

EcosimPro

Modelling and Simulation Software



EcosimPro is a stand-alone, flexible and extendible object oriented simulation tool with a user-friendly environment. It is developed by Empresarios Agrupados Internacional for modelling simple and complex physical processes that can be expressed in terms of differential algebraic equations or ordinary-differential equations and discrete events. It is the European Space Agency's preferred tool for simulating rocket propulsion, environmental control and life support systems.

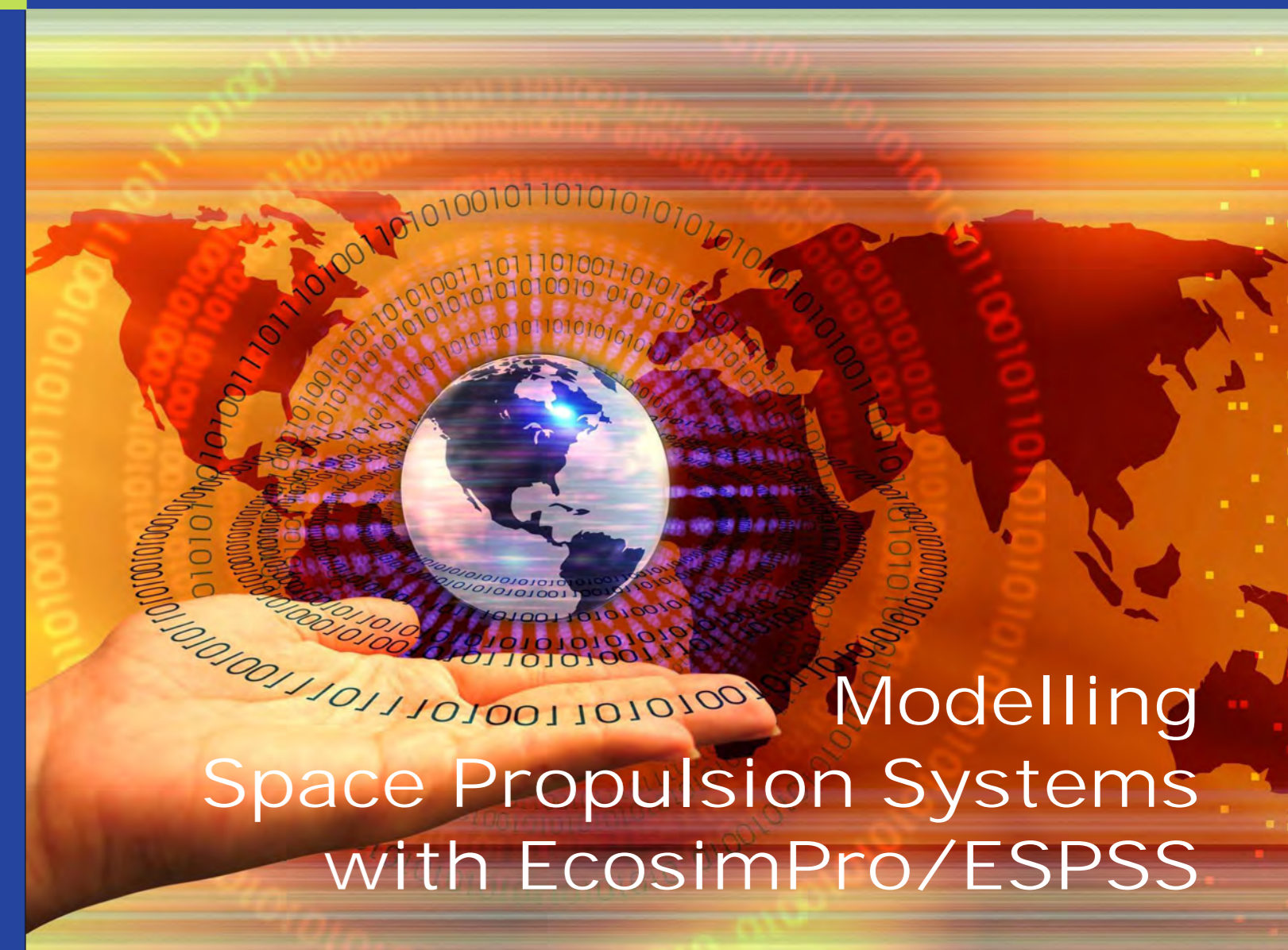
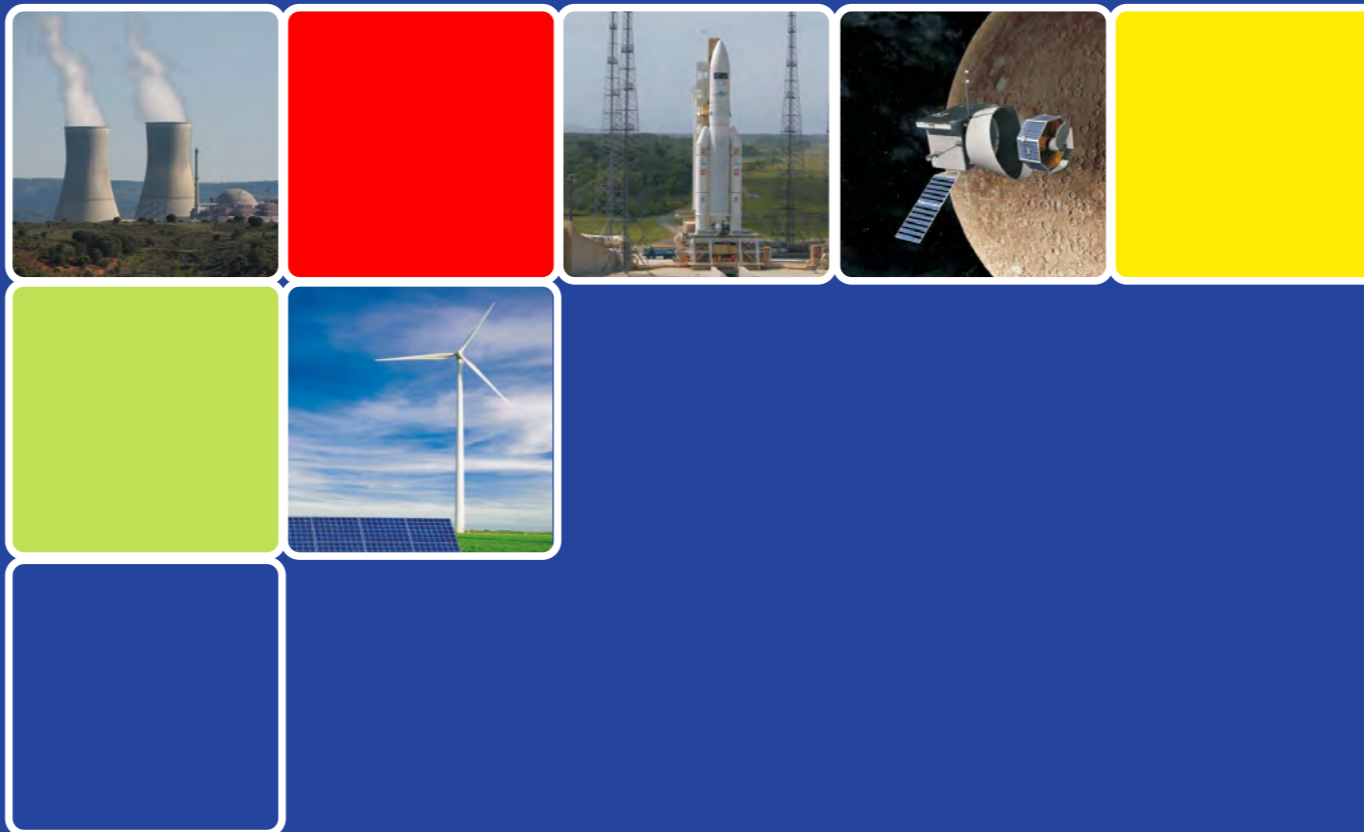
EcosimPro has an advanced Graphical User Interface and uses a high-level, "engineer-friendly" object-oriented language (EL) for modelling continuous and discrete processes. EcosimPro works with libraries containing types of components (mechanical, electrical, pneumatic, hydraulic, energy, etc) that can be reused to model any physical system graphically by "dragging and dropping" the required component symbols.

