

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.

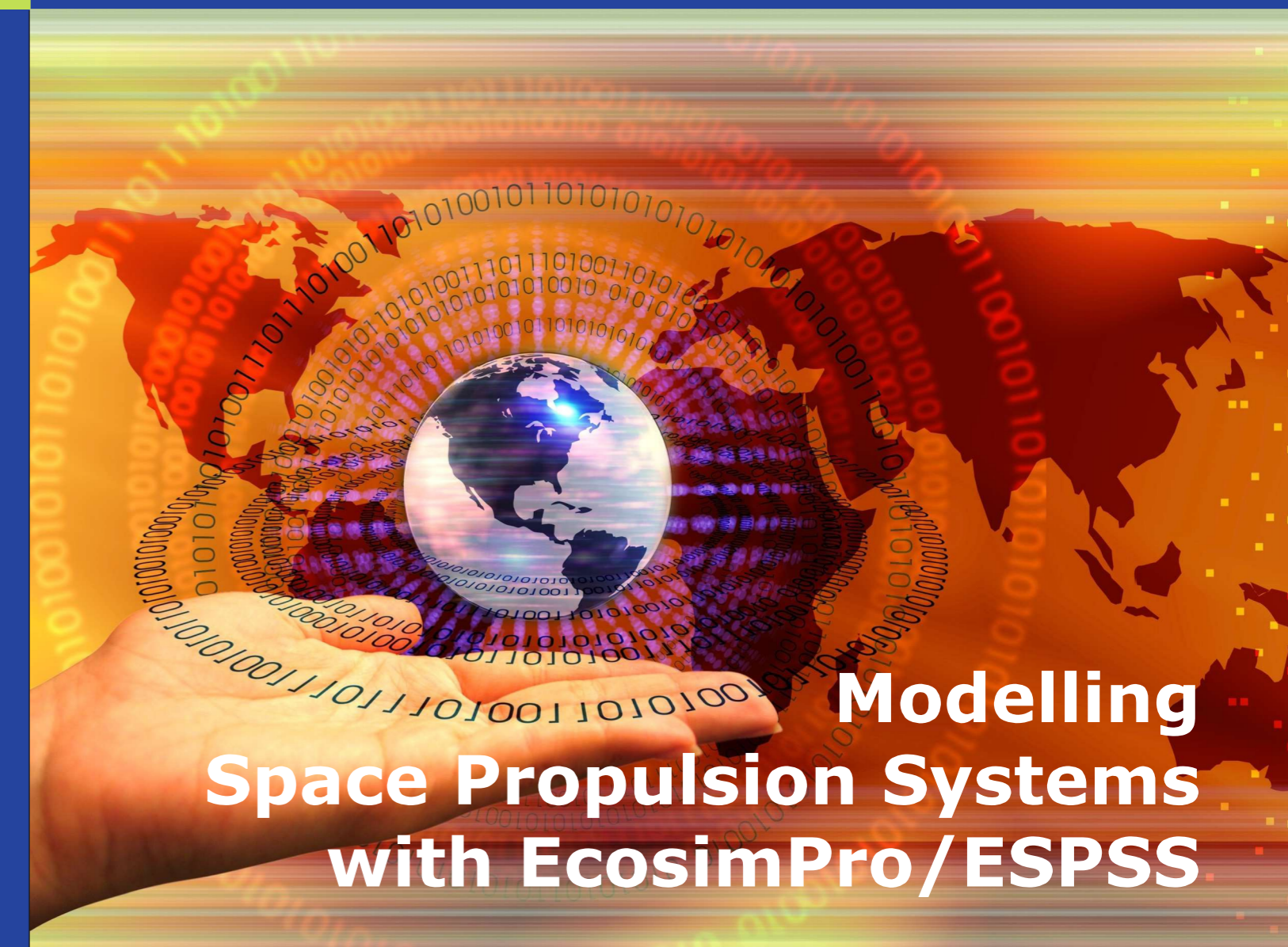
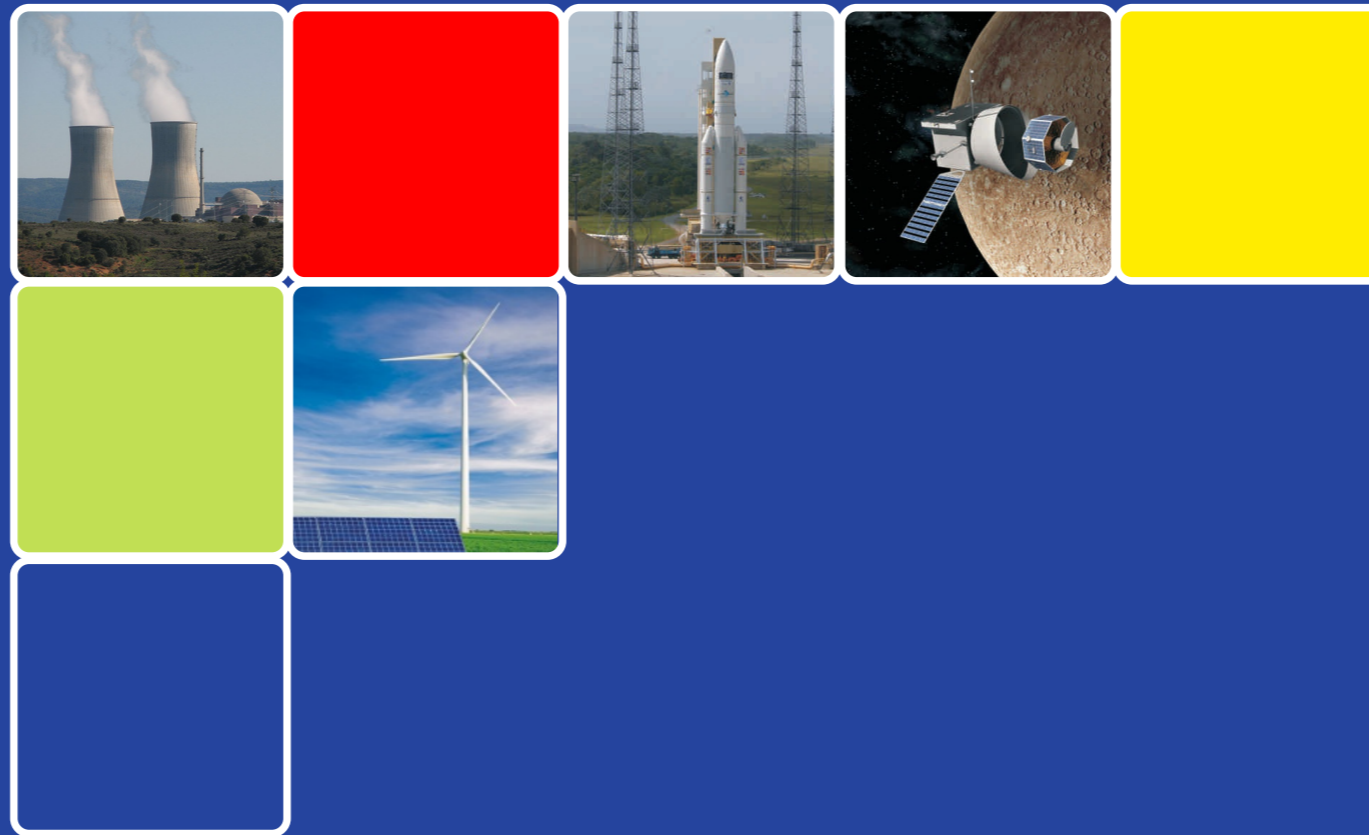
EcosimPro has an advanced Graphical User Interface and uses a high-level, "engineer-friendly" object-oriented language (EL) for modelling continuous and discrete processes. EcosimPro works with libraries containing types of components (mechanical, electrical, pneumatic, hydraulic, energy, etc) that can 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:

