MSc in Systems Engineering and Management

Syllabus A—Systems engineering

1. Systems Engineering—Rôle, Purpose and Value
Mission, definitions, codes of practice, competencies, relation to other corporate functions, marketing, risk-management, business performance, time-to-market

2. Systems Engineering Organization
Life cycle process models—waterfall, helix, prototyping, simultaneous/concurrent, evolutionary acquisition, Sashami, chaotic, regression, etc. The engineering and application systems model. The 5 systems model. Engineering environments; ATMOSPHERE, SEAMS, system factory, etc..

3. Methods, Modelling and Mathematics

4. Evaluating Systems
Efficiency, effectiveness, cost-effectiveness; net contribution; tradeoffs, ranking methods, weighting and scoring methods

5. Requirements

6. Concept Development
Process modelling, seven-step continuum, creative entropy, necessary and sufficient sets, need and options templates, generic reference models

7. Architectonics
Architectures: clusters, links, infrastructure, entropy. Protocols, processing structures, memory, reconfigurability, redundancy, availability, survivability. Databuses, data links, self test and BIT(E). Interoperability, tempest, electromagnetic compatibility, security, failure modes effects and criticality analysis

8. Design and Specification
Design for:—usability, MMI/HCI, RAM-D, survival, damage tolerance, safety, reconfigurability, stealth, self-defence, self-healing, replacement, test, production, integration, installation, pre-planned improvement.

9. Development
Interface control, adjusting design for integration, configuration management, compatibility management
10. Integration and Test

11. Systems Proving and Transition to Use
Planning and analyzing results from trials, conduct of trials, demonstrating compliance/concessions, commissioning, installation, methods and support for transition into use.

12. System In-use Support

Syllabus B—Systems Engineering Management

1. Systems theory
Modern systems thinking, human aspects, emergence and hierarchy, gestalt, generic reference models, unified systems hypothesis

2. Management of Systems Creation
Specifications, interface management, configuration management, interface management, documentation, design and partitioning management, design change control, managing integration and test, measures of effectiveness and performance, planning and managing trials, managing compliance demonstrations, commissioning, installation and acceptance, transition to use. Managing the in-service systems

3. Project Management
Planning, estimating, costing, budgeting, resource allocation, work breakdown structures, statements of work, on-line control, tiger teams, project reviews, red teams, Programme Evaluation and Review Technique, GANTT charts, audit trails, project records, data management

4. Procurement
MOD/DOD procurement cycles, design-construct contracts, whole-platform procurements. Consortia, Joint Ventures. Prime-subcontractor relationships. Evolutionary acquisition, prototyping, mid-life updates, etc.

5. Managing R&D
Planning and budgeting, identifying “winners”, value for money, organization and method, effective environments and control.

6. Quality Management
Definitions and misunderstandings. Quality ethics, right first time, zero defects, total quality management and their relationship with systems engineering. Quality practices, circles, chains, audits, control, assurance. Eliminating the need for the quality management function
7. Resource Management
Human resources, finance, accounting, life cycle costing, estimating, forecasting, investments, business computing, management of change, information management. Logistics: integrated Logistic Systems, CALS, MANPRINT, CIRPLS and RAM-D

8. Manufacturing Management
Organization and methods, principles of system design, modelling, batch and continuous flow-line, mixed system approaches, control system design, MRP II, just-in-time and the management of its risks

9. Operations Management
Operations organizations, singleton and intensive operations. Improving operational availability, modelling resource utilization, operational logistics, servicing policies

10. Maintenance Management

11. Risk Management
Pros and cons of risks: technological, economic, political, commercial. Risk metrics, probabilities and impacts. Embedding risk management in process models, contingency planning. Commercial factors: warranties, terms and conditions, export credit guarantees, international law, etc.

12. Marketing
Marketing and selling, understanding the market, competition, SWOT, closing sales, bid management and proposals, publicity, image

13. Personal Management
Leadership, team leadership, communications, presentations, promoting synergy and commitment, time management, self-training and education, negotiating skills