

February 9, 2009

SAE 599: Systems Architecting and Engineering through Motorsports

Semester:	Fall 2009
Lecture:	Wednesday, 6:30 to 9:10 PM
Instructor:	Stan Settles, settles@usc.edu, (Preferred method to contact)
Office Hours:	Wednesday 4:30 to 6:00 PM, or by appointment
Phone Numbers:	Office 213-740-0263, Cell 562-714-2795, CA Home office 562-495-4040, AZ home office 480-838-1947
Location:	TBD, and on DEN

Course Texts:

1. The Physics of NASCAR, Leslie-Pelecky, Diandra, 2008. (DLP)
2. A virtual course reader will be created using the DEN Blackboard system. Examples include papers from IEEE, SAE International, F-1 Racing, and INCOSE.

Course objectives: This course is intended to use the excitement and in-depth technical aspects of motorsports to enhance understanding of systems architecting, engineering and management. Systems architecting and engineer students will have the opportunity to see the application of their work in bringing an entire system from design to validation and verification. Engineering students from many disciplines will have the opportunity to expand their awareness of how their scientific and technical backgrounds contribute to success in motorsports and ultimately in the solution of major challenges facing society. Insight into the impact of enterprise level systems and economic factors should result from the course. The course will start with the instructor's personal experience driving at 206 MPH on the Bonneville Salt Flats and use that as a segue into what the professional racers do. Professor Leslie-Pelecky's text on the Physics of NASCAR will build on the landspeed experience to dig deeper into the scientific and mathematical underpinnings of NASCAR, which will form the backbone of the course. The next level of excitement will result from examination of Formula 1 racing. In each venue we will be probing into basics such as combustion, suspension, aerodynamics and

materials. We will also explore how they turn the fun of a racing venue into a serious business. Other venues will include drqg racing, grand prix. Formula SAE racing, sprint cars, DARPA Grand Challenge, and DARPA Urban Challenge. The course will emphasize the racing enterprises that result from the various venues. These are comprised of the ones that control the sport and also the successful businesses that have resulted from individuals' participation.

Homework:

- Assignments will be posted and submitted through the course website. Specific instructions will be provided.
- Assignments (except for the midterm and final project) are due before the start of class on the following class period.
- Assignments will be graded down 2 points for each day late, the midterm and final project will not be accepted past their due dates/times.
- The lowest homework grade will be dropped from the average calculation.
- Assignments will be graded on a basis of 0 to 10 points.
- Assignments must follow the correct file naming convention (last_name, first_name-HW X.doc or .ppt or .xls). "X" should be replaced with the corresponding assignment number.
- All submissions should be in the Microsoft Word (.doc), PowerPoint (.ppt), or Excel (.xls) format.
- It is expected that submitted homework is the work of the submitting student(s).

Midterm Paper: The midterm paper will be expected to outline the final paper and show what challenges and issues exist in addressing the chosen problem.

Final Paper: A major portion of this learning from this course comes from the final paper/project that is submitted. It may be done as a single person effort or a team project. The level of the paper should be such that it could be submitted, with some format changes, to an appropriate journal in the systems engineering, motorsports, or other engineering areas. It is expected to be the work of the submitting student(s) with proper documentation of referenced sources. More guidance on the papers/projects will be provided throughout the course.

Course Grading

	<i>Percentage</i>	
Homework	20 %	
Midterm paper	35%	
Final paper & presentation	45%	

Course Schedule

<i>Session/Date [instructor]</i>	<i>Subjects</i>	<i>Reading</i>	<i>Homework</i>
1) August 26	<u>Introduction</u> , Overview, Instructor's bio, Architecting a Race Car System, Motor Sports Venues, Enterprises	Syllabus,	Student Bio assigned HW#1 assigned
2) September 2	Physics of NASCAR Introduction, "Bones of Contention", "Skin Care", Systems Lessons	DLP Ch. 1 & 2	Student Bio due HW #1 due HW #2 assigned
3) September 9	NASCAR "Makeup", Combustion Introduction, Systems Lessons	DLP Ch 3 & 4	HW #2 due HW #3 assigned Paper proposal draft due
4) September 16	Guest Lecture on Combustion Laboratory at USC, Engines Intro. "Power Play"	DLP Ch. 4, Special Papers on Combustion DLP Ch.5	HW #3 due HW #4 assigned
5) September 23	Engines	DLP Ch. 5, Special Papers on Engines	HW #4 due HW #5 assigned
6) September 30	Aerodynamics – "The Wizard & the Flying Car Problem"	DLP Ch. 6	HW #5 due HW #6 assigned
7) October 7	Guest Lecture on Aerodynamics	Special Papers on Aerodynamics	HW #6 due
8) October 14	Mini presentations by students		MIDTERM PAPER DUE
9) October 21	Operations on the track	DLP Ch. 7, 8, 9 & 12	HW #7 assigned
10) October 28	Traction, "The Rubber Meets the Road"	DLP Ch. 10	HW # 7 due HW #8 assigned
10) November 4	"Shock Therapy", suspension systems	DLP Ch. 11	HW #8 due HW #9 assigned
11) November 11	Guest Lecture on Chasses	Special Papers on Chasses	HW #9 due HW #10 assigned

12) November 18	Safety for Drivers, Fans and Participants	DLP Ch. 13 & 14	HW #10 due HW #11 assigned
13) November 25	Going for the Checkered Flag	DLP Ch. 15 - 18	HW #11 due
14) December 2	Course wrap-up, Mini presentations by students		FINAL PAPER/PROJECT DUE

Academic Integrity

We know that as students of systems architecting and engineering, you hold yourselves to the highest standards of conduct and we, too, will expect that from you. We also expect you to abide by the expectations of the University; to familiarize with those, please see the USC publication ***SCampus***, which can be found online at www.usc.edu/dept/publications/SCAMPUS. The provisions of this publication will be explicitly enforced. If you have questions about what is allowed, please discuss it with the professor.

Students with Disabilities

Any Student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to the professor (or to TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m. - 5:00 p.m., Monday through Friday. The phone number for DSP is (213)740-0776.