STRATEGOS

Master of Science on Engineering Technology for Strategy and Security,
Modelling, Simulation, Data Analysis, AI/IA for Strategies on Operations and Systems

Course: Modeling and Design of Complex System
ING-IND17

Credits: 8
- 4 Credits for Modeling and Design of Complex Systems (M&DCS) in Industry
- 4 Credits for Modeling and Design of Complex Systems (M&DCS) in Defense

Schedule & Timetable:
1st Year, 1st & 2nd Semester
- M&DCS in Industry, Bruzzone, 1st Semester, 1st Year
  o Tentative Schedule 1 Lecture of 5 hours in a row per week, for 8 weeks to support Class Exercises and Lab Activities as well as International Seminars
- M&DCS in Defense & Homeland Security, Bruzzone, 2nd Semester, 1st Year
  o Tentative Schedule 1 Lecture of 5 hours in a row per week, for 8 weeks to support Class Exercises and Lab Activities as well as International Seminars

Teachers, Email, URL:
Prof. Agostino G. Bruzzone, agostino.bruzzone@simulationteam.com
Col. Michele Turi (PhD in M&S), michele.turi@simulationteam.com
Ing. Federico Tarone (PhD in M&S), federico.tarone@simulationteam.com
www.simulationteam.com & www.itim.unige.it

Offices & Labs in DIME:
Genoa Site, Via Opera Pia 15, 16125 Genova, Italy
Savona Campus, via Magliotto 2, 17100 Savona, Italy
Assistants for Exercises & Simulation Lab Experience:
Exercises are carried out by Teachers, Invited Guests and Assistants that are introduced directly to class for directing specific Seminars.

Education Objectives:
Foundation on Complex Systems. Transfer of knowledge about Simulation Paradigms and Modeling Methodologies effective for addressing Complex Systems. Transfer of capabilities to analyze real problems and case studies corresponding to Complex Systems. Acquisition of skills in Conceptual Modeling applied to Complex Problems. Acquisition of Skills in design of Simulation Architectures and Model Development applied to Complex Systems.

Course Program & Elements:


Strategic Analysis and Decision Making related to Complex Systems, Design and Reengineering of Complex Systems based on Quantitative Modelling & Simulation
Techniques for Identification and Analysis of Emergent Behaviors

Simulation Paradigms of M&S for Complex Systems; theoretical foundations of interoperable Simulation, distributed simulation, MS2G, MSaaS. Interoperable Simulation and Modelling Solution for Complex Systems. Design of Models and Development of Simulators and Federations of Simulators.

Human Behavior Modeling and Intelligent Agents reproducing Population and Social Systems. Operational Expertise in using Modeling and Simulation (M&S) and related experimental methodologies and techniques to investigate complex systems and to support related decision making processes.

Lean Simulation: Concept, Methodologies and Techniques, Modeling and Simulation applied to Early Stage Evaluation of Large Programs. Methodologies and Techniques for applying M&S in SME (Small Medium Size Enterprises).

Simulation as enabler for Applying Artificial Intelligence and Intelligent Agents in Industrial and Defense Applications: Nested and Combined Simulation to support Decision Making and Planning. Artificial Intelligence Techniques integrated with Simulation for Strategic Decision Making.

Strategic Decision Making Based on Simulation in Defense over Multiple Join Domains: M&S of Joint Operations over a Comprehensive Approach and Simulation for Transformation (e.g. Autonomous Multi Domain Systems, Hybrid Warfare, Threat Networks).

Simulation of Complex Systems in Business and Industrial Plants (e.g. MOSES, CUMANA, LEM, LEXIS, GreenLog, SISOM).

Simulation of Complex Systems in Defense and Homeland Security (e.g. JESSI, CAPRICORN, IA-CGF, IDRAS).

Direct Experiences in applying different Simulation Tools, Models, Soft Computing Intelligent Agents and technologies to address specific problems involving Complex Systems (e.g. MISCHIEF, SIMCJOH, T-REX, DT).

Teaching Approach:


Training and Education of the Students in Virtual Experiences within Simulation Labs by using directly the presented methodologies and techniques in realistic problems and case studies using M&S solutions.

Evaluation and Final Exam:

Multiple Experiences carried out in Virtual Labs where the Students are evaluated on Simulation Exercises and Experiences, based on Individual and in team working by Collaborative and/or Competitive approach, representing Micro Projects devoted to address specific issues within realistic complex problems by using M&S (e.g. MISCHIEF, SIMCJOH, T-REX, DT). Final Exam will be carried out by Oral Exam including review of the Simulation Exercises & Experiences and by requiring to demonstrate skills in conceptual modeling and simulation development.

Time Zone:

A, Genoa, Italy (CET), GMT+1 (during Daylight Saving Time GMT+2)
Prerequisites:

The Course does not require specific prerequisites, being accessible to University students and including all the elements and references necessary for the Candidates; therefore basics know-how in engineering, mathematics, statistics and computer use could be useful to improve the Candidate learning curve and performance.

References