

**Tuesday, December 5, 2023**

<b>AM Session</b>	<u>Focus: Vehicle Structures Design &amp; Engineering</u>	<b>PM Session</b>	<u>Focus: Vehicle Structures Design &amp; Engineering</u>
<b>Time</b>	<b>Virtual Classroom</b>	<b>Time</b>	<b>Virtual Classroom</b>
9:00 am	<b>Introduction</b> Vasant Pednekar <i>US Steel</i>	1:00 pm	<b>EV Body Structure Design &amp; Analysis</b> Instructor: Sudip Bhattacharya, PhD Ford - Basic design of thin-walled structures for stiffness and crush strength - Material selection for weight efficiency in EV structure design - EV structure design with CAE
9:30 am	<b>Overview of Electric Vehicles</b> Instructor: Andy Oury, GM		
10:30 am	<b>Vehicle design for the protection of occupants and vulnerable road users</b> Instructor: Sudip Bhattacharya, PhD Ford - Field accident statistics and standardized vehicle crash tests - Key vehicle response variables for occupant safety	3:00 pm	<b>Break</b>
11:30 am	<b>Break</b>	4:00 pm	<b>EV Body Structure Design &amp; Analysis</b> Instructor: Sudip Bhattacharya, PhD Ford - Review of in-production EV design examples
11:45 am	<b>Load paths and design targets for EV structures</b> Instructor: Sudip Bhattacharya, PhD Ford - Field accident statistics and key measurement metrics for impact worthiness of Li-ion batteries - Load paths and concept design of EV body structures		
12:45 pm	<b>Lunch Break</b>	5:00 pm	<b>Adjournment</b>

**Wednesday, December 6, 2023**

AM Session	<u>Focus: Materials Aspects Steel/Aluminum</u>	PM Session	<u>Focus: Materials Aspects Steel/Aluminum</u>
Time	Virtual Classroom	Time	Virtual Classroom
9:15 am	<b>Introduction to hot stamping, processes, and design guidelines</b> <b>Instructor: Parth Patel, ArcelorMittal</b> - 1st Generation of coated Press Hardened Steel for direct hot stamping, - New challenges in automotive industry - 2nd GEN of coated Press Hardened Steel and - Basic Design guidelines in hot stamping	1:00 pm	<b>Gen3 Grades, Formability, and Design Manufacturing</b> <b>Instructor: Daryl McCaleb, ArcelorMittal</b> <ul style="list-style-type: none"> <li>• Local Formability Criteria</li> <li>• Global Formability Criteria</li> <li>• Die Development Methods and Forming Operations</li> <li>• Lessons Learned</li> </ul>
		2:00 pm	<b>Battery Manufacturing</b> <b>Instructor: Teresa Rinker, PhD, General Motors</b> <ul style="list-style-type: none"> <li>▪ Battery form factors and packaging considerations</li> <li>▪ Battery Module &amp; Pack joining overview.</li> <li>▪ The importance of non-destructive testing in battery manufacturing</li> </ul>
10:30 am	Break	3:00 pm	Break
11:00 am	<b>Laser welded blanks – key to future vehicle design strategy</b> <b>Instructor – Nachiket Gokhale, ArcelorMittal</b> <b>Tailored Blanks</b> <ul style="list-style-type: none"> <li>• Introduction to LWBs</li> <li>• Benefits of LWBs – Assembly simplification and Co2 emissions reduction</li> <li>• Applications in production</li> <li>• MPIs for the future</li> <li>• LWB part design practice:               <ul style="list-style-type: none"> <li>○ Material utilization</li> <li>○ Performance optimization</li> </ul> </li> <li>• LWB Design guidelines               <ul style="list-style-type: none"> <li>○ Flat blank development</li> <li>○ Forming for CS and PHS LWBs</li> </ul> </li> </ul>	3:15pm	<b>Steel Products &amp; Processes</b> <b>Instructor: Todd Link, US Steel</b> <ul style="list-style-type: none"> <li>• Sheet steel products – HR, CR, hot-dip coated, electrogalvanized.</li> <li>• Steel Finishing Processes – BA, CAL, and CGL</li> <li>• Materials, Microstructure, Mechanical Properties:               <ul style="list-style-type: none"> <li>• Mild, BH, HSLA steels</li> <li>• Gen 1 AHSS – DP, TRIP, CP, martensitic, press hardened steel.</li> <li>• Gen 3 AHSS</li> </ul> </li> <li>• Formability and performance:               <ul style="list-style-type: none"> <li>• Global and local formability</li> <li>• Formability Maps</li> <li>• Crashworthiness</li> <li>• Fatigue behavior</li> </ul> </li> </ul>
12:30 pm	Lunch Break		Adjournment
		4:15 pm	