EcosimPro is able to perform steady state and transient simulations as well as different types of calculations such as parametric and optimization studies. EcosimPro can also deal with high-fidelity, multi-disciplinary and distributed simulations thanks to its open architecture, which allows it to connect to external commercial (Excel, Matlab, COM) or in-house tools and link with codes written in C, C++ and FORTRAN.

These features make EcosimPro a useful tool for all phases the physical system modeling, from preliminary and detailed simulation and design to post-certification, validation and in-service support, and allow it to serve as a common framework in multi-partner collaborative engineering projects providing common standards and methodologies.

EcosimPro and its libraries are being successfully applied to applications in different industrial sectors:

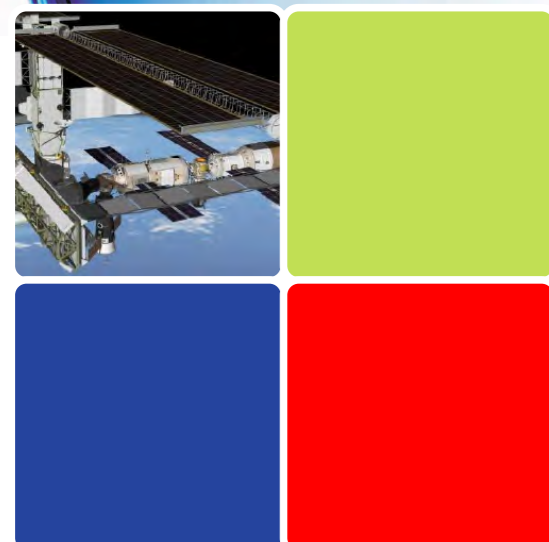
- Space: ESPSS libraries (European Space Propulsion System Simulation), an ESA initiative to create a European simulation platform for spacecraft and launch vehicle propulsion systems, and also other libraries such as Environmental Control and Life Support Systems, Thermal Analysis and Satellite System.
- Aeronautics (through PROOSIS tool derived from EcosimPro): Gas Turbines Performance and Control and Aircraft Systems.
- Power, Water and Process: Themal Balance, Plant Transients, Water and Steam Hammer, Advanced Power Cycles, Cryogenics, Tritium Transport and Process, Process Units, Desalination Plants and Electrical Systems.



Modelling Space Propulsion Systems with EcosimPro/ESPSS

3-day Introductory Course

Madrid, Spain
6th - 8th October 2015



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COURSE OVERVIEW

EcosimPro is a leading tool for modeling multidisciplinary complex continuous and discrete physical systems and in particular for performing system level simulations of space propulsion systems. More and more users find it is the solution to their design problems, performance analysis, transient studies, optimization, etc. in an environment offering multiple functionalities.

The course is focused on the modeling and simulation of space propulsion systems through the Space Propulsion libraries and on acquainting users with the wide range of calculations that can be done with EcosimPro. Moreover, it also includes basic notions of creating and modifying basic components (eg compressors and turbines) as an introduction to modeling in EcosimPro. The topics covered therefore include:

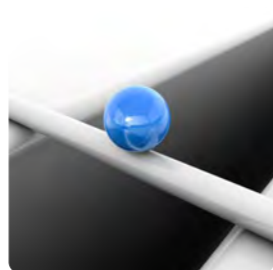
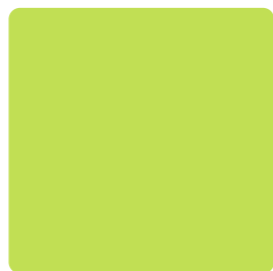
- Basic notions of EcosimPro
- Creation of typical configurations (eg. piping networks, tank pressurization systems, rocket engine cycles, etc.)
- Creation of typical performance calculations: design, off-design, transient, optimization, etc.
- Advanced modeling of two-phase fluid systems
- Exporting models as a black-box

This course is taught by our Space Propulsion modeling engineers. They have considerable experience in modeling and helping resolve our customer's simulation problems.

