George Mason University
Graduate Course Approval/Inventory Form

Please complete this form and attach a copy of the syllabus for new courses. Forward it as an email attachment to the Secretary of the Graduate Council. A printed copy of the form with signatures should be brought to the Graduate Council Meeting. Complete the Coordinator Form on page 2, if changes in this course will affect other units.

Please indicate: _____ NEW   __X__ MODIFY   _____ DELETE

Local Unit: IT&E

Graduate Council Approval Date:

Course Abbreviation: ECE / SYST
ECE is primary locus of course; SEOR is cross listing

Course Number: 673 / 620

Full Course Title: Discrete Event Systems

Abbreviated Course Title (24 characters max.): Discrete Event Systems

Credit hours: 3

Program of Record: MS in EE, MS in SE

Repeatable for Credit?

__D=Yes, not within same term Up to hours

__T=Yes, within the same term Up to hours

__N=Cannot be repeated for credit

Activity Code (please indicate): _X__ Lecture (LEC) ___ Lab (LAB) ___ Recitation (RCT)
___ Studio (STU) ___ Internship (INT) ___ Independent Study (IND) ____ Seminar (SEM)

Catalog Credit Format  3 : 0 : 3   Course Level: GF(500-600) __X__ GA(700+) ____

Maximum Enrollment: 50

For NEW courses, first term to be offered: Fall 2004

Prerequisites or corequisites: ECE 521 or SYST 611 or equivalent

Catalog Description (35 words or less): Please use catalog format and attach a copy of the syllabus for new courses. Introduction to modeling and analysis of discrete event dynamical systems. Course covers elements of discrete mathematics and then focuses on Petri Net models and their basic properties. Relation to other discrete event models of dynamical systems.

For MODIFIED or DELETED courses as appropriate:

Last term offered: Spring 00   Previous Course Abbreviation: ECE/SYST   Previous number: 595

Description of modification: Revised contents, changed prerequisites and moved to 6xx level

APPROVAL SIGNATURES:

Submitted by:  ________________________________ email: ________________

Department/Program:  ________________________________ Date: ________________

College Committee:  ________________________________ Date: ________________

Graduate Council Representative: ________________________________ Date: ________________
GEORGE MASON UNIVERSITY  
Course Coordination Form

**Approval from other units:**

Please list those units outside of your own who may be affected by this new, modified, or deleted course. Each of these units must approve this change prior to its being submitted to the Graduate Council for approval.

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<th>Unit:</th>
<th>Head of Unit’s Signature:</th>
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Graduate Council approval: ____________________________________________ Date: ____________

Graduate Council representative: ____________________________ Date: ____________

Provost Office representative: ________________________________ Date: ____________
1. CATALOG DESCRIPTION
   (a) ECE 673 / SYST 620 Discrete Event Systems (3.3:0)
   (b) Prerequisites: ECE 521 or SYST 611 or equivalent
   (c) Catalog Description:
       Introduction to modeling and analysis of discrete event dynamical systems. Course covers
       elements of discrete mathematics and then focuses on Petri Net Models and their basic
       properties: locality and concurrency. condition/event systems; place/transition nets; Colored
       Petri Nets; reachability graphs (occurrence nets); and invariant analysis. Issues in Petri Nets
       and temporal logic. Stochastic Petri Nets. Relation to other discrete event models of dynamical
       systems. Applications of the theory to modeling and simulation and to systems engineering
       problems, especially in systems architecting.

2. JUSTIFICATION
   (a) Course Objectives
       Introduce the fundamental concepts and algorithms of discrete event dynamical systems. Set the
       analytical foundations for the architecture design course and be the key methods course for the
       Architecture Based System Integration concentration area. Introduce foundations and methods
       for the analysis of architectures. Illustrate the modeling and simulation capabilities of Colored
       Petri Nets.
   (b) Course Necessity
       Some of the material in this course was covered in ECE/SYST 595. The coverage of discrete
       event systems has been expanded to include more recent results and focused to serve as the
       analytical foundation for the architecture based systems engineering concentration area.
   (c) Relationship to Existing Courses
       There is no similar course. It is replacing a course with the same name but at the 5xx level
       (ECE/SYST 595).

3. APPROVAL HISTORY
   ECE Department Date:
   SEOR Department Date:
   IT&E Graduate Committee Date:
   IT&E Dean Date:

4. SCHEDULING
   The course will be offered every fall semester as part of the ECE and SYST programs.
   Proposed Instructors: Prof. Alexander H. Levis, Dr. Abbas K. Zaidi or other faculty and adjunct
   professors, who are qualified in this area.

5. COURSE OUTLINE
   (a) Syllabus
   1. Introduction to discrete event dynamical systems – systems and models
2. Relationship to continuous/discrete time dynamical systems
3. Mathematical foundations: Sets and multisets/bags; relations and ordering; partial ordering and lattices; generalization of graph theory
4. Introduction to Petri Nets – basic properties: locality and concurrency
5. Condition/event systems
6. Place/transition nets
7. Colored Petri nets
8. Reachability graphs (Occurrence nets)
9. Invariant Analysis – the Farkas algorithm
10. Architecture related problems:
    a. The Lattice algorithm
    b. Deconstruction using invariants (structural methods)
    c. Behavior analysis using the reachability graph (state space methods)
11. Temporal issues in Petri nets
    a. Temporal Logic
    b. Time in Petri nets
12. Stochastic Petri nets
13. Relation of Petri net models to other models – automata/finite state machines; Markov chains, queuing theory
14. Modeling and simulation of discrete event systems

(b) Reading and reference material

Detailed class notes by A. H. Levis

(c) Student Evaluation Criteria

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<tr>
<th>Component</th>
<th>Percentage</th>
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<tr>
<td>Homework</td>
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<td>Midterm</td>
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<td>Final</td>
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