所大學的20多名著名研究人員和學人以及100多名博士、碩士研究生, 專門研究先進製造技術和系統, 並透過成果和技術的轉化與應用來幫助製造行業的廠商成為高性能的製造企業。作為首席研究員 (PI), 陳教授獲得超過1600萬美元的研究計劃資助。這些科研資金有來自美國能源部(Department of Energy), 美國空軍(Air Force Office of Scientific Research), 美國陸軍(Army Research Office), 美國海軍 (Office of Naval Research), 美國國防先進研計局 (Defense Advanced Research Projects Agency)、美國聖地亞(Sandia)國家實驗室、卡特比勒公司 (Caterpillar Inc.), 美國國家科學基金會(National Science Foundation)、維吉尼亞州政府、路易士安納州政府等。陳教授還曾應邀在許多大型國際會議上擔任開幕主講。在1991年返回學術界之前, 陳博士曾受聘於卡特比勒公司技術中心(Caterpillar Inc. Technical Center), 先後在機加工與自動化部門擔任製造系統工程師, 在計量與流程控制部門擔任高階工程師, 和擔任項目經理, 領導一組技術研究人員專門從事生產製造單元的設計與控制。陳教授於1996年榮獲由美國總統克林頓在白宮頒發的「美國總統教授獎」(Presidential Faculty Fellows) (PFF/PECASE Award- *The highest honor bestowed by the United States government on outstanding scientists and engineers in the early stages of their independent research careers.*), 是當年受獎的九位工程教授之一, 也是第一位台裔學者獲頒此獎。在其30多年的工業和學術生涯, 陳教授共獲得數十個不同的獎項。陳教授是一位在工業與製造業領域享譽國際的專家和學人。陳教授目前的研究領域包括: 雲端製造 (Cloud Manufacturing), 精實系統運用於製造與服務業包括政府及醫療行業, 精實產品開發設計, 精實研發系統, 彈性製造系統的設計與分析, 智能製造, 企業建模與一體化等。他的研究成果發表於諸多威權專業學術刊物和國際學術會議, 共有300多篇。他是美國製造工程學術刊物 (Journal of Manufacturing Systems) 的副主編; 國際先進製造工程學刊 (International Journal of Advanced Manufacturing Technology) & 彈性服務與製造學刊 (Flexible Services and Manufacturing Journal) 的主編及主編委員。

陳博士畢業於台灣東海大學, 獲工業工程學士學位。1982赴美, 先後獲得美國密蘇裡大學(The University of Missouri-Columbia)工業工程碩士和博士學位。他是美國工業及系統工程師學會 (IISE) 的會士 (Fellow), 製造工程師學會(SME)的會士(Fellow), 和在台灣的中國工業工程師學會會士。陳博士專門從事先進工程技術和精實 (Lean)系統的諮詢、研發、技術移轉、培養訓練等業務; 已經為全球性大公司和企業提供了多項技術服務和開展了科研項目, 其中包括卡特比勒公司 (Caterpillar Inc., Manufacturing R&D, Caterpillar Production Systems Divisions), 英格索蘭公司(Ingersoll Rand, Hussmann & Club Car Divisions), 諾斯羅普-格魯曼公司(Northrop Grumman, Newport News & Sperry Marine Divisions), 美國ITT工業公司 (ITT, Night Vision Division), 美國泰科公司 (Tyco Electronics, M/A Com Division), 波士頓科學公司 (Boston Scientific), 布裡斯托爾公司(Bristol Compressors), 富豪卡車公司(Volvo Truck, Global and North America Operations), 蘭斯爾公司 (Lancer Corp.), Time Warner有線電視及波音公司(Boeing)。近十年來, 陳教授更進一步指導培訓德州大學聖安東尼校區, 美國聖地亞國家實驗室(Sandia National Labs), 德州大學六個醫學院及相關醫院單位, 及台灣清華大學執行全面精實改善計劃, 也多次利用寒暑假及大學長期休假機會, 返台任短期講座, 在清華大學、台灣科技大學、虎尾科技大學及東海大學, 教授與精實綠色永續企業工程有關的課程, 也曾應邀在台中榮民總醫院、童綜合醫院與彰化基督教醫院開辦精實醫療種子培訓班。陳教授長期兼任行政職務, 多次在任職的不同大學創建院級與校的研究中心, 任職中心主任、研究所所長、副系主任及代理系主任等, 也接受多所大學的校長室、副校長室與院長室的委託, 提供行政作業改善的諮詢服務, 及輔導各階層單位從事中長期策略分析規劃 (SWOT Analysis)。