

# COMSOL CONFERENCE 2017 SINGAPORE

22  
NOVEMBER  
2017



CONCORDE  
HOTEL  
SINGAPORE

[www.imath-asia.com/event/comsol-conference-2017-singapore](http://www.imath-asia.com/event/comsol-conference-2017-singapore)

**REGISTER  
EARLY FOR  
MORE SAVINGS**

Check inside for  
registration rates

Organised By



In Partnership With



Media Partner



# WHAT CAN YOU EXPECT?

2



## HANDS-ON MINI COURSES

This conference offers 6 Hands-On Mini Courses where you can pick up new simulation techniques. This mix of core functionality and application-focused courses will help you understand how COMSOL Multiphysics works and its best practices, which will be useful for beginners and advanced users.



## USER PRESENTATIONS

There will be Oral & Poster Presentations given by COMSOL users. This part of the programme highlights mathematical modeling and multiphysics simulation for various R&D and product design work. You will get to hear about how fellow researchers and engineers use COMSOL Multiphysics for so many different applications.



## COMSOL CLINIC

Visit the COMSOL Clinic where you can work one-on-one with a COMSOL expert. You can discuss your model with a COMSOL expert and gain insight into how you can model a design or solve a problem.



## WHAT'S NEW

Learn about the new features of the latest version of COMSOL Multiphysics that can help to speed up your simulation analysis.



## NETWORKING

Connect with industry and academic researchers and engineers, to share ideas, discuss on common challenges and solutions. This would be the perfect platform to source for possible research collaborations.



## FREE 30-DAY COMSOL EVALUATION LICENSE

You would be able to try out the latest features of COMSOL Multiphysics and ALL the add-on modules with the free 30-Day COMSOL evaluation license.



## PROMOTIONS ON COMSOL TRAINING COURSES

All attendees can receive a 50% discount on any 2-Day COMSOL Training courses (courses are worth from SGD2,500-2,800). Participate in a quiz during the conference and 5 lucky winners will win a FREE 2-Day COMSOL Multiphysics Intensive Training Course (worth SGD2500).

(Terms & conditions apply, please visit [website's FAQ section](#) for more details)

Register today:

[www.imath-asia.com/event/comsol-conference-2017-singapore](http://www.imath-asia.com/event/comsol-conference-2017-singapore)

# CONFERENCE FEES & PROGRAMME OVERVIEW

3

REGISTRATION TYPE	SALE PERIOD	FEE
EARLY BIRD Standard Registration	Till 30 Sept	SGD 53.50 per person
EARLY BIRD Group Registration (3 persons or more)	Till 30 Sept	SGD 48.15 per person
2-To-Go Registration	Till 31 Oct	SGD 64.20 per person
Standard Registration	Till 22 Nov	SGD 80.25 per person
Group Registration (3 persons or more)	Till 22 Nov	SGD \$74.90 per person

