



Academic Standards for Information Technology Programs

2025

Version 2.0



Introduction

This document aims to contribute to the establishment of minimum requirements for bachelor's degree programs in Information Technology to ensure the academic quality of the programs. It seeks to ensure that graduates are highly qualified, possessing the knowledge, skills, and values required by the labor market, in accordance with national trends and in line with best practices required for the academic and professional pursuit of the specialty.

The Education and Training Evaluation Commission (ETEC), according to its mandate by virtue of the Council of Ministers decision No. 108, dated 14/2/1440 AH, has developed specialized academic standards for Information Technology programs. The remit of the Commission includes building systems for evaluating, approving, and accrediting programs in education and training, including institutional and programmatic, encompassing rules, standards, frameworks, and indicators, and building and developing high-quality national academic programs.

Terms

Academic Standards: Established benchmarks for the quality and level of student achievement in an academic program, outlining the expected knowledge, skills, and values upon completion and ensuring consistency, fairness, and credibility in learning and assessment as a foundation for quality assurance in higher education.

Education and Training Evaluation Commission (ETEC): Independent body aimed at evaluating, assessing, and accrediting qualifications in education and training in both public and private sectors, raising the quality and efficiency of those qualifications and ensuring they contribute to the national economy and development.

Essential Knowledge Units (EKUs): Knowledge Units necessary for future learning in a given discipline.

General Knowledge Units (GKUs): Knowledge Units that should be introduced to students majoring in a discipline.

Key Learning Outcomes (KLOs): The minimum required Learning Outcomes in the discipline that students are expected to obtain.

Knowledge Units (KUs): Mandatory multiple related topics that must be included in an institution's degree program.

Learning Outcomes (LOs): Description of what a learner is expected to know, understand, and be able to achieve, which is represented in his/her behavior and ability at the end of a specific educational program.

National Qualifications Framework (NQF): A comprehensive and uniform structure for building, organizing, and categorizing qualifications into levels based on Learning Outcomes.

Specific Knowledge Units (SKUs): Knowledge Units derived from a General Knowledge Unit.

Specific Learning Outcomes (SLOs): Learning Outcomes for a Specific Knowledge Unit.





Goals

The purpose of this work is to develop the minimum Knowledge Units (KUs) in Information Technology, specifying a set of Specific Learning Outcomes (SLOs) that students are expected to acquire after completing their studies. This document lays the foundations for the design of the academic program and the study plans and the alignment of the program with the demands of the labor market. This document also lays out the curriculum design, to facilitate selecting the appropriate teaching strategies and methods and tools for evaluation of the students.

Methodology

This document describes the minimum Essential, General, and Specific Knowledge Units (EKUs, GKUs, and SKUs) in Information Technology. The Learning Outcomes (LOs) of each KU set the threshold for what the students are expected to learn and be able to achieve after successfully completing that KU. Educational institutions should take into account the depth and breadth of these KUs so that the LOs integrate communication skills and values into the curriculum. Institutions can also offer additional KUs that are consistent with their objectives. It should also be noted that the KU is not necessarily an independent course; one or more courses can cover a single KU. Likewise, one course could also cover one or more KUs entirely or partially.

The methodology consists of the following phases:

1. Survey and benchmarking

- Benchmarking with international learned societies and professional bodies.
- Benchmarking with top-rated international and local universities.
- Identifying national labor market requirements.
- Incorporating input from specialists and experts from different sectoral groups.

2. Preparation of the contents of the specific standards document

- Identifying program Key Learning Outcomes (KLOs).
- Defining the general characteristics of the curriculum.
- Developing the GKUs and SKUs for each GKU.
- Formulating SLOs for each SKU.
- Determining the minimum topics required for each SKU.
- Describing the methodology for aligning academic content with the National Qualification Framework (NQF).

The KUs are derived from analyzing several high-ranked QS universities and international regulatory bodies and professional associations. The total credit hours outlined in this document account for about 60% of the total credit hours typically required for an Information Technology program.





