TEL3217 SYSTEMS ENGINEERING

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
60	0	00	60	100	60	40	4

Rationale

This course imparts the skills required to build, manage and decommission large scale engineering systems.

Course Objectives

- To give a comprehensive coverage of *system* analysis, design, development and decommissioning.
- To study the principles that make a *remarkable* difference in System development performance, Organizational performance and Level of personal frustrations in coping with complex tasks
- To study the system, product, or service problem-solving/solution development techniques

Detailed Course Content:

SYSTEM ANALYSIS CONCEPTS **[20 Hours]**

Definition of Terms: Concept, Principle, Process, Operation, Task, Practice, Best or Preferred Practice. **System Entity Concepts:** What Is a System; System Attributes, Properties, and Characteristics; System Roles and Stakeholders; System Acceptability; The System/Product Life Cycle. **System Architecture Concepts:** The Architecture of Systems; System Levels of Abstraction and Semantics; The System of Interest Architecture; The Operating Environment Architecture; System Interfaces. **System Mission Concepts:** Organizational Roles, Missions, and System Applications; Understanding the Problem, Opportunity, and Solution Spaces; System Interactions with its Operating Environment; System Mission Analysis; System Use Cases and Scenarios. **System Operations Concepts:** System Operations Model; System Phases, Modes, and States of Operation; Modelling System and Support Operations.

System Capability Concepts: System Operational Capability Derivation and Allocation; The Anatomy of a System Capability. **System Concept Synthesis:** System Analysis Synthesis

SYSTEM DESIGN AND DEVELOPMENT PRACTICES **[25 Hours]**

Design Principles: Detailed study of design principles and system requirements analysis.

System Development Strategies: The System Development Workflow Strategy; System Design, Integration, and Verification Strategy; The SE Process Model; System Development Models. **System Specification:** System Specification Practices; Understanding Specification Requirements; Specification Analysis; Specification Development; Requirements Derivation, Allocation, Flow Down, and Traceability; Requirements Statement Development. **System Development:** Operational Utility, Suitability, and Effectiveness; System Design To/For Objectives; System Architecture Development; Developing an Entity's Requirements, Operations, Behavioural and Physical Domain Solutions; Component Selection and Development; System Configuration Identification; System Interface Analysis, Design, and Control; Human–System Integration; Engineering Standards, Frames of Reference, and Conventions; System Design and Development Documentation. **Decision Support .** Analytical Decision Support; Statistical Influences on System Design; System Performance Analysis, Budgets, and Safety Margins; System Reliability, Availability, and Maintainability (RAM); System Modeling and Simulation; Trade Study Analysis of Alternatives. **Verification and Validation:** System Verification and Validation; Technical Reviews; System Integration, Test, and Evaluation. **System Deployment, Operations, and Support:** System Deployment; System Operations and Support (O&S).

PRINCIPLES MAINTENANCE ENG: **[15 Hours]**

Detailed study of the principles of maintenance engineering applied to electrical engineering systems.

Learning Outcomes

This course will enable the student to productively contribute as a systems engineer in the planning, design or analysis of facilities, equipment, or processes. The student will gain an in-depth understanding of the Scientific Method, DOD Systems Engineering Practice, and the principles of project management, excluding emphasis of cost and schedule control. The student will understand the meaning and practice of: requirements and functional analysis, alternatives development, synthesis, trade studies, decision methodology, life-cycle cost analysis, interface control, and system integration. The student will develop the skills necessary to analyze a system and define requirements. Practical applications will be oriented towards the design and operation of waste management and environmental restoration facilities within the DOE complex

Method of Teaching /Delivery

The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended and Reference Books

[1] Scientific Systems Engineering and Analysis, by B.S. Blanchard and W.J. Fabrycky, Prentice hall. Third Edition ISBN 0-13-135047-1; and Engineering of Complex Systems, University of Washington Monograph, Brian Mar, 1996.

Possible Lecturers:

Mr. P. I. Musasizi
Mr. S. Mwanje