Seminario de Sistemas Embebidos (SE)

Localidad: UNSAM

Setiembre 2015 - 3 dias de 9:30 a 16:30 (15 al 17 o 16 al 18 de setiembre)

Presenta: Dr. Michael Winokur (*)

Modalidad: Seminario avanzado para profesionales y estudiantes de posgrado.

Las clases seran presentadas en castellano con material escrito en Ingles (transparencias, referencias y ejercicios de clase).

La audiencia maxima sera de 30 participantes. Un numero mas reducido permitira mejor interaccion con los participantes.

Prerrequisitos de los participantes: Familiaridad con Sistemas Embebidos, dominio de ingles tecnico, familiaridad basica con procesos de desarrollo de hardware y software, conocimiento de algun lenguage de programacion (C, basic, PL1, Pascal, etc) , familiaridad con algebra booleana, participacion en ejercicios de clase grupales. Conocimiento de sistemas operacionales de tiempo real es una ventaja pero no un prerrequisito excluyente.

Objetivos:

El foco del seminario sera la especificacion , definicion de requerimientos y diseño conceptual de sistemas embebidos; basandose en modelos (Model driven specification of Embedded Systems) Esta es la fase critica en el desarrollo de sistemas efectivos y robustos. En particular se trataran aspectos de modelos conceptuales, estructural , funcional y especialmente dinamico (el desafio principal de esta actividad de ingenieria). Un aspecto importante a incluir es el de los procesos, modelado y especificacion requeridos para seguridad funcional y / o certificacion de sistemas embebidos como EIC 61508 y DO 178 B/C con analisis comparativo de sus enfoques y los desafios que presentan. El seminario cubrira brevemente standards de modelage de-facto com SysML/ UML. Las clases incluyen presentacions y ejercicios ; breves demostraciones de herramientas de modelage y especification (Matlab, Rhapsody, etc) y un mini proyecto.

(*) Short CV

Dr. Michael Winokur is Director of Corporate Engineering and Development, Israel Aerospace Industries (IAI). He is responsible for development, acquisition and technology transfer of methods, and tools for Systems Development and Engineering for the corporation.

Dr. Winokur has vast teaching experience. He is an external associate professor at the ME in Systems Engineering in the Technion and at HIT, Holon Institute of Technology. Recently, at the request of the academic board he has developed a specialization in Embedded Systems at HIT for students of the BSc in Electrical and Electronic Engineering. Students in the specialization are required to take three core courses, three elective ones and two out of three specially developed laboratories. At IAI he has developed, manages and is an active lecturer in the internal specialization courses (240 training hours) in Embedded Systems Engineering that have been taught to hundreds of Engineers working in Systems Development for Aeronautics, Space and Defense systems. He lectures frequently in the subjects in international conferences. He holds over 30 publications in engineering subjects with emphasis on Systems development, management and engineering and has been invited as the keynote speaker to the 11th Workshop on Embedded and Cyber-Physical Systems Education (WESE 2015) taking place October 8th in Amsterdam as part of ES Week 2015.

Dr. Winokur has been Chairman of the Israeli Chapter of INCOSE, the International Council for Systems Engineering and Chairman of the Computer Society section of the IEEE in Israel. Since 2014 he is Chairman of the yearly Israel Embedded Systems Symposium. He holds a B.S. "Summa Cum Laude" in Electrical Engineering and an M.S. in Nuclear Engineering from the Technion in Haifa Israel; and a Ph.D. in Systems Engineering from Imperial College, London where he did his doctoral research under a British Council fellowship.

Programa del seminario:

i) Preparacion del aula, proyector, handaouts, etc. Dia anterior al seminario por la tarde.

ii) Primer dia

Introducion y descripcion de Sistemas Embebidos. Aspectos de sistema, SW y HW
Especificacion, modelos y diseño conceptual (estructural) . Topicos:

- The system in its environment
- The analysis process
- Basic functional models and specification
- The need for Object Based Analysis
- The Generic Model of Embedded Computer Systems and Their Software
- System Conceptual components
- Conceptual vs. design architecture
- Basic decomposition steps
- Criteria supporting decomposition
- Practical decomposition considerations
- Scenarios
- Examples and exercise (ATM, Remote Medical Diagnostics, Automatic Parking System

iii) Segundo dia

Especificacion, modelos y diseño funcional y dinamico de sistemas embebidos. Topicos:

- ES functionality modeling
- Analysis objectives
- Hierarchical decomposition of flows
- Signal flows, Process flow & variable characterization
- Identification of functional capabilities of components
- Class exercise review: all steps, from system in its environment, until identification of sub-sysem activities
- Dynamics Modeling: definition of operating modes and states of embedded systems
- The mathematical formalism of STATECHARTs
- Defining systems operating modes: the working method
- Analysis and timing of transitions
  Real-time behavior specification and analysis
- Examples and exercise (ATM, Remote Medical Diagnostics, Automatic Parking System)

iv) Tercer dia

Tool Demo de modelage y especification de SE.
Seguridad funcional en sistemas embebidos. Topicos:

- Developing embedded systems (often with safety critical software) that complies to industry standards such as:
  - DO-178B/C for avionics;
  - ISO 26262 for automotive;
  - IEC 62304 for medical;
  - EN 50128 for railway, and
  - IEC 61508 for industrial control (the parent of many of these standards)
- ‘objectives’ or ‘requirements’ that need to be met and ways in which they can be implemented and documented
- processes, procedures, risks and tools used to achieve safety-critical software certification.
- requirements traceability, coding standards adherence, independence criteria, testing and structural coverage analysis. Finally, we discuss how these can assist in the next generation of certification.

Mini proyecto aplicando los topicos del seminario "end to end".