*Fees are inclusive of 7% GST*

## Modes of Payment

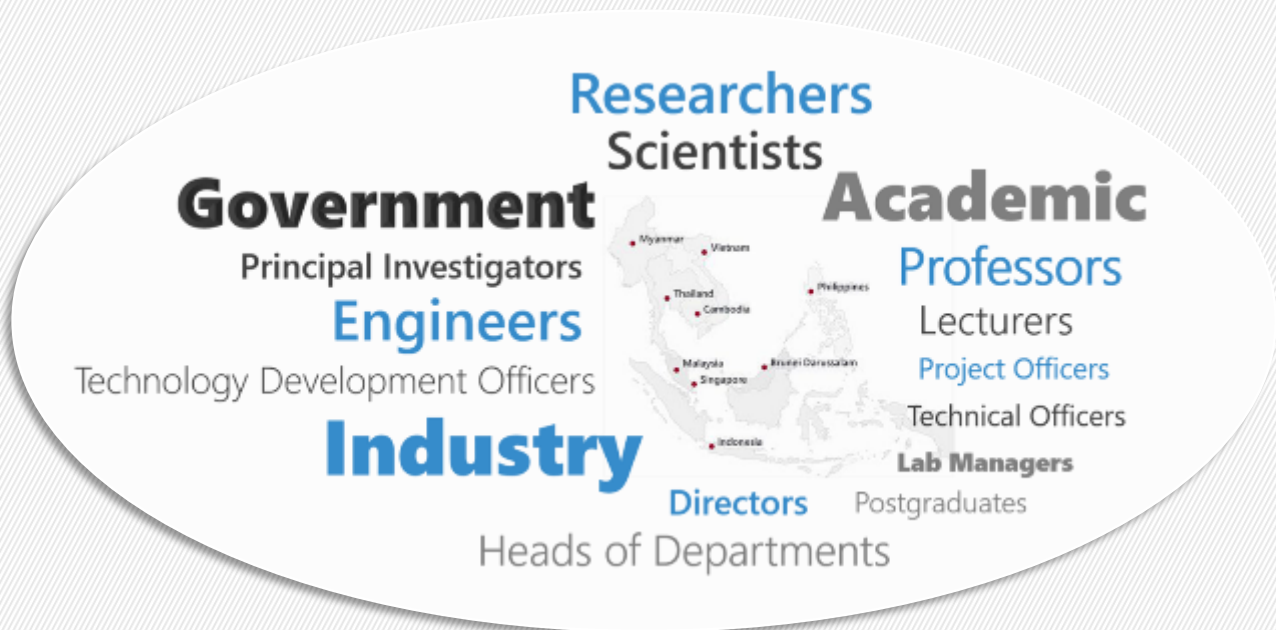
1. Online payments via PayPal, including credit cards accepted by PayPal
2. Bank transfer - for company sponsored participants  
(contact us at email: [comsol.conference@l-math.com.sg](mailto:comsol.conference@l-math.com.sg) or tel: +65 6742 1250)

TIME	PROGRAMME
8.30am - 9.00am	Registration, Poster Exhibition, COMSOL Clinic
9.00am - 9.30am	Keynote
9.30am - 9.50am	Oral Presentation Session 1
9.50am - 10.05am	Oral Presentation Session 2
10.05am - 12.50pm	<b>Hands-On Mini Courses (Concurrent Sessions)</b>
	1. Introduction to COMSOL Multiphysics
	2. Structural Mechanics & Heat Transfer
	3. Electrochemistry
12.50pm - 2.00pm	Lunch, Poster Exhibition, COMSOL Clinic
2.00pm - 2.15pm	Oral Presentation Session 3
2.15pm - 2.30pm	Oral Presentation Session 4
2.30pm - 5.15pm	<b>Hands-On Mini Courses (Concurrent Sessions)</b>
	4. Equation-Based Modelling
	5. CFD
	6. ElectromagneticS
5.15pm - 6.00pm	Refreshments

*\*Subject to changes without prior notice. Please visit the [event website](#) for latest information*

# WHO WILL BE ATTENDING

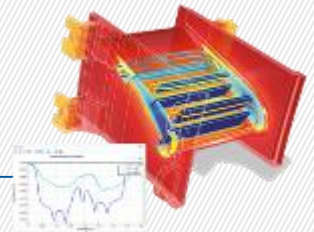
4



## RELEVANT APPLICATION AREAS

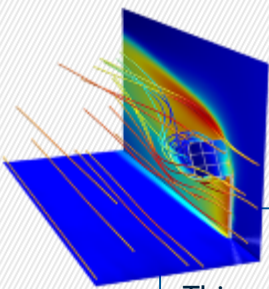
- AC/DC Electromagnetics
- Acoustics & Vibrations
- Batteries, Fuel Cells & Electrochemical Processes
- Bioscience & Bioengineering
- Chemical Reaction Engineering
- Computational Fluid Dynamics
- Electromagnetic Heating
- Geophysics & Geomechanics
- Heat Transfer & Phase Change
- MEMS & Nanotechnology
- Microfluidics
- Multiphysics
- Optics, Photonics & Semiconductors
- Optimization & Inverse Methods
- Partial Differential Equation, Finite Element Analysis
- Particle Tracing
- Physics
- Piezoelectric Devices
- Plasma Physics
- RF & Microwave Engineering
- Simulation Methods & Teaching
- Structural Mechanics & Thermal Stresses
- Transport Phenomena





## INTRODUCTION TO COMSOL MULTIPHYSICS

This mini-course will give you an introduction to the multiphysics concept in COMSOL. You will learn about the general capabilities in COMSOL Multiphysics. The simulation workflow, from defining a model to post-processing the results, will be presented alongside with demonstrations on creating a geometry, meshing, and setting up single and multiphysics applications. Special attention will be given to novel features in the latest releases. This is followed by a demonstration of the Application Builder, a development environment for designing applications based on COMSOL Multiphysics models.



