WM950-15 Systems Thinking and Systems Engineering

20/21

Department
WMG
Level
Taught Postgraduate Level
Module leader
Kim Stansfield
Credit value
15
Module duration
1 week
Assessment
Multiple
Study location
University of Warwick main campus, Coventry

Description

Introductory description

To establish key principles and methods of systems thinking to help students address complex problems and needs of Enterprises. This will include identifying stakeholders, capturing and managing requirements and translating these into appropriate solutions. Students will be given an appreciation of whole lifecycle views and approaches, and the major systems engineering management processes essential to deliver successful, complex programmes.

Module aims

To establish key principles and methods of systems thinking to help students address complex problems and needs of Enterprises. This will include identifying stakeholders, capturing and managing requirements and translating these into appropriate solutions. Students will be given an appreciation of whole lifecycle views and approaches, and the major systems engineering management processes essential to deliver successful, complex programmes.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

- Systems thinking and systems engineering concepts
- Soft Systems Method and approach
- Linking vision, outcomes and goals deployment
- Prioritising goals, stakeholders and needs
- Developing and evaluating high level Concept of Operations (Conops)
- System development lifecycles vs programme lifecycles
- Alternative architectural frameworks – pros and cons
- Systems engineering processes and competencies for successful outcomes
- Concept of Operations – high level design principles, visualisation and evaluation
- Systems Engineering developments for future enterprises and product service systems
- Systems development exercise and assessment
  Case studies – the good, the bad and the ugly in complex civil and enterprise systems developments

Learning outcomes

By the end of the module, students should be able to:

- Critically evaluate the role of systems thinking and soft systems methodology in complex, multi-stakeholder environments
- Select and justify appropriate architectural frameworks for product-service and enterprise development scenarios
- Explain the hierarchy of vision, outcomes, business and system programme goals and apply tools to support the prioritisation of goals and stakeholders
- Apply the principles of systems engineering to create more effective development, delivery, in-service support and retirement of product-service and enterprise systems
- Understand and evaluate systems engineering development processes and associated competencies, including needs & requirements capture, requirements management, validation, verification, integration and risk management.
- Critique developments in systems engineering of relevance to business and industry

Indicative reading list

Bhise, V.D., Designing Complex Products with System Engineering Processes and Techniques, CRC Press, 2014. ISBN: 9781466507036
Blanchard, B.S., System Engineering Management, 4th ed., Wiley, 2008. ISBN: 9780470167359
Hitchins, D.K., Systems Engineering: A 21st Century Systems Methodology, Wiley-Blackwell, 2007 ISBN: 9780470058565
INCOSE, ‘Systems Engineering Handbook – A Guide for System Life Cycle Processes and Activities’, INCOSE TP-2003-002-04, John Wiley and Son, ISBN 978-1-1 18-99940-0, 2015
ISO Standard, ‘ISO/IEC/IEEE 15288:2015, Systems and software engineering -- System life cycle processes’, 2015.
Johnson, N., Simply Complexity: a clear guide to complexity theory, Oneworld Publications, 2009. ISBN: 9781851686308

Kossiakoff, A., Sweet, W.N.,Seymour, S.J., Biemer, S.M., Systems Engineering Principles and Practice, Wiley, 2011, ISBN: 9780470405482.
Koestler, A., The Ghost in the Machine, Hutchinson, London, 1967. [QZ.1.K6]. ISBN: 9781939438348.
Meadows, D., Thinking in Systems – A Primer, Chelsea Green Publishing, 2008 ISBN: 9781603580557.
NASA, 'Systems Engineering Handbook', Washington, D.C.: National Aeronautics and Space Administration (NASA), NASA SP-2016-6105 Rev2, 2017, ISBN 197938147X.
Simon, H.A., The Architecture of Complexity, Proceedings of the American Philosophical Society, Vol. 106, No. 6 (Dec. 12, 1962) pp467-482

View reading list on Talis Aspire

Subject specific skills

Systems Thinking, Systems Development Lifecycle vs Programme Lifecycles, Risk Management, Systems Engineering Processes, STSE Tools and Techniques, SE Team Development, STSE Developments

Transferable skills

Communications, Leadership, Organisational, Teamwork, Team Development

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Study

Study time

Type	Required
Lectures	18 sessions of 1 hour (12%)
Seminars	12 sessions of 1 hour (8%)
Practical classes	12 sessions of 1 hour (8%)
Other activity	30 hours (20%)
Assessment	78 hours (52%)
Total	150 hours

Private study description

No private study requirements defined for this module.

Other activity description

Pre-work: 10 hours
Self guided group work: 20 hours TEL, (combination of 6 hours of guided and 14 hours of self-

directed work)

Costs

No further costs have been identified for this module.

Assessment

You do not need to pass all assessment components to pass the module.

Assessment group A1

	Weighting	Study time	Eligible for self-certification
Assessed work as specified by department	100%	78 hours	Yes (extension)
4500-5000 word individual written assignment (70%) in-module exercise assessment (15%) post-module self-directed group assignment (15%)			

Assessment group R

	Weighting	Study time	Eligible for self-certification
Assessed work as specified by department	100%		Yes (extension)
One consolidated assessment component of 100% only			

Feedback on assessment

In class debrief of performance on simulation; written feedback will be provided in a report for all Post Module assignments.

Availability

Courses

This module is Core for:

- Year 1 of TESS-H1PU Postgraduate Taught International Technology Management