هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	**System Integration & Architecture**
Course Code:	**ITEC-426**
Program:	**Bachelor In Information Technology**
Department:	**Information Technology & Security**
College:	**Computer Science And Information Technology**
Institution:	**JAZAN UNIVERSITY**
Version:	**1**
Last Revision Date:	**02/06/2024**

Table of Contents:

A. General information about the course:

Course Identification					
1. Credit hours:	3 Hours				
2. Course type					
a.	University ☐	College ☒	Department☒	Track☐	Others☐
b.	Required ☒	Elective☐			
3. Level/year at which this course is offered:	08/4th				

4. Course general 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.

5. Pre-requirements for this course (if any):

1.Software Engineering.

6. Co- requirements for this course (if any): NIL

7. Course Main Objective(s)

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

This course will develop the students' ability to learn:

 Understand the process all the systems work together in harmony to boostup productivity and enhance the quality

 The System architecture must address the following service level requirements: performance, scalability, reliability, availability, extensibility, maintainability and manageability and security.

 Identify integration issues upfront in the process of System Integration and should be able to identify the best practices that ensures successful System Integration.
 Have an understanding of technical and business process issues involved in systems.

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	66	100%
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	30
2.	Laboratory/Studio	30
3.	Field	Nil
4.	Tutorial	Nil
5.	Others (specify)Revision	06
	Total	66

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	**Explain** the activities of Systems Engineering Plan	K1	Visual & Verbal [Lectures / Presentations]	Mid Term Exam- Final Exam
1.2	**Summarize** the stages of Systems Engineering Life Cycle	K2	Visual & Verbal [Lectures / Presentations]	Mid Term Exam- Final Exam
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2.0	Skills			
2.1	**Analyze** the Operational, Logical, Architectural Views	S1	Visual & Verbal [Lectures / Presentations / Case Studies]	Assignment, Mid Term Exam
2.2	**Identify** the activities of Requirements Analysis	S1	Visual & Verbal [Lectures / Group Activity]	Assig-I, Quiz, Lab Exam, Final Exam
2.4	**Design** the integration of the total system	S2	Visual & Verbal [Lectures / Group Activity] [Lab Session]	Quiz, Assignment-II, Lab Exam, Final Theory Exam
3.0	Values, autonomy, and responsibility			
3.1	**Demonstrate** the responsibilities of Program Manager in Systems Engineering	V1	Visual & Practical [Lab Session].	Quiz, Lab Exam Assignment-II
3.2	**Analyze** the steps of functional building blocks in Functional Analysis	V3	Visual & Practical [Lab Session].	Quiz, Assignment-II and Final Theory Exam
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C. Course Content

No	List of Topics	Contact Hours
1.	**Chapter – 1: System Engineering and the World of Modern Systems, Structure of Complex Systems** a) Definition Systems Engineering, Systems Engineering & Traditional Engineering b) Difference Between Systems Engineering & Project Management, MBSE (Model Based Systems Engineering). c) Systems Engineering Principles and Practices, System Domains, System Engineering Components. System Engineering methods. d) Complex Engineered Systems, Structure of Complex System, e) Definition of System Levels. System Building Blocks, Functional Building Blocks. f) Information Elements, Application of System Building Blocks, System Environment, System Boundaries and its controls. g) System Boundaries: The Context Diagram. Types of Environmental Interactions. Interfaces & Interactions. h) Interface Elements and common examples Complexity in Modern Systems, System of Systems, Enterprise Systems Engineering	5T+4P
2.	**Chapter –2: The System Development Process** a) Systems Engineering through the System Life Cycle, Development of a Systems Engineering Life Cycle Model. b) Two Primary Objectives, DoD System Life Cycle Model, Systems Engineering Life Cycle Model, Software Cycle Model. c) System Engineering Life Cycle Stages, Concept Development Stage, Engineering Development Stage, Post Development Stage, Principal stages in system life cycle. d) Concept Development Phases, Concept Definition Phase, Concept development phases of system life cycle. e) Engineering Development Phase in System Life cycle, Advanced Development Phase. f) Engineering Design Phase. Integration and Evaluation Phase, Modern Integration Technique. g) The Systems Engineering Method, Requirement Analysis, Functional Definition, Physical Definition, Design Validation.	5T+4P