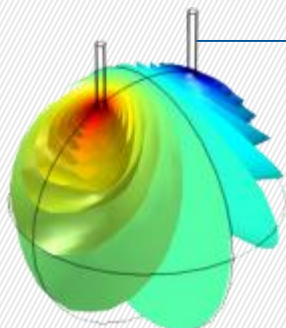
## Structural Mechanics & Heat Transfer

This mini course will provide an introduction to the capabilities in the COMSOL's Structural Mechanics Module, its built-in coupling features and multiphysics couplings with other modules. The session will cover the physics interfaces of Structural Mechanics Modules and its add-on modules that can supplement your structural analyses for specific application areas.

You will learn about the structural element types that can be used to model different structural components and how the different structural elements can be coupled together. A variety of study types in the Structural Mechanics Module will be discussed and demonstrations will be used to illustrate the selection of the correct study type.

Topics that will be covered include:

- Key features of Structural Mechanics module
- Add-on modules
- Couplings of different structural elements
- Multiphysics couplings
- Built-in: Joule Heating, Thermal Expansion
- With other physics: Thermal-Structural Interaction (such as Inductive Heating, RF Heating and Laser Heating)
- Selection of study types
- Demos and hands-on exercises



## Electrochemistry

This session will provide an overview of COMSOL capabilities in regards with electrochemical applications such as electroanalysis, electrochemical impedance spectroscopy and electrolysis. We will also discuss the use of COMSOL for modeling corrosion, electrodeposition and batteries & fuel cells. We will cover the basic theoretical aspect of electrochemistry interfaces and then gradually introduce you to customized interfaces to model above mentioned problems, along with suitable case studies. This will then be followed by a demonstration example and a hands-on exercise to give you a feel of COMSOL user interface.

Topics that will be covered include:

- Overview of capabilities of electrochemistry interfaces
- Introduction to key features in Electrochemistry interfaces: current distribution interfaces, electrochemical kinetics
- Introduction to customized interfaces for modeling electroanalysis, corrosion, electrodeposition and batteries& fuel cells applications
- Different study types available in electrochemistry
- Supporting multiphysics couplings in Electrochemistry interfaces

$$e_a \frac{\partial^2 u}{\partial t^2} + d_a \frac{\partial u}{\partial t} - \nabla \cdot (c \nabla u + \alpha u - \gamma) + \beta \cdot \nabla u + a u = f$$

## Equation-Based Modeling

Partial differential equations (PDEs) constitute the mathematical foundation for describing the laws of nature. This course will provide an introduction to customizing your simulations by developing models directly with PDEs. You will also learn how to add ordinary differential equations (ODEs) and algebraic equations to your model. This feature has great usability as it allows users to add new physics and additional features to their models. We will begin with a discussion on importance of equation based modeling in COMSOL. Following this, we will introduce you to various mathematics interfaces which allow you to add new PDEs, ODEs and algebraic equations in COMSOL. This will then be followed by a demonstration example and a hands-on exercise to give you a feel of COMSOL user interface.

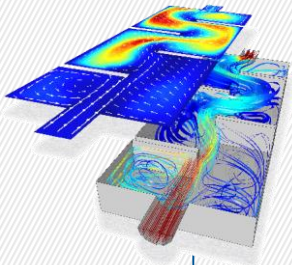
Topics that will be covered include:

- Importance of equation based modeling
- Different kinds of equations: PDE, ODE and DAE interfaces
- PDE interfaces: Coefficient Form, General Form and Weak Form
- ODE and DAE interfaces: Global, Domain and boundary interfaces
- Coupling of these mathematics interfaces with each other
- Coupling of these mathematics interfaces with existing physics interface

Register today:

[www.imath-asia.com/event/comsol-conference-2017-singapore](http://www.imath-asia.com/event/comsol-conference-2017-singapore)

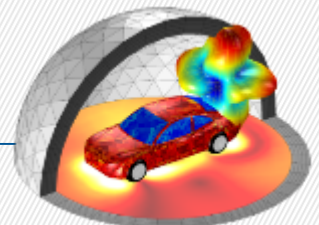




## CFD

In this mini course you will learn about the capabilities of COMSOL's CFD and Microfluidics Modules. The numerous physics interfaces in the CFD Module, covering creeping flow, Newtonian and non-Newtonian laminar flow, and turbulent flow at various Mach numbers will be presented along with the physics interfaces in the Microfluidics Module that allow for rarefaction effects.