**Thursday, December 7, 2023**

AM Session	<u>Focus: Manufacturing Aspects</u>	PM Session	<u>Focus: Manufacturing Aspects</u>
Time	Virtual Classroom	Time	Virtual Classroom
9:00 am	<b>Introduction</b> <b>Raj Dasu</b> <b><i>Commonwealth Rolled Products</i></b>	1:00 pm	<b>Steel Joining Technologies</b> <b>Instructor: Mark Gugel, PhD, US Steel</b> <ul style="list-style-type: none"> <li>• Assembly Methods for Steel, Steel/Aluminum and Steel/Composite Structures</li> <li>• Fundamentals of Common Assembly Methods</li> <li>• Resistance Spot Welding (RSW)</li> <li>• Gas Metal Arc Welding and Gas Tungsten Arc Welding (GMAW/MIG/GTAW/TIG)</li> <li>• Laser Welding</li> <li>• Adhesive Bonding</li> <li>• Hemming</li> <li>• Friction -Stir Welding</li> </ul> Hybrid-Joints (Mechanical, Welded, and/or Adhesive Bonded)
9:15 am	<b>Roll forming process overview.</b> <b>Instructor: Brian Oxley, SHAPE CORP</b> <ul style="list-style-type: none"> <li>▪ Design and cost considerations for roll forming.</li> <li>▪ Materials for roll forming.</li> <li>▪ Engineered profiles &amp; applications.</li> <li>▪ Additional in-line value added opportunities for roll forming</li> </ul>	2:30 pm	<b>Break</b>
10:45 am	<b>Break</b>	3:00 pm	<b>Aluminum Joining Technologies</b> <b>Instructor: Tamer Girgis, PhD, Commonwealth Rolled Products</b> <ul style="list-style-type: none"> <li>• Importance of joining Aluminum and its alloys</li> <li>• Material property, difference between aluminum alloys and steels</li> <li>• Joining processes overview</li> <li>• Joining processes and its automotive applications</li> <li>• Joining challenges and its remedies</li> </ul>
10:45 am	<b>Instructor: Zhi Deng, Commonwealth Rolled Products</b> <b>Aluminum Metal Forming</b> <b>Instructor: Zhi Deng, PhD, Commonwealth Rolled Products</b> <ul style="list-style-type: none"> <li>• Material property, formability and testing methods</li> <li>• Typical forming modes and requirements on material property/formability</li> <li>• Formability evaluation and design for formability</li> <li>• Stamping press lines and applications</li> <li>• Formability considerations in stamping processes (splits, edge cracking, ...)</li> <li>• Quality considerations in stamping processes (wrinkling, spring back, surface quality, ...)</li> <li>• Stamping production and manufacturing considerations (die wear, galling, lubrication, ...)</li> <li>• Stamping feasibility analysis and key considerations to improve part formability</li> </ul>	5:00 pm	<b>Feedback</b> <b>Vasant Pednekar</b> <b><i>US Steel</i></b>
12:30 pm	<b>Lunch</b>	5:30 pm	<b>Adjournment</b>