**School of Engineering, University of California, Merced**

ME-280 Fractional Order Mechanics (FOMech) ([32641](https://pbanssb.ucmerced.edu/pls/PROD/xhwschedule.P_ViewCrnDetail?subjcode=ME&crsenumb=280&validterm=201330&crn=32641)) Fall 2013

**FISP (Focused Independent Study and Presentation) Schedule (Room:KOLLIG 217)**

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| Name | Topic | Presentation Time | Remarks |
| Baikejiang, Reheman (rbaikejiang) | Fractional Order Integral Filtering On Diffuse Optical Tomography Image Reconstruction | 12/10/13 Tue  9:00-9:25 @ | Dr. C. Li |
| Ko, Marwin (mko3) | Artificial Heart Rate Variability Using Fractional Calculus | 12/10/13Tue  9:25-9:50 @  **KOLLIG 217** | Dr. Y. Q. Chen |
| Li, Zhuo (zli32) | An Investigation Of The Measurement Anomaly Of The Industrial Reactor Plasma DC Bias Through Anomalous Diffusion Analysis | 12/10/13 Tue  9:50-10:15 @  **KOLLIG 217** | Dr. Y. Q. Chen |
| Liang, Wei (wliang) | Design Of Fractional Order PID Controller With Simple Cell Mapping Multi-Objective Optimization Algorithm On Time Delay Model Of Protein Synthesis And Degradation | 12/12/13Thu  9:00-9:25 @  **KOLLIG 217** | Dr. J. Q. Sun |
| Naranjani, Yousef (ynaranjani) | Modified Simple Cell Mapping Using Stochastic Approaches For Solving Multi-Objective Optimization Problems | 12/12/13 Thu  9:25-9:50 @  **KOLLIG 217** | Dr. J. Q. Sun |
| Qu, Zhengxian (zqu2) | The Other Half Of Anomalous World: Fractional Order Energy Transport | 12/12/13Thu  9:50-10:15 @  **KOLLIG 217** | Dr. Y. Ma |
| Rider, Sean (srider) | Fractional Order Motion Control In Unmanned Aerial Systems For Pest Diffusion Control | 12/17/13 Tue  3:00-3:25PM @  **KOLLIG 217** | Dr. Y. Q. Chen |
| Sardahi, Yousef (ysardahi) | Non-Gaussian Non-Dominated Sorting Multi-Objective Genetic Algorithm (NGNSMOGA-II) | 12/17/13Tue  3:25-3:50PM @  **KOLLIG 217** | Dr. J. Q. Sun |
| Zhao, Tiebiao (tzhao3) | Fractional Order Model Nonlinear Predictive Control Using RIOTS\_95. | 12/17/13 Tue  3:50-4:15PM @  **KOLLIG 217** | Dr. Y. Q. Chen |
| Zhao, Yue (yzhao32) | Application Of Fractional Fourier Transform In Structured Light 3D Shape Reconstruction For FMT Imaging System | 12/17/13 Tue  4:15-4:40PM @  **KOLLIG 217** | Dr. C. Li |
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| YangQuan Chen | MATLAB Toolbox for Solving Fractional Order Optimal Control Problems in General Form | 12/17/13 Tue  5:00-6:00PM @  **KOLLIG 217** |  |
| Jiaguo Liu | Microscopic mechanism of fractional viscoelasticity | 12/17/13 Tue  5:00-6:00PM @  **KOLLIG 217** |  |
| Taizhi Lyu | Fractional stochasticity analysis of variability of variabilities – a new way of characterizing human ECG signals | 12/17/13 Tue  5:00-6:00PM @  **KOLLIG 217** |  |

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**Catalog description:** This course prepares students with fractional calculus (differentiation or integration of non-integer order) and fractional dynamic modeling of complex mechanical systems such as porous media, particulate systems, soft matters etc. that have inherent nature of memory, heredity, or long-range dependence (LRD), or long range interactions at or across various scales.

**Textbook:** Richard Magin (2006). “[*Fractional Calculus in Bioengineering*](http://www.amazon.com/Fractional-Calculus-Bioengineering-Richard-Magin/dp/1567002153/ref=sr_1_2?s=books&ie=UTF8&qid=1377747638&sr=1-2&keywords=richard+magin)” Begell House Publishers. ISBN-13: 978-1567002157

**TOPICS:**

1. Course admin, motivations and real world needs; (2 weeks) 1 2
2. FOMech Motivations: FOT and fractional stochasticity; (2 weeks) 3 4
3. Fractional mechanics in classical sense (Bagley-Torvik) (1 week) 5
4. Fundamentals of FC and Geometrical/Physical Interpretations (1 week) 6
5. CTRW and Anomalous Diffusion (2 weeks) 7 8
6. Fractional order system modeling; (1 weeks) 9
7. Fractional order damping (1 week) 10
8. Variable-Order and Distributed Order Mechanics (1 week) 11
9. Fractional-Order Analytical Mechanics (2 weeks) 12 13

* Integer-Order Analytical Mechanics and A Dark Cloud
* Integer-Order Optimal Control, Integer Order Calculus of Variation and RIOTS\_95
* Fractional Order Analytical Mechanics (FO Euler-Lagrange mechanics and fractional variational principle)

1. Semester Summary and Looking Into The Future (1 week Thanksgiving week) 14
2. FISP – Weeks 15, 16 and 17 (final exam week) plus guest lectures