ITEC-426
Systems Integration and Architecture

General Information

Course Code	ITEC-426	Level/ Year	8^{th} / 4^{th}	Required (R)/ Selected Elective (SE)			R
Credit Hours	Theory		2	Lab	1	Total	3
Prerequisites	ITEC-322						
Course Coordinator	Ahamed Ali Shaik Meeran						

Course Description

This course is designed to provide students with an understanding of Systems Integration (SI) process, approaches, drivers, tools and techniques required for successful SI, critical success factors, and best practices. The course focuses on how a proposed system will be integrated with other existing or planned systems. It addresses the System Integration problem using architectures as the basis and then addresses the evaluation of the architectures in terms of the capabilities they provide. Case studies and examples from the Information Technology (IT), energy, and financial services industry will be used to illustrate the concepts discussed. The students will learn the theory and practice of business process integration, legacy integration, new systems integration, business-to-business integration, integration of commercial-off-the-shelf (COTS) products, interface control and management, testing, integrated program management, integrated Business Continuity Planning (BCP). Specific focus will be given to issues of interface integration and interoperability of systems.

Course Objectives

- This course will develop the students' ability to learn, create, develop and integrate complex system architectures.
- It includes a student's understanding the role of system architects and relationship to systems engineering and integration. Applying the system architecture concepts to define an enterprise baseline.
- System integration Architecture creates an architectural blue print for transforming the enterprise. One of the important objectives in systems integration is identifying capability gaps as well as redundancies. Facilitating effective systems integration

Course Contents

List of Topics	**Weeks**
UNIT 1: Systems Engineering & Traditional Engineering , Complex Engineered Systems, Structure of Complex System, Complexity in Modern Systems, System of Systems	1,2
UNIT 2: The System Development Process, Systems Engineering through the System Life Cycle, Development of a Systems Engineering Life Cycle Model, Concept Development Stage, Engineering Development Stage, Post Development Stage, Principal stages in system life cycle, Concept Development Phases, Engineering Development Phase, The Systems Engineering Method, Requirement Analysis, Functional Definition, Physical Definition, Design Validation	3, 4, 5
UNIT 3: Systems Engineering Management, Project Management and Systems Engineering, Work Breakdown Structure, Elements of a Typical WBS, System support and System Testing, Elements of Typical SEMP, Organization of Systems Engineering	5, 6,
UNIT 4: Needs, Requirement & Functional Analysis, Functional Definition, Operational, Functional, Performance and Physical Requirements, Needs analysis	7,8, 9

phase flow diagram, Implementation concept exploration, Concept exploration phase flow diagram, Requirements development process, Functional Analysis, System Engineering Method in Concept Definition, Concept Selection and validation, Concept definition Phase flow diagram, Functional Analysis and formulation	
UNIT 5: System Architecting, Model Based Systems Engineering: Role of Systems Architect Within Systems Engineering, Types of Architecture, Architectural Views, Architecture Development, Architecture Validation	10, 11,
UNIT 6: Risk Management, Risk Management in the Systems Engineering Life Cycle, Risk Management, Risk Reduction Through the System Life Cycle, Components of Risk Management, Risk Assessment, Role of Systems Engineering, Risk Management Plan	12, 13
UNIT 7: Integration and System of Systems Engineering, Systems Integration: Integrating the total System, Place of Integration in the System Life Cycle, Program Focus, Program Participants, Systems Engineering Method in Integration, Total System Integration, System of Systems Integration, Types of Integration	14,15

Textbook

Systems Engineering Principles and Practice, Alexander Kossiakoff, Samuel J. Seymour, Third Edition, Published:2020, Publisher: Wiley & Sons Inc

Reference Materials

Software Systems Engineering, Andrew P Sage, James D Palmer, Wiley Series

Architecting Resilient Systems: Accident Avoidance and Survival and Recovery from disruptions, Scott Jackson, Wiley series

Course Learning Outcomes

CLO	Description	Level of Learning (LOL)	Mapped PI
CLO#01	**Identify** the activities of System Engineering Plan	Knowledge	PI 1.3
CLO#02	**Design** the integration of the Total System.	Creating	PI 2.3
CLO#03	**Analyse** the Operational**,** Logical**,** Architectural views.	Analysis	PI 3.1
CLO#04	**Demonstrate** the responsibilities of Program Manager in Systems Engineering.	Comprehension	PI 4.3
CLO#05	**Explain** the functional building blocks in functional Analysis.	Application	PI 5.4
CLO#06	**Explain** integrating the total system in Systems Integration.	Application	PI 6.3

CLO-SO-PI Mapping

	SOs					
CLOs	**SO1**	**SO2**	**SO3**	**SO4**	**SO5**	**SO6**
CLO#01	PI 1.3	-	PI 3.2	PI 4.1-	-	-
CLO#02	-	PI 2.3	-	-	-	-
CLO#03	-	-	PI.3.1	PI 4.2	-	-
CLO#04	-	-	-	PI.4.3	PI.5.1	-
CLO#05	-	-	-	-	PI.5.4	-
CLO#06	-	-	-	-	-	PI.6.3

Approvals

Prepared by Course Coordinator	Ahamed Ali Shaik Meeran		
Approved by Track Leader	Dr.	**TL Signature**	
Last updated	August 18, 2024		