

- I. Department, Number, and Title of Course:** Mechanical Engineering and Energy Processes, ME 505 (3), Vehicle Dynamics
Designation as a ‘Required’ or ‘Elective’ Course:
 Elective
- II. Course (catalog) Description:** To provide an introductory coverage of dynamics of vehicle systems. The topics include mainly automotive systems but others such as aircraft and train systems may be discussed. This course is intended for graduate students or undergraduate students during their senior year.
- III. Prerequisite(s):**
 Engineering 260
- IV. Textbook(s) and/or Other Required Material:**
 None
- V. Course Objectives:** To provide an introductory coverage of dynamics of vehicle systems. The topics include mainly automotive systems but others such as aircraft and train systems may be discussed.
- VI. Topics Covered:**
1. Preliminaries 1 lectures
 - Vehicle subsystems
 - Vehicle coordinate systems
 2. Load Transfer 5 lectures
 - In acceleration and braking
 - Incline and banked road
 - Cornering
 - Combined maneuvers and road slant
 - Tangential load
 3. Tire/Road Interaction 10 lectures
 - Tire specification
 - Tire print and deflections
 - Lateral load and tire slip angle
 - Longitudinal load and tire slip ratio
 - Definitions of slip ratio: SAE, Sakai, CALSPAN, etc
 - Rolling resistance
 - Tire camber, camber angle
 - Non-dimensionalization of tire data and MAGIC Formula
 4. Cornering Dynamics 8 lectures
 - Steering geometry and Ackermann angle
 - Steady State Cornering
 - Steady state responses
 - Curvature, yaw, side-slip and acceleration responses
 - Under steer (US), neutral steer (NS), and over steer (OS) responses

5. Suspension 8 lectures
Suspension types and geometry
Roll steer effect
Swing arm, tire scrub, and camber gain
Instant centers and roll center for the sprung mass
Suspension design and performance analysis
Side view and front view swing arm
Anti dive, Anti lift and Anti squat properties of suspension

VII. Class/Laboratory Schedule:

Meet 2 times a week, 75 minute lectures

VIII. Contribution of Homework, Quizzes, Tests, Laboratory Reports, or Research Papers:

Exams 70%: Exam1 = 10%, Exam2 = 20%, Exam3 = 20%, Exam 4 = 20%.

Homework 30%;

There will be no final exam.

Person(s) who prepared this description and date of preparation:

Dr. Kambiz Farhang, January, 2014

"We emphasize student achievement and success because achievement and success are essential if we are to shape future leaders and transform lives."

Syllabus Attachment

Spring 2014

<http://pvcaa.siu.edu/>

IMPORTANT DATES *

Semester Class Begins.....	01/13/2014
Last day to add a class (without instructor permission):	01/24/2014
Last day to withdraw completely and receive a 100% refund:	01/26/2014
Last day to drop a course using SalukiNet:	03/23/2014
Last day to file diploma application (for name to appear in Commencement program)	03/28/2014
Final examinations:.....	5/5 – 5/9/2014

* *Note: For outreach, online, and short course drop/add dates, visit Registrar's Academic webpage*

<http://registrar.siu.edu/>

SPRING SEMESTER HOLIDAYS

Martin Luther King, Jr.'s Birthday 01/20/2014

Spring Vacation 03/08—03/16/2014

WITHDRAWAL POLICY ~ Undergraduate only

Students who officially register for a session may not withdraw merely by the stopping of attendance. An official withdrawal form needs to be initiated by the student and processed by the University. For the proper procedures to follow when dropping courses and when withdrawing from the University, please visit

<http://registrar.siu.edu/pdf/ugradcatalog1314.pdf>

INCOMPLETE POLICY~ Undergraduate only

An INC is assigned when, for reasons beyond their control, students engaged in passing work are unable to complete all class assignments. An INC must be changed to a completed grade within one semester following the term in which the course was taken, or *graduation*, whichever occurs first. Should the student fail to complete the course within the time period designated, that is, by no later than the end of the semester following the term in which the course was taken, or graduation, whichever occurs first, the incomplete will be converted to a grade of *F* and the grade will be computed in the student's grade point average. *For more information please visit:*

