Course Approval Form

For approval of new courses and deletions or modifications to an existing course.

registrar.gmu.edu/facultystaff/curriculum

Action Requested:

- [x] Create new course
- [ ] Inactivate existing course
- [ ] Modify existing course (check all that apply)
  - [ ] Title
  - [ ] Credits
  - [ ] Repeat Status
  - [ ] Grade Type
  - [ ] Prereq/coreq
  - [ ] Schedule Type
  - [ ] Restrictions
  - [ ] Other:

Course Level:

- [ ] Undergraduate
- [ ] Graduate

College/School: COS **Department:** SPACS
Submitted by: Chi Yang **Ext:** 3-4077 **Email:** cyang@gmu.edu

Subject Code: CSI **Number:** 629
(Do not list multiple codes or numbers. Each course proposal must have a separate form.)

Effective Term:

- [x] Fall
- [ ] Spring
- [ ] Summer

Year 2013

Title:
Current: CSI 729 Topics in Continuum Systems
Banner (30 characters max including spaces): Topics in Continuum Systems
New:

Credits: (check one)

- [3] Fixed
- [ ] Variable

x or to

Repeat Status: (check one)

- [ ] Not Repeatable (NR)
- [x] Repeatable within degree (RD)
- [x] Repeatable within term (RT)

Maximum credits allowed:

Grade Mode: (check one)

- [x] Regular (A, B, C, etc.)
- [ ] Satisfactory/No Credit
- [ ] Special (A, B C, etc. +IP)

Schedule Type: (check one) LEC can include LAB or RCT

- [x] Lecture (LEC)
- [ ] Lab (LAB)
- [ ] Recitation (RCT)
- [ ] Internship (INT)
- [ ] Independent Study (IND)
- [ ] Seminar (SEM)
- [ ] Studio (STU)

Prerequisite(s): Permission of instructor

Corequisite(s):

Instructional Mode:

- [x] 100% face-to-face
- [X] Hybrid: ≤ 50% electronically delivered
- [X] 100% electronically delivered

Restrictions Enforced by System: Major, College, Degree, Program, etc. Include Code.

Are there equivalent course(s)?

- [ ] Yes
- [x] No

If yes, please list

Catalog Copy for NEW Courses Only (Consult University Catalog for models)

Description (No more than 60 words, use verb phrases and present tense)	**Notes** (List additional information for the course)

Indicate number of contact hours: Hours of Lecture or Seminar per week: Hours of Lab or Studio:

When Offered: (check all that apply) [ ] Fall [ ] Summer [ ] Spring

Approval Signatures

Department Approval Date

College/School Approval Date

If this course includes subject matter currently dealt with by any other units, the originating department must circulate this proposal for review by those units and obtain the necessary signatures prior to submission. Failure to do so will delay action on this proposal.

Unit Name	Unit Approval Name	Unit Approver's Signature	Date

For Graduate Courses Only

Graduate Council Member

Provost Office

Graduate Council Approval Date

For Registrar Office's Use Only: Banner_____Catalog_____

revised 11/8/11

Course Proposal Submitted to the Curriculum Committee of the College of Science

1. COURSE NUMBER AND TITLE: CSI 629 Topics in Continuum Systems

Course Prerequisites: Permission of instructor.

Catalog Description: Covers selected topics in the computational aspects of continuum systems not covered in fixed-content courses in dynamical systems. Possible topics are smooth-particle hydrodynamics, radiation hydrodynamics, algorithms for continuum systems, adaptive grids for continuum computations, spectral methods in computational fluid dynamics, algorithms for concurrent machines, formation of high energy particle jets in astrophysical applications, application to Earth atmospheric problems, and flow considerations in molten materials.

Rationale for number change; By lowering the number to the 600-level courses, undergraduate students, primarily those in accelerated master programs, can register and take advantage of the content that the course brings to their programs.

2. COURSE JUSTIFICATION:

Course Objectives: Bring novel topics into the curriculum
Course Necessity: No change in the necessity by changing its number.
Course Relationship to Existing Programs: This is a course within the CSI and COMP programs

Course Relationship to Existing Courses:

3. APPROVAL HISTORY:

4. SCHEDULING AND PROPOSED INSTRUCTORS:
Semester of Initial Offering with New Number: Fall 2013

Proposed Instructors: Fernando Camelli, Juan Cebral, Rainald Lohner, Cing-Dao (Steve) Kan, Dhafer Marzougui