	h) Systems Engineering method Flow Diagram, Requirements Analysis, Functional Definition (Analysis and Allocation). i) Trade-Off Analysis, Functional Interactions, Physical Definition, j) Design Validation, Modeling the System Environment. k) Test and Test Data Analysis	
3.	**Chapter – 3: Systems Engineering Management** a) Management System Development, Project Management and Systems Engineering, b) Program Manager, Systems Engineer, Proposal Development and Statement of Work. c) Work Breakdown Structure, Elements of a Typical WBS, System support and System Testing. d) Cost Control and Estimating, Critical Path Method. e) System Engineering Management Plan. f) Elements of Typical SEMP, Organization of Systems Engineering	5T+4P
4.	**Chapter – 4: Needs, Requirement & Functional Analysis** a) Objective, Place of the Needs Analysis Phase in the System Life Cycle, Examples of New System Needs, External Events, Competitive Issues b) Functional Definition, Operational, Functional, Performance and Physical Requirements, Needs analysis phase flow diagram c) Requirements Analysis: Developing the System Requirements d) Implementation concept exploration, Performance requirements validation, Requirements Development and Sources. e) Concept exploration phase flow diagram. f) Requirements features and attributes, Example of public transportation system concept, Example of Poor requirements g) Requirements development process, Requirements Elicitation, Requirements of Analysis h) Requirements Validation, Requirements Documentation. i) Requirements Hierarchy, Operation Requirement, System Level Requirements.	5T+4P

	h) Functional Analysis, System Engineering Method in Concept Definition. i) Performance Requirements Analysis, Functional Analysis and formulation j) Concept Selection and validation, Concept definition Phase flow diagram, Functional Analysis and formulation	
5	**Chapter:5 System Architecting, Model Based Systems Engineering:** Architecture Introduction, a) Role of Systems Architect Within Systems Engineering. b) Types of Architecture: Functional & Physical Architecture, Allocated Architecture, Architecture Frameworks, Architectural Views:- c) a)Operational View, Logical View, Physical View, Architecting in the Engineering Hierarchy d) Architecture Development, Architecture Traceability, Tools Sets. e) Architecture Validation	5T+4P
6	**Chapter – 6: Risk Management:** a) Risk Management in the Systems Engineering Life Cycle. b) Risk Management, Risk Reduction Through the System Life Cycle, c) Components of Risk Management, d) Risk Assessment, e) Role of Systems Engineering. f) Risk Mitigation, g) Risk Management Plan	5T+4P
	Chapter:7: Integration and System of Systems Engineering a) Systems Integration: Integrating the total System, b) Place of Integration in the System Life Cycle,Program Focus. c) Program Participants, Systems Engineering Method in Integration. d) Agile Systems Engineering and Integration. e) Total System Integration, System of Systems Integration, Types of Integration	5T+4P
Total		

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Assignment -1	4nd Week	10%
2.	Mid Term Exam (Scheduled in Class)	7th / 8th Week	15%
3.	Assignment-2	11th Week	15%
.4	Final Lab Exam	14th Week	20%
5.	Final Exam	16th Week	40%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.)

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	Systems Engineering Principles and Practice, Alexander Kossiakoff, Samuel J. Seymour, Third Edition,Published:2020,Publisher: Wiley & Sons Inc
Supportive References	1.Software Systems Engineering, Andrew P Sage, James D Palmer, Wiley Series 2.Architecting Resilient Systems: Accident Avoidance and Survival and Recovery from disruptions, Scott Jackson,Wiley serices
Electronic Materials	https://lms.jazanu.edu.sa/webapps/login
Other Learning Materials	Real time scenarios and Case Studies were implemented in Assignments to gain knowledge on the Subject

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	One lecture room for each section (maximum 30 students at a time) Each Lab with 30 working PC.
Technology equipment (projector, smart board, software)	• Projector • Smart Board • MS Office • Blackboard (online learning platform) Operating System, ArgoUML, Lucid Chart,
Other equipment (depending on the nature of the specialty)	

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	HOD / QAU	Direct
Effectiveness of students assessment	Students	Indirect
Quality of learning resources	QAU, Course Coordinator	Direct
The extent to which CLOs have been achieved	Academic Coordinator, Track Leaders, Course Coordinator	Direct
Other		

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

G. Specification Approval Data

COUNCIL /COMMITTEE	Department Council Meeting along with Course Coordinators
REFERENCE NO.	
DATE	