The ETEC has developed this document in cooperation and coordination with different entities in Information Technology, such as the Ministry of Communications and Information Technology (MCIT), the Saudi Data and Artificial Intelligence Authority (SDAIA), the National Cybersecurity Authority (NCA), the Saudi Information Technology Company (SITE), and the Advanced Technology and Cybersecurity Company (SIRAR by STC), and with the involvement of various stakeholders from government bodies, the private sector, and academia.

Scope and Uses

This document is primarily intended to guide the development of curricula for a bachelor's degree in Information Technology for public and private higher education institutions in Saudi Arabia. It defines the minimum required knowledge, skills, and values that must be incorporated into program design to ensure graduates meet both academic and professional expectations. It is also used to support the creation of standardized tests and inform accreditation processes, ensuring consistency and quality across programs.

Key Learning Outcomes

Key Learning Outcomes¹ describe the essential knowledge, skills, and values that graduates of the Information Technology undergraduate program will be able to demonstrate once they complete the program.

On successful completion of a bachelor's degree in Information Technology, graduates should be able to:

- KLO 1: Specialist Knowledge for Solving Computing Problems: Apply (a) knowledge of computing fundamentals, (b) knowledge of a computing specialization, (c) mathematics, science, and domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models for defined problems and requirements; and demonstrate the in-depth knowledge and skills for a professional role in a recognized computing specialization.
- KLO 2: Problem Analysis: Identify, formulate, research literature, analyze complex computing problems and conduct investigation through: (a) experiments, (b) analysis and interpretation of data, as well as (c) synthesis of information to provide valid and substantiated conclusions with holistic considerations.
- KLO 3: Design/ Development of Solutions: Design solutions with own perspectives for complex computing problems, and design systems, components, or processes that meet identified needs with appropriate consideration for public health and safety, information privacy and security, cyber security, life cycle cost analysis, net zero carbon, resource efficiency, culture, society, and environment.

¹ The key learning outcomes are defined according to the Seoul Accord Graduate Attributes (2025).





- KLO 4: Modern Tool Usage: Create, select, adapt and apply appropriate techniques, resources, and modern computing tools, including but not limited to simulation, prediction and modelling, with recognition of their limitations, to complex computing activities and problems.
- KLO 5: Individual and Team Work: Participate effectively as an individual and as a member or leader in diverse and inclusive teams and in multi-disciplinary, face-to-face, remote and distributed settings.
- KLO 6: Project Management and Finance: Apply knowledge of IT management principles to the work as a member or leader of a team with consideration of market needs and budget, to manage projects under multidisciplinary environments.
- KLO 7: Communication: Communicate effectively on complex computing activities with the computing community and with society at large, such as being able to comprehend and write effective reports, design documentation and make effective presentations, taking into account of cultural, language, and learning differences.
- KLO 8: Computing Professionalism and Society: Analyze and assess the impacts on the sustainable development of professional computing practices and solutions related to the society, economy, information privacy and security, cyber security, health and safety, legal frameworks, corporate governance, entrepreneurship and the environment when solving complex computing problems.
- KLO 9: Ethics: Apply ethical principles, adhere to professional ethics and norms of professional computing practice, accept responsibilities, incorporate diversity and inclusion, and comply with relevant local and international laws.
- KLO 10: Life-long Learning: Recognize the need and have the ability for acquiring independent and life-long learning as a computing professional, adapt to new and emerging computing technologies and exercise critical thinking in the broadest context of technological advancement.

Curriculum General Criteria

Based on the benchmarking study of leading universities and the KUs and skills in the Information Technology programs, the KUs have been grouped into categories. The curriculum should consist of the following:

1. Essential Knowledge Units (EKUs) (minimum of 30 credit hours): Mathematics, Statistics, Basic Sciences, Project Management, and Finance appropriate to the discipline.
2. Computing Knowledge Units:
 - 2.1. Computing Knowledge Units (minimum of 40 credit hours).
 - 2.2. General Knowledge Units (GKUs): mandatory Information Technology knowledge.