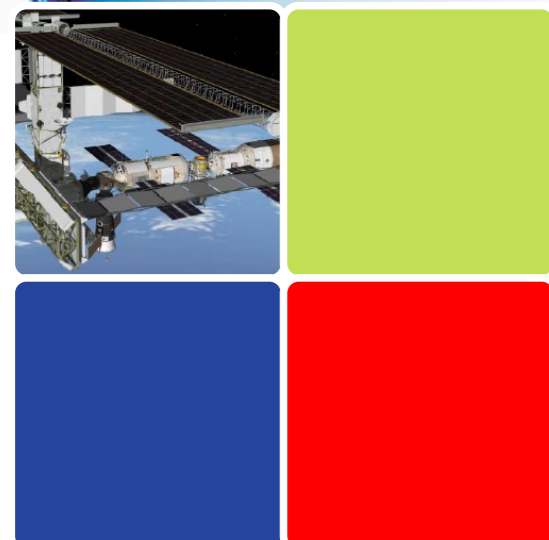
- Space: spacecraft and launch vehicle propulsion systems, Environmental Control and Life Support Systems, Thermal Analysis and Satellite Power Systems
- Aeronautics (through PROOSIS tool derived from EcosimPro): Gas Turbines Performance and Control and Aircraft Systems
- Power, Water and Process: Thermal 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 Practical Introductory Course

Madrid, Spain
17th - 19th September 2024



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COURSE OVERVIEW

EcosimPro/ESPSS is a leading tool for modeling space propulsion systems in 0D-1D. ESPSS is an ESA simulation toolkit maintained every year with new updates. More and more users find it as the solution to their design problems, performance analysis, transient studies, optimization, etc.