You will learn about the special boundary conditions that can be used to model unresolved physical phenomena or thin immersed structures. Particle tracing can be used to simulate flows of dilute suspensions whereas continuum multiphase flow models are needed for higher volume fractions, e.g. the mixture model or Euler-Euler model for dispersed multiphase flow and the level-set model or phase-field model for separated multiphase flow. The most common multiphysics couplings will also be addressed. This is followed by a presentation of the various turbulence models and their applicability. The session will be concluded with a few words about the solvers with special focus on the new AMG (Aggregated Multi Grid) solver. Live demonstrations will be used to clarify and exemplify the different topics covered in this mini course.



## Electromagnetics

This mini course provides an introduction to electromagnetic modeling for high-frequency applications with COMSOL. In particular, you will learn about the capabilities of COMSOL's RF and Wave Optics Modules, their differences and knowing which of these 2 modules to use when modeling particular electromagnetic applications.

Topics that will be covered include:

- The physics interfaces in RF and Wave Optics Modules
- Application areas
- Differences between RF and Wave Optics Modules
- Dispersion models
- Special boundary conditions
- Perfectly matched layer
- Absorbing boundaries
- Symmetry and Periodicity
- Modeling and meshing techniques
- Demos and hands-on exercises

# ORAL PRESENTATIONS

8

## Session 1: 9.30am - 9.50am

### **Towards Multiscale Models for Bioimpedance of Human Skin with COMSOL Multiphysics**

Dr. Karl Erik Birgersson, Associate Professor, National University of Singapore

### **Red Blood Cells (RBCs) Separation Using Magnetophoresis Force**

Dr. Tran Si Bui Quang, Scientist, A\*STAR Institute of High Performance Computing

### **Numerical Simulations of Condensing Moist Air Around Cold Cylinder**

Dr. Adel E. Alshayji, Assistant Professor, Kuwait University

## Session 2: 9.50am - 10.05am

### **Vibro-Acoustic Modeling, Analysis and Optimization Using COMSOL Multiphysics**

Dr. Yu Xiang, Research Scientist, A\*STAR Institute of High Performance Computing

### **Finite Element Analysis of Accelerating Projectile Inside Vacuum Bazooka**

Dr. Amir Shakouri, Research Fellow, Nanyang Technological University

### **Monotonic and Cyclec Behavior Of Trabecular Bone Under Uniaxial and Multiaxial Loading**

Dr. Ardiyansyah Syahrom, Lecturer, Universiti Teknologi Malaysia

## Session 3: 2.00pm - 2.15pm

### **Modelling Thermal Capillary Effects and Flow in the Molten Pool During Selective Laser Melting**

Mr. Habimana Jean Willy, Research Student, National University of Singapore

### **3D Hydrodynamic and Mass Transport Simulations of Ocular Drug Delivery Considering Segmental Aqueous Humour Outflow Phenomenon in the Human Eye**

Ms. Loke Chai Yee, Doctoral Candidate, Monash University Malaysia

### **Conductivity Recovery Around Point Electrodes in Electrical Impedance Tomography**

Mr. Agah D. Garnadi, Senior Lecturer, Institut Pertanian Bogor

## Session 4: 2.15pm - 2.30pm

### **Enhanced Fin Tube Heat Exchanger Design Through Topology Optimization**

Mr. Shi Zeng, Ph.D. Student, National University of Singapore

### **Numerical Optimization of Microelectrode Systems for Single Cell Manipulation by Dielectrophoresis**

Mr. Nguyen Ba Loc, Student, Nanyang Technological University

### **Transient Analysis of a Finned, Cylindrical Adsorber Reactor in Solar Adsorption Refrigeration**

Ms. Norhafizah binti Ahmad Junaidi, Postgraduate Researcher, Universiti Teknologi Malaysia

Register today:

[www.imath-asia.com/event/comsol-conference-2017-singapore](http://www.imath-asia.com/event/comsol-conference-2017-singapore)