2.3. Specific Knowledge Units (SKUs): mandatory Information Technology knowledge derived from GKUs.

3. Professional practice and experiential learning:

3.1. Coverage of ethical aspects of professional practice.

3.2. Minimum of three semester credit hours (or equivalent) for a capstone project.

3.3. Field training experience of a minimum duration of eight weeks.

Each group consists of different subgroups essential in any typical Information Technology program. These subgroups are identified in the next section.

Knowledge Units

Essential Knowledge Units (EKU)

The Essential Knowledge Units should consist of a minimum of 30 credit hours in Mathematics, Statistics, Basic Sciences, and Project Management and Finance. This should include 23 credit hours of Mathematics, Physics, and Chemistry as shown in Table 1. Additional credit hours may be allocated to other Basic Sciences to address specific disciplinary depth requirements. Standardized tests should not include these EKUs.

Table 1: Essential Knowledge Unit for Information Technology programs

#	EKU	Description	Minimum Requirements (credit hours)
1	Mathematics and Statistics	Covers discrete mathematics, calculus, linear algebra, and probability to form the foundation of computing. This EKU equips students with the logical structures and continuous analytical tools necessary for algorithmic analysis, optimization, and statistical inference	11
2	Physics	Provides fundamental knowledge of physical laws, emphasizing mechanics and electromagnetism to understand hardware architecture and physical system constraints. This EKU covers electric circuits and magnetic fields.	6
3	General Chemistry	Provides the scientific basis for understanding material properties, energy conversion, and material constraints of computing hardware, including atomic structure, chemical bonding, and electrochemistry.	4
4	Project Management and Finance	Covers essential professional skills in project management principles, financial planning, budgeting, and risk assessment necessary for leading and justifying complex computing and technology initiatives.	2





Program Core Knowledge Units

The following table (Table 2) provides an overall view of the curriculum distribution of KUs: Essential, General, Specific, and others. The table provides general recommendations on the acceptable range of topic distribution for each KU. The weighting of the credits is calculated based on a minimum of 40 GKU credits, as shown in Table 2.

Table 2: General and Specific Knowledge Units of an Information Technology program.

GKU	Weight	SKU	Weight
1. User Experience Design	10%	1.1. Human-centered design	5%
		1.2 Human-centered evaluation	5%
2. Global Professional Practice	10%	2.1 Principles of information systems and project management	7.5%
		2.2 Ethical, legal, and privacy issues	2.5%
3. Cybersecurity Principles	10%	3.1 Cyber attacks, vulnerabilities, threats, risk, and detection	5%
		3.2 Cryptography overview	5%
4. Networking	10%	4.1 Foundations of networking	5%
		4.2 Network management	5%
5. Platform Technologies	10%	5.1 Operating systems	10%
6. Information Management	15%	6.1 Data-information concepts and data modeling	8%
		6.2 Database management and query languages	7%
7. System Paradigms	10%	7.1 Requirements engineering	5%
		7.2 Testing and quality assurance	5%
8. Software Fundamentals	15%	8.1 Problem solving and program development	9.5%
		8.2 Fundamental data structures and algorithms	5.5%
9. Web and Mobile Systems	10%	9.1 Web and mobile systems concepts and technologies	10%





Appendix A: Alignment of Key Learning Outcomes of an Information Technology Program within the National Qualifications Framework

Table A1 shows how each KLO aligns with specific areas within the National Qualifications Framework (NQF).

Table A1: Alignment of the Key Learning Outcomes for an Information Technology program with the NQF.