WHO IS THIS COURSE MEANT FOR?

This course was conceived for new users of EcosimPro who are interested in the following simulation areas:

- Conceptual design
- Detailed design
- Performance study
- Space Propulsion systems
- Transient and steady simulations
- Optimization



COURSE INFORMATION

COURSE FEE

The fee for the course is 1000 euro (VAT not included). For multiple attendees from the same company, there are discounts from the second person. The fee includes beverages, coffee, lunches, dinner on 7th October and copy of the slides.

COURSE LOCATION

EA Headquarters (Madrid city centre)
Calle Magallanes, 3
Madrid, 28015
Spain

COURSE DINNER

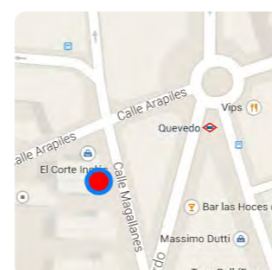
On 7th October there is an official dinner visiting a typical restaurant in the historic city centre of Madrid.

HOW TO REGISTER FOR THE COURSE

Please, contact Daphne Diana Jimenez
E-mail: djj@empre.es
Phone: +34.913.098.150
Web: www.ecosimpro.com

HOTEL RESERVATION

Some hotels nearby have special discounts for attendees. Please contact us for good prices and reservations.



PROGRAMME

TUESDAY, 6th OCTOBER (9AM – 6PM)

INTRODUCTION TO ECOSIMPRO

- Overview: Libraries and application areas
- Main Features: Flexibility, acausal and object-oriented modeling, steady and transient equation solvers, etc.

FIRST STEPS

- Graphical User Interface, Workspaces, Libraries & Components
- EL language: Component equations, ports, functions, etc.
- Partitions: Symbolic manipulation
- Experiments: Code, wizards, execution, monitor simulations

CREATING MODELS GRAPHICALLY

- Quick overview of the Space Propulsion libraries
- Review of the general concepts of EcosimPro applied to models of the Space Propulsion libraries

WEDNESDAY, 7th OCTOBER (9AM-6PM)

SPACE PROPULSION LIBRARIES

- Property files of available fluids and description of the thermodynamic functions valid for two-phase two-fluid flow
- Physical modelling of the Space Propulsion libraries and their components: 1D pipes, valves, splitters, collectors, turbomachinery, tanks, combustors, nozzles, etc.
- Coupling with control and thermal networks
- First models: Piping networks, pressure regulators, tank filling and emptying, etc.

STEADY LIBRARY

- Main features and description of components
- Differences and configuration of design and off-design models: sizing of a rocket engine from the required performances

THURSDAY 8th OCTOBER (8:30AM-4PM)

ADVANCED CALCULATIONS

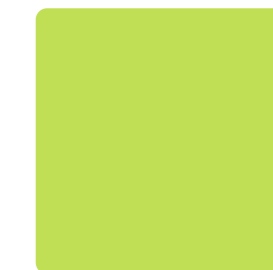
- Parametric Studies
- Optimization cases: minimization of the initial mass of a launcher depending on the mission requirements
- Parameter Estimation: matching of the simulation results of a tank discharge with test results

EXTERNAL CONNECTIONS

- Decks: How to export models as black boxes
- Excel Connection: Excel Add-in, Watch, Reports

CREATION AND ANALYSIS OF COMPLETE EXAMPLE

- Priming simulation in a two-phase piping network
- Startup and shutdown of a rocket engine
- Steady simulation of a rocket engine in design and off-design conditions



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