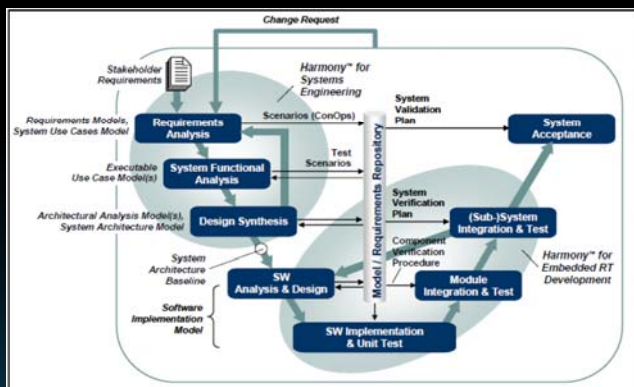
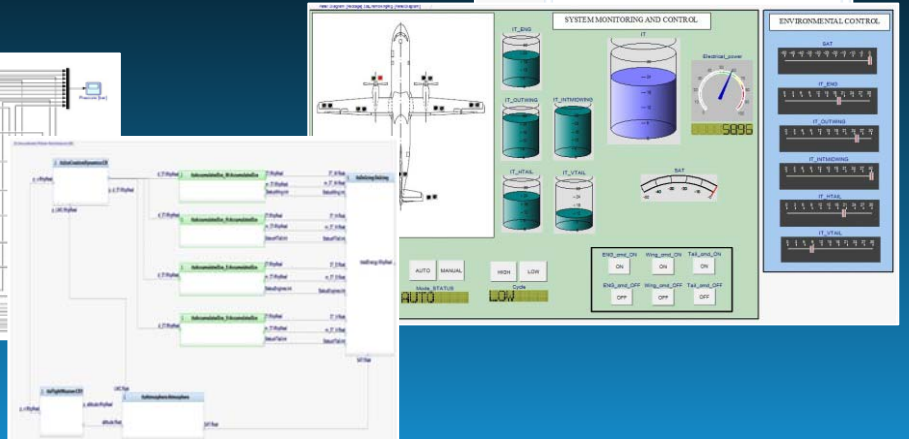
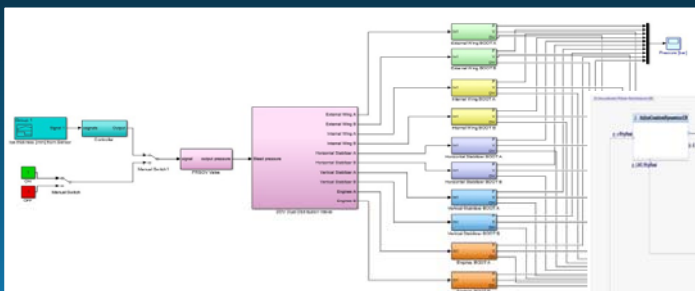
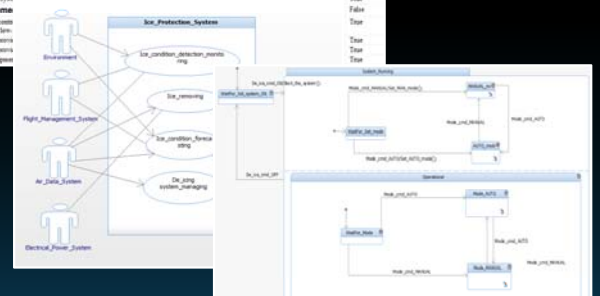


DESIGN AND HETEROGENEUS SIMULATION BASED ON THE 'SYSTEMS ENGINEERING' TECHNIQUES

Prof. Eugenio Brusa – DIMEAS



ID REQ	Description	Requirement Type	Location	Requirement
REQ_001_001	First landing system shall be provided by the stand by control system	Operational	Control and navigation	True
REQ_001_002	1.4 Safety Requirements	S/A	S/A	False
REQ_001_003	Probability of single catastrophic failure of the system shall be less than 1% per flight hour	Safety	General	True
REQ_001_004	Each ice protection component shall be redundant in order to guarantee ice protection functionality after single failure event	Safety	General	True
REQ_001_005	The ice protection failure which is categorized as catastrophic is the undesired malfunction of ice detection	S/A	S/A	False
REQ_001_006	1.5 Physical Requirements	S/A	S/A	False
REQ_001_007	The weight of the ice protection system	S/A	S/A	True
REQ_001_008	1.6 Functional Requirements	S/A	S/A	True
REQ_001_009	The De-icing Control Unit shall ensure select the type of cycle (dry, wet, anti-ice)	S/A	S/A	True
REQ_001_010	The ice protection system shall pass	S/A	S/A	True
REQ_001_011	The ice protection system shall pass	S/A	S/A	True
REQ_001_012	In non-icing conditions, the engine	S/A	S/A	True



Description

This course is aimed at providing some practical skills and follows a previous one, which was proposed since the academic year 2013-2014 ('Tools and Applications of the Systems Engineering'). Nevertheless, the approach extremely practical applied to this module does not require that students are already aware about the subject.

The implementation of software tools and functional models typical of the 'Model Based Systems Engineering' is described. The requirement, functional and physical modeling activities and the architecture trade-off are performed by dealing with the design of some industrial systems. During classes the students will make some practice by analyzing the design of a fleet of drones for surveillance and rescue on a defined controlled area as an amazing example of applied knowledge.

The Model Based Systems Engineering within the Product Life Cycle Management is developed through some outlines about context and implementation in terms of methodology, tools, software and data management.

This methodology is described by dealing with requirements (definition, classification, allocation and management within IBM Rational DOORS®); project development from concept to preliminary design, by means of the language SysML and modelling through the IBM Rational Rhapsody®; design synthesis and physical modelling, through the Simulink® environment. Particularly, the requirement, functional, operational and architectural analyses will be applied to a test case and interfacing with a numerical simulator of dynamic behaviour like the Simulink® or equivalent will be shown. Interoperability of tools and system design synthesis will be finally analyzed.

Timetable and location

- ❑ **May 30th** : Systems Engineering: Methodology / Process, Method, Language, Life cycle Model and Product Model
- ❑ **June 13th** : Requirement analysis and IBM DOORS®
- ❑ **June 20th** : Functional, operational and architectural analyses and IBM Rhapsody®
- ❑ **June 27th** : Physical analysis and connection to some dynamic simulator like the Simulink®
- ❑ **June 29th** : Heterogeneous simulation and Interoperability + Final test (1/2 hours)

LOCATION : DIMEAS – III Floor – Meeting Room (Sala Riunioni)

TIME : 9 to 13

Suggested reading and references:

D.Walden, G.Roedler, K.Forsberg, D.Hamelin, T.Shortell – *Systems Engineering Handbook of INCOSE*, 4th Ed., John Wiley and Sons, 2015.

C. Wasson – *System analysis, design and development: concepts, principles and practices*, Wiley, 2nd ed., July 2015

P. Roques – *Modélisation de systèmes complexes avec SysML*, Eyrolles, 2013 (*in French*).

B. Powel Douglass – *AGILE Systems Engineering*, MK Morgan Kaufmann, Waltham, MA, USA, 2016.

E. Brusa, A. Cala, D. Ferretto – *Systems Engineering and Its Applications to Industrial Product Development*, to appear, published by Springer as a ref.pub.86845246 within 2017.