5. TENTATIVE SYLLABUS: see the existing CSI729 syllabus below

CSI 729
Topics in Continuum Systems
Syllabus

Instructor:
Contact Info:
Date:
Place:
Office Hour:
Prerequisites: knowledge in Linear Algebra and Vector Calculus, Numerical Methods (CSI 700 or CSI 701) and Finite Element Theory (CSI 742), and Fluency with at least one of the following computer languages:
C/C++, or
Fortran (CSI 501), or permission of Instructor

Description:

This course introduces the students to the modeling of Continuum System, like solids or solid-like materials. The basic of vector and tensor analysis applied to the kinematics of continuous media are presented during the course. The course covers constitutive laws that relate kinematic and dynamic (forces) quantities inside the material. The conservation principles of mass, linear momentum, angular momentum, and energy are introduced and applied to simple continuum systems where analytical solutions are possible. An overview of more complex system is presented to illustrate the need of computational sciences to solve them. A brief overview of numerical approaches to solve the set of equation obtained from the conservation laws, i.e. Finite Element Model, is given to the students. The course combines the theoretical formulation of Continuum Systems and numerical solution of problems on the field of Continuum Systems. In addition, this course brings an overview of scientific visualization of vector and tensor fields that are the foundation of scientific data analysis in continuous mechanics.

Topics:

- Linear Algebra Concepts: Matrices, vectors tensors
- D'Alembert's Principle, Virtual Work Principle
- Approximation methods
- Kinematics: motion description, strain components, deformation, velocity and acceleration, transformation of coordinates, continuity equation, Reynolds Transport Theorem
- Forces and stresses: equilibrium of forces, transformation of stresses, equations of equilibrium, deviatoric stresses, energy balance
- Constitutive equations: Hooke's Law, anisotropic linearly elastic materials, principal strain invariants, large deformations, linear and non-linear viscoelasticity, simple models for isotropic materials
- Plasticity formulations: loading and unloading conditions, plasticity equations, small strains
- Finite Element Model: small and large deformation
- Visualization of Vector and Tensor Fields.

Grades:

- Homework assignment: 40%
- Final project: 35%
- Final exam: 25%

Class URL:

Note: Presentations in PDF format will be posted on ***Blackboard*** after lectures for students.

Text Book:

- **An Introduction to Continuum Mechanics,** by J. N. Reddy, Cambridge University Press (2008).
- **Elements of Continuum Mechanics,** by R. C. Batra, AIAA (2006).
- **Continuum Mechanics,** by A. J. Spencer, Dover (1980).
- **Introduction to the Mechanics of Continuous Media,** by L. E. Malvern, Prentice-Hall (1969).

Honor Code:
As in any class, you are allowed to study with other students. However, tests and homework assignments (unless otherwise specified) must be completed on your own. SPECIFICALLY - YOU MAY NOT COPY ANY TEXT OR MATERIAL AND REPRESENT IT AS YOUR OWN WORK. For both papers and for code, you may reference or link to other peoples work (if it is consistent with the assignment), but you MUST cite the source it came from. Failure to follow these guidelines will be considered a violation of GMU's academic honor code and will be treated as such.
Student members of the George Mason University community pledge not to cheat, plagiarize, steal, or lie in matters related to academic work. http://academicintegrity.gmu.edu/honorcode/
Plagiarism will not be tolerated.

Academic Integrity:
GMU is an Honor Code university; please see the University Catalog for a full description of the code and the honor committee process. The principle of academic integrity is taken very seriously and violations are treated gravely. What does academic integrity mean in this course? Essentially this: when you are responsible for a task, you will perform that task. When you rely on someone else's work in an aspect of the performance of that task, you will give full credit in the proper, accepted form. Another aspect of academic integrity is the free play of ideas. Vigorous discussion and debate are encouraged in this course, with the firm expectation that all aspects of the class will be conducted with civility and respect for differing ideas, perspectives, and traditions. When in doubt (of any kind) please ask for guidance and clarification.

GMU e-mail Accounts:
Students must use their Mason email accounts—either the existing "MEMO" system or a new "MASONLIVE" account to receive important University information, including messages related to this class. See http://masonlive.gmu.edu for more information.

Office of Disability Services:
If you are a student with a disability and you need academic accommodations, please see me and contact the Office of Disability Services (ODS) at 993-2474. All academic accommodations must be arranged through the ODS. http://ods.gmu.edu

Other Useful Campus Resources:

Writing Center: A114 Robinson Hall; (703) 993-1200; http://writingcenter.gmu.edu

University Libraries "Ask a Librarian" http://library.gmu.edu/mudge/IM/IMRef.html

University Policies
The University Catalog, http://catalog.gmu.edu, is the central resource for university policies affecting student, faculty, and staff conduct in university academic affairs. Other policies are available at http://universitypolicy.gmu.edu/. All members of the university community are responsible for knowing and following established policies.