WM950-15 Systems Thinking and Systems Engineering

22/23

Department
WMG
Level
Taught Postgraduate Level
Module leader
David Wright
Credit value
15
Module duration
2 weeks
Assessment
Multiple
Study location
University of Warwick main campus, Coventry

Description

Introductory description

This module provides an overview of systems thinking and systems engineering approaches required to help understand and design 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

- Linking vision, outcomes and goals deployment
- Prioritising goals, stakeholders and requirements
- Developing and evaluating high level Concept of Operations (Conops)
- Designing solutions to meet stakeholder requirements (QFD)
- System lifecycle and system development lifecycles - pros and cons
- Concept of Operations – high level design principles, visualisation and evaluation
- Systems Engineering modelling approaches
- Systems development exercise and assessment - 'Mars Habitation'

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
- 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.

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

Subject specific skills

Systems Thinking, Systems Development Lifecycle vs Programme Lifecycles, Risk Management, Systems Engineering Processes, STSE Tools and Techniques, Requirements Management, QFD

Transferable skills

Communications, Leadership, Organisational, Teamwork, Team Development, Systems Thinking

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Study

Study time

Type	Required
Lectures	8 sessions of 1 hour (5%)
Seminars	10 sessions of 1 hour (7%)
Practical classes	12 sessions of 1 hour (8%)
Other activity	20 hours (13%)
Assessment	100 hours (67%)
Total	150 hours

Private study description

No private study requirements defined for this module.

Other activity description

Pre-work: 5 hours online, independent self teaching
Self guided individual activity - 5 hours independent learning
Self guided group work exercises: 10 hours TEL

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 A2

	Weighting	Study time
PMA question	70%	90 hours
2800 word individual written assignment (70%)		
Self guided learning quiz and workbook	10%	6 hours
20 multiple choice questions and pass/fail workbook with answers to the self guided learning videos.		
Mars Habitation Case Study	20%	4 hours
2 presentations each worth 10%		

Assessment group R1

	Weighting	Study time
PMA question	100%	
4000 words assignment		

Feedback on assessment

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

Availability

Courses

This module is Optional for:

- Year 1 of TWMS-H1S4 Postgraduate Taught e-Business Management (Full-time)