Short Course: Mechanics of Structure Genome

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This 4-day short course covers fundamentals of mechanics of structure genome (MSG) needed for multiscale modeling of composite structures through directly linking structural analysis and microstructures. Students with good understanding of elasticity, finite element method, and mechanics of composite materials should have no problem to take this course. This course not only covers the essential theoretical fundamentals of MSG including the concept of structure genome and the principle of minimum information loss, but also the companion software SwiftComp to solve typical problems in composite structures. On completing this course the student shall be able to:

1. Understand the concept of structure genome (SG) and its difference from representative volume element (RVE).
2. Understand the principle of minimum information loss.
3. Apply MSG to solve practical problems including 3D properties of laminates, interlaminar stresses of composite laminates, buckling/postbuckling of stiffened composite panels, multiscale modeling of textile composites.
4. Design and analyze composite structures using SwiftComp and other commercial composite simulation software

Short Course Schedule

Total Duration: 24 hrs

Dec. 11 2017

9:00 AM: Challenges for modeling composites

10:00 AM: The concept of SG

11:00 AM: The principle of minimum information loss

12:00 PM: Lunch

1:00 PM: Introduction to cdmHUB

2:00 PM: Introduction to SwiftComp

3:00 PM: Hands-on workshop on cdmHUB & SwiftComp

4:00 PM: Adjourn

Dec. 12 2017

9:00 AM: Introduction to micromechanics

10:00 AM: MSG-based micromechanics modeling

11:00 AM: 3D properties of composite laminates

12:00 PM: Lunch

1:00 PM: Hands-on workshop on SwiftComp for laminates

2:30 PM: Hands-on workshop on SwiftComp for UD composites

3:00 PM: Hands-on workshop on SwiftComp for textile composites

4:00 PM: Adjourn

Dec. 13 2017

9:00 AM: Introduction to plate/shell modeling

10:00 AM: MSG-based plate/shell modeling

11:00 AM: MSG-based classical plate theory

12:00 PM: Lunch

1:00 PM: Hands-on workshop on SwiftComp for laminated plates

2:30 PM: Hands-on workshop on SwiftComp for multiscale modeling of textile panels

3:00 PM: Hands-on workshop on SwiftComp for buckling/postbuckling analysis of stiffened composite panels

4:00 PM: Adjourn

Dec. 14 2017

9:00 Introduction to beam modeling

10:00 AM: MSG-based beam modeling

11:00 AM: Free-edge stress analysis

12:00 PM: Lunch

1:00 PM: Hands-on workshop on SwiftComp for free-edge stress analysis

2:30 PM: Hands-on workshop on SwiftComp for cross-sectional analysis

3:00 PM: Hands-on workshop on SwiftComp for spanwise heterogeneous beams

4:00 PM: Adjourn