ESPSS is used today by leading European companies for designing new propulsion systems.

This course is focused on the modeling and simulation of space propulsion systems with ESPSS. Moreover, it also includes notions of creating and modifying basic components using the EL language (eg compressors and turbines). The topics covered are:

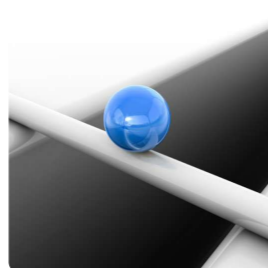
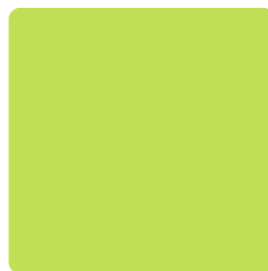
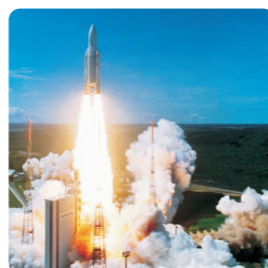
- Basic notions of EcosimPro
- Creation of typical configurations (eg. piping networks, tank pressurization systems, rocket engine cycles, etc.)
- Creation of typical performance calculations: design, off-design, transient, optimization, etc.
- Advanced modeling of two-phase fluid systems
- Exporting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

This course is taught by our space propulsion modeling engineers. They have wide experience in modeling and simulation activities as well as in customer support services.

WHO IS THIS COURSE MEANT FOR?

This course has been 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 1800 euro (VAT not included). We offer 10% early-bird discount if you book before 31st May. For multiple attendees from the same company we offer additional discounts from the second attendee. The fee includes beverages, coffee, lunches, dinner on the 18th September and copy of the slides.

COURSE LOCATION

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

COURSE DINNER

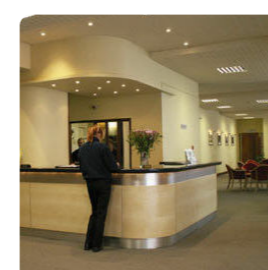
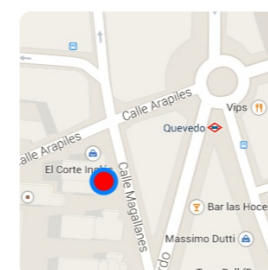
On the 18th there is an official dinner in restaurant in Madrid downtown.

HOW TO REGISTER FOR THE COURSE

Sent an email to sales@ecosimpro.com with your data. Somebody will contact you requesting the inscription data. Limited number of places.

HOTEL RESERVATION

Some hotels nearby have special prices for EAI guests. If you are interested to receive information you can contact us.



PROGRAMME

TUESDAY, 17th SEPTEMBER (10:30AM-5PM)

INTRODUCTION TO ECOSIMPRO

- Overview of EcosimPro
- Presentation of EcosimPro Space Simulation Toolkits: ESPSS, FluidaPro and LPRES for modelling launchers and satellite propulsion systems

FIRST STEPS

- Main concepts: GUI, Workspaces, Libraries, Components...
- Object-oriented language for modelling propulsion components
- How to model graphically new propulsion systems
- How to create robust mathematical models
- How to create simple and complex propulsion experiments
- Review of the general concepts of EcosimPro applied to models of the Space Propulsion libraries

WEDNESDAY, 18th SEPTEMBER (9AM-5PM)

SPACE PROPULSION LIBRARIES

- Property files, 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, turbomachinery, tanks, combustors...
- Coupling with control and thermal networks
- First models: piping network, pressure regulator, tank filling and emptying,...

STEADY LIBRARY

- Main features and description of elements
- Differences and configuration of Design and Off-design models: sizing a rocket engine from the required performances

THURSDAY, 19th SEPTEMBER (9AM-15:30PM)

ADVANCED CALCULATIONS

- Parametric studies
- Optimization: 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
- 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
- Electrical propulsion test case



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