<http://registrar.siu.edu/grades/incomplete.html>

REPEAT POLICY

An undergraduate student may, for the purpose of raising a grade, enroll in a course for credit no more than two times (two total enrollments) unless otherwise noted in the course description. For students receiving a letter grade of A,B,C,D, or F, the course repetition must occur at Southern Illinois University Carbondale. Only the most recent (last) grade will be calculated in the overall GPA and count toward hours earned. *See full policy at*

<http://registrar.siu.edu/pdf/ugradcatalog1314.pdf>

GRADUATE POLICIES

Graduate policies often vary from Undergraduate policies. To view the applicable policies for graduate students, please visit <http://gradschool.siu.edu/about-us/grad-catalog/index.html>

DISABILITY POLICY

Disability Support Services provides the required academic and programmatic support services to students with permanent and temporary disabilities. DSS provides centralized coordination and referral services. To utilize DSS services, students must come to the DSS to open cases. The process involves interviews, reviews of student-supplied documentation, and completion of Disability Accommodation Agreements.

<http://disabilityservices.siu.edu/>

STUDENT CONDUCT CODE http://policies.siu.edu/other_policies/chapter3/conduct.html

1 Southern Illinois University Carbondale. (2013). *Pathways to Excellence: A Strategic Plan* Retrieved from http://chancellor.siu.edu/common/docs/A_Strategic_Plan.pdf

SALUKI CARES

The purpose of Saluki Cares is to develop, facilitate and coordinate a university-wide program of care and support for students in any type of distress—physical, emotional, financial, or personal. By working closely with faculty, staff, students and their families, SIU will continue to display a culture of care and demonstrate to our students and their families that they are an important part of the community. For Information on Saluki Cares: (618) 453-5714, or siucares@siu.edu, <http://salukicare.siu.edu/index.html>

EMERGENCY PROCEDURES

Southern Illinois University Carbondale is committed to providing a safe and healthy environment for study and work. We ask that you become familiar with the **SIU Emergency Response Plan** and **Build- ing Emergency Response Team (BERT)** programs. Emergency re- sponse information is available on posters in buildings on campus, available on BERT's website at www.bert.siu.edu, Department of Safety's website at www.dps.siu.edu (disaster drop down) and the Emergency Response Guideline pamphlet. Instructors will provide guidance and direction to students in the classroom in the event of an emergency affecting your location. *It is important that you follow these instructions and stay with your instructor during an evacuation or sheltering emergency.*

INCLUSIVE EXCELLENCE

SIU contains people from all walks of life, from many different cultures and sub-cultures, and representing all strata of society, nationalities, ethnicities, lifestyles, and affiliations. Learning from and working with people who differ is an important part of education as well an essential preparation for any career. *For more information please visit:* <http://www.inclusiveexcellence.siu.edu/>

MORRIS LIBRARY HOURS

<http://www.lib.siu.edu/about>

LEARNING AND SUPPORT SERVICES

Help is within reach. Learning support services offers free tutoring on campus and math labs. To find more information please visit the Center for Learning and Support Services website:

Tutoring : <http://tutoring.siu.edu/>

Math Labs http://tutoring.siu.edu/math_tutoring/index.html **WRITING CENTER**

The Writing Center offers free tutoring services to all SIU students and faculty. To find a Center or Schedule an appointment please visit <http://write.siu.edu/>

AFFIRMATIVE ACTION & EQUAL OPPORTUNITY

Our office's main focus is to ensure that the university complies with federal and state equity policies and handles reporting and investigating of discrimination cases. *For more information visit:* <http://diversity.siu.edu/#>

Additional Resources Available:

SALUKINET: <https://salukinet.siu.edu/cp/home/displaylogin>

ADVISEMENT: <http://advisement.siu.edu/>

PROVOST & VICE CHANCELLOR: <http://pvcaa.siu.edu/>

SIU ONLINE: <http://online.siu.edu/>

Spring 2014 R.O'Rourke