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Syllabus for

SARC-InnovMgmt – Product Innovation for Aerospace Applications

CREDITS	7.5 credits
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TARGET GROUP	Graduate students that are interested in relating their research to product innovation (with focus on aeronautical and space applications).
COURSE OBJECTIVES	1) To provide a theoretical reference base for conducting research in product development for aerospace applications, and 2) To introduce participants to carry out research and innovation activities in aerospace industry, including engineering and innovation management perspectives.
LEARNING OBJECTIVES	After the course the PhD candidate participant should have: • Gained increased awareness of research on the product development and innovation process, especially applied to aerospace industry. • Improved their ability to critically review and make use of established and recent research literature. • Independently written a critical review of research literature on product development and innovation, especially applied to aerospace industry. • Trained evaluation of other course participants' work.

- Improved their ability to communicate orally and in written about product development and innovation, especially applied to aerospace industry, in a research context.

CONTENT	• Engineering Design and Optimization- How can optimization support the design process? • Optimization methods – from traditional gradient based methods to non-gradient methods such as the Complex method, Genetic Algorithms and Particle Swarm Optimization. • Multi-objective optimization – How to handle problems with several conflicting objectives. • Handling of constraints via penalty functions. • Surrogate Models – How to use Design of Experiments and Surrogate Models to reduce the optimization time. • Post-optimization analysis – How to choose a solution from a large pool of optimal solutions. • Application examples where modeling, simulation and optimization are used to solve real world industrial problems.
LITERATURE	*Managing Innovation* by J Tidd and J. Bessant (A good reference book that exists in several editions. The latest is not needed.) Complementary scientific articles, newspaper texts and white papers, YouTube clips etc. along the course.
EXAMINATION	The course is examined through active participation, oral and written assignments, as presented and discussed in the course during the time schedule. ***For industrial participants:*** *The learning objectives and examination are decided on an individual basis.*
DIPLOMA	All participants will achieve a signed course diploma describing the content of the course.
INDUSTRIAL MEMBER FEE	The course fee is SEK12 500. The course is free of charge for participants within SARC, the Graduate School of Space Technology and ACS. Travel expenses are not included.
SIGN UP	https://kunskapsformedlingen.se/en/courses/product-innovation-for-aerospace-applications-01/ The number of spots is limited to 25.

TEACHERS	• Professor René Laufer and Professor Anna Öhrwall Rönnbäck, Luleå University of Technology (examiners). • Professor Petter Krus and assistant professor Ingo Staack, Linköping University (examiners). • Associate professor Peter Törlind and Professor Mario Storga, Luleå University of Technology. • Business and IPR experts: Kent Mrozek, Jonas Hjelm, LTU Business. Venture capital, start-ups and business incubators in the aerospace industry. • + Additional teachers and presenters for specific content (among others Ulf Palmnäs, independent consultant, previously at GKN).
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PRELIMINARY SCHEDULE	The course is given by Swedish Aerospace Research Center (SARC) and the Graduate School of Space Technology (LTU/national), in close collaboration with ACS (Aerospace Cluster Sweden) and partly funded by the strategic research program Innovair and the EU regional program RITSpace. The course started with an information meeting in Kiruna, Aug 25, at 14.00. At this meeting, the following course dates and events were decided: • 12-13 October 2022: **Space Innovation Forum (SIF)**, **Kiruna**, Hotel Scandic (arranged by LTU). • 6-8 February 2023: **MODPROD** , Linköping. Course event on 6th Febr.; then optional participation on MODPROD 7th-8th Febr. (arranged by LiU). • 5-8 March 2023: Rymdforum/Space Forum, Kiruna (arranged by LTU and IRF). (note: the event 2023 is not yet announced) • Lectures (additional to the events): All lectures (2-3 hours each) will be given online (zoom) but could be given partly as a physical meeting (on site e.g., at LTU, LiU, KTH, Chalmers) for participants that

physically are at the same place. Will be arranged by the participants along the course.

- **LE1:** Introduction to product innovation for aerospace applications (A Öhrwall Rönnbäck, R Laufer), Oct 4, 2022, at 16.00-17.00 online.
- **LE2:** Organizing innovation and creativity events (P Törlind, M Storga) PREL early Nov, 2022 online.
- **LE3:** IPR, venture capital and business for aerospace applications (K Mrozek, J Hjelm) PREL 15 Dec 2022 online 13.00-15.00.
- **LE4:** The enterprise platform and entrepreneurship for future ventures in aerospace (I Staack, P Krus, A Öhrwall Rönnbäck) PREL early Jan 2023 online.
- **LE5:** Systems engineering for future innovations (N Lakemond, G Holmberg) PREL 18 Jan 2023 online 14.00-16.00.
- **LE6:** Paper presentation and prepare your pitch presentation (to be presented in conjunction with Rymdforum 2023, which will be the final seminar) (A Öhrwall Rönnbäck et al) PREL mid Feb-23 online.