Information Technology Key Learning Outcomes	NQF Learning Areas		
	Knowledge and Understanding	Skills	Values, Autonomy, and Responsibility
1.	✓		
2.		✓	
3.		✓	
4.		✓	
5.			✓
6.			✓
7.		✓	
8.			✓
9.			✓
10.	✓		✓





Appendix B: Learning Outcomes and Topics for Knowledge Units

Essential Knowledge Unit (EKU.1): Mathematics and Statistics

Description	<p>Mathematics and Statistics form the rigorous foundation for Computer Science. This EKU encompasses discrete mathematics for analyzing logical structures and algorithmic complexity, alongside continuous analytical tools such as calculus and linear algebra. It integrates probabilistic reasoning and statistical inference necessary for modeling complex systems, processing data, quantifying uncertainty, and deriving robust computing solutions.</p>
Topics	<p>The following topics must be included in this EKU:</p> <ol style="list-style-type: none"> 1. Discrete Mathematics 2. Calculus 3. Linear Algebra 4. Probability Theory 5. Statistical Inference and Modeling
Specific Learning Outcomes	<p>By completing this EKU, students should be able to:</p> <ol style="list-style-type: none"> 1. Analyze discrete mathematical structures to solve computing-related problems. 2. Apply logic and proof techniques to validate the correctness of algorithms 3. Analyze the properties of infinite series expansions related to function approximation. 4. Calculate partial derivatives and use optimization methods for gradient-based learning. 5. Perform matrix operations and solve systems of linear equations. 6. Apply counting techniques to compute probabilities for discrete scenarios. 7. Formulate probabilistic models for solving problems involving uncertainty and dependence. 8. Apply hypothesis testing and confidence intervals to draw rigorous inferences about data populations. <p>The table below maps the Specific Learning Outcomes for the EKU to the Key Learning Outcomes.</p>





SLOs	KLOs									
	1	2	3	4	5	6	7	8	9	10
1	✓	✓								
2	✓	✓								
3	✓									
4	✓			✓						
5	✓	✓								
6	✓									
7	✓			✓						
8	✓	✓								





Essential Knowledge Unit (EKU.2): Physics

Description	This EKU provides fundamental knowledge of physical laws, with a focus on Mechanics and Electricity & Magnetism. It covers kinematics, work and energy, electric circuits, and magnetic fields. This unit includes mandatory experimental experience.																																																																																					
Topics	<p>The following topics must be included in this EKU:</p> <ol style="list-style-type: none"> 1. Mechanics 2. Electricity & Magnetism 3. Optics/Thermodynamics 																																																																																					
Specific Learning Outcomes	<p>By completing this EKU, students should be able to:</p> <ol style="list-style-type: none"> 1. Apply conservation laws and mechanics principles to analyze physical phenomena in computing systems. 2. Analyze the behavior of oscillatory systems and wave propagation phenomena (mechanical and electromagnetic). 3. Analyze performance limitations and failure modes of hardware based on electromagnetic constraints. 4. Utilize principles of thermodynamics to analyze energy transfer, heat management, and cooling needs for high-density computing. 5. Assess thermodynamic cycles to compare operational effectiveness. <p>The table below maps the Specific Learning Outcomes for the EKU to the Key Learning Outcomes.</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr style="background-color: #4a5568; color: white;"> <th rowspan="2">SLOs</th> <th colspan="10">KLOs</th> </tr> <tr style="background-color: #4a5568; color: white;"> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> <th>9</th> <th>10</th> </tr> </thead> <tbody> <tr> <td style="background-color: #4a5568; color: white;">1</td> <td>✓</td> <td>✓</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="background-color: #4a5568; color: white;">2</td> <td>✓</td> <td>✓</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="background-color: #4a5568; color: white;">3</td> <td>✓</td> <td>✓</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="background-color: #4a5568; color: white;">4</td> <td>✓</td> <td></td> <td>✓</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="background-color: #4a5568; color: white;">5</td> <td></td> <td>✓</td> <td>✓</td> <td></td> <td></td> <td></td> <td></td> <td>✓</td> <td></td> <td></td> </tr> </tbody> </table>										SLOs	KLOs										1	2	3	4	5	6	7	8	9	10	1	✓	✓									2	✓	✓									3	✓	✓									4	✓		✓								5		✓	✓					✓		
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Essential Knowledge Unit (EKU.3): General Chemistry