# POSTER PRESENTATIONS

9

## **Diffusion-Limited Cluster Growth During Nucleation**

Mr. Lau Yang Hao, A\*STAR - Institute of High Performance Computing, Singapore

## **Numerical Simulation and Experimental Validation of Single Clad Laser Metal Deposition**

Dr. Song Jie, A\*STAR - Singapore Institute of Manufacturing Technology, Singapore

## **Modified Model of Heat & Mass Transfer Phase Change with High Density Ratio Using COMSOL Multiphysics**

Mr. Jayden Tan Jun Wong, A\*STAR - Singapore Institute of Manufacturing Technology, Singapore

## **A Microfluidic System for Capturing Malaria-Infected Blood-Cells Using an Array of Nickel Structures**

Mr. Pachara Noosawad, Chulalongkorn University, Thailand

## **A Trapping Mechanism of a Single-Particle Inside a Triangular Microwell**

Mr. Phakpoom Yingprathanphon, Chulalongkorn University, Thailand

## **Comparative Analysis of Array 2×2 Double Bi Circular Microstrip Antenna with the Empirical Formula and COMSOL Programme**

Mr. Putu Artawan, Institut Teknologi Sepuluh Nopember, Indonesia

## **Numerical Analysis of Flow Chamber Morphologies for Pilot-Scale Ultrasonication**

Mr. Naveen Arunachalam, Kaneka Corporation, United States

## **Electric Field Distribution of ZnO-PCL Nanocomposites Using Rectangular Waveguide, Microstrip and Finite Element Method**

Dr. Abubakar Yakubu, Kebbi University of Science and Technology, Aliero, Nigeria

## **Investigating Effects of Number of Layers on Thermal Behavior of Lithium Ion Batteries**

Mr. Mohammad Alipour, Koç University, Turkey

## **Effects of Acoustic Scattering on the Active Control of Noise Through Apertures**

Mr. Lam Bhan, Nanyang Technological University, Singapore

## **Analysis of Current at the Surface of a Rocking Disk Electrode**

Mr. Vishvak Kannan, National University of Singapore, Singapore

## **Visualization of Non-Invasive Electrical Impedance Spectroscopy on the Volar Forearm**

Ms. Betty Tsai, National University of Singapore, Singapore

## **Modelling and Loss Analysis of Meso-Structured Perovskite Solar Cells**

Mr. Xue Hansong, National University of Singapore, Singapore

## **Comparison of Flow Patterns of Different Stents Within a Simulated Disease Model**

Ms. Ang Zhi Ting, National University of Singapore, Singapore

## **Fabrication of 4130 Steel Powder for 3D Printing and Its Simulation Study**

Dr. Herng Tun Seng, National University of Singapore, Singapore

## **Modelling of Heat Transfer in Different Materials in Cooking Vessels Using COMSOL**

Ms. Lew Zhiyi and Ms. Helen Claudia Maria Yu-Hwei T, Raffles Girls' School (Secondary), Singapore

## **Computational and Experimental Study on Electrostatic Properties of Fractal Capacitors**

Mr. Low Yuen Wei Samuel, Ms. Athalye Surabhi Sachin and Dr. Yee Sin ANG, Singapore University of Technology and Design, Singapore

## **Dielectric Properties of Heterogeneous Media with Inclusion of Fractal Media**

Ms. Athalye Surabhi Sachin and Dr. Muhammad Zubair, Singapore University of Technology and Design, Singapore

## **3D Electromagnetic Simulation for Wide Band Wireless Power Transfer via Resonance Inductive Coupling**

Mr. Omkar and Mr. Zhou Wenshen, Singapore University of Technology and Design, Singapore

## **Thermal Analysis of a Latent Heat Storage Based Battery Thermal Cooling Wrap**

Mr. Chiew Hay King Joel, Temasek Polytechnic, Singapore

## **Generalized Power Law Model of 3D Blood Flow in Bifurcated Stenosed Artery**

Dr. Zuhaila Ismail, Universiti Teknologi Malaysia, Malaysia

## **Adaptive Temperature Controller in Hemodialysis - Essential for Next-Gens**

Mr. Mohamed Haroon Abdul Jabbar, University of Nottingham, Malaysia

To find out more the COMSOL Conference 2017, Singapore  
go to [http://www.imath-asia.com/event/comsol-  
conference-2017-singapore](http://www.imath-asia.com/event/comsol-conference-2017-singapore)  
or scan this tag on your smartphone