Description	Chemistry provides the scientific basis for understanding material properties, energy conversion, and device stability. This unit covers the fundamental principles of atomic structure, chemical bonding, and electrochemistry necessary for analyzing material limitations and assessing environmental impact.																																																																												
Topics	<p>The following topics must be included in this EKU:</p> <ol style="list-style-type: none"> 1. Atomic Structure and Bonding 2. Stoichiometry and Chemical Reactions 3. Electrochemistry and Energy Systems 																																																																												
Specific Learning Outcomes	<p>By completing this EKU, students should be able to:</p> <ol style="list-style-type: none"> 1. Describe the relationship between atomic structure, bonding mechanisms, and material periodicity. 2. Relate material structure (molecular/crystal) to macroscopic physical properties. 3. Apply stoichiometry and conservation principles to quantify chemical reactions and mass/energy balances. 4. Analyze energy conversion mechanisms and quantify electrochemical processes. 5. Analyze material and energy considerations to assess environmental impact and inform sustainable design choices. <p>The table below maps the Specific Learning Outcomes for the EKU to the Key Learning Outcomes.</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr style="background-color: #4a5568; color: white;"> <th rowspan="2">SLOs</th> <th colspan="10">KLOs</th> </tr> <tr style="background-color: #4a5568; color: white;"> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> <th>9</th> <th>10</th> </tr> </thead> <tbody> <tr> <td style="background-color: #4a5568; color: white;">1</td> <td>✓</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="background-color: #4a5568; color: white;">2</td> <td>✓</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="background-color: #4a5568; color: white;">3</td> <td>✓</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="background-color: #4a5568; color: white;">4</td> <td>✓</td> <td>✓</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="background-color: #4a5568; color: white;">5</td> <td></td> <td></td> <td>✓</td> <td></td> <td></td> <td></td> <td>✓</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	SLOs	KLOs										1	2	3	4	5	6	7	8	9	10	1	✓										2	✓										3	✓										4	✓	✓									5			✓				✓			
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Essential Knowledge Unit (EKU.4): Project Management and Finance

Description	This unit provides the essential professional knowledge in project management principles, financial planning, budgeting, and economic decision-making, which are explicitly mandated as foundational components of the CS EKU set. This knowledge is crucial for graduates to manage projects and justify solutions under economic and business constraints.																																																																																						
Topics	<p>The following topics must be included in this EKU:</p> <ol style="list-style-type: none"> 1. Project Management Fundamentals (Project Life Cycle, Planning, Scope, and Scheduling) 2. Risk, Resource, and Budget Management (Risk Identification, Resource Allocation, and Budgeting Principles) 3. Economic Decision Making (Time Value of Money, Feasibility Studies, and Cost/Benefit Analysis) 																																																																																						
Specific Learning Outcomes	<p>By completing this EKU, students should be able to:</p> <ol style="list-style-type: none"> 1. Develop a basic project plan including a defined scope, WBS, and realistic scheduling. 2. Analyze common project risks and allocate resources effectively within a defined budget. 3. Apply budgeting principles to manage project funds and control expenditures throughout the project lifecycle. 4. Evaluate the economic feasibility of technology projects using cost/benefit analysis and time value of money concepts. 5. Apply financial analysis techniques to assess economic viability and return on investment of proposed computing solutions. <p>The table below maps the Specific Learning Outcomes for the EKU to the Key Learning Outcomes.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2" style="background-color: #4a5568; color: white;">SLOs</th> <th colspan="10" style="background-color: #4a5568; color: white;">KLOs</th> </tr> <tr> <th style="background-color: #4a5568; color: white;">1</th> <th style="background-color: #4a5568; color: white;">2</th> <th style="background-color: #4a5568; color: white;">3</th> <th style="background-color: #4a5568; color: white;">4</th> <th style="background-color: #4a5568; color: white;">5</th> <th style="background-color: #4a5568; color: white;">6</th> <th style="background-color: #4a5568; color: white;">7</th> <th style="background-color: #4a5568; color: white;">8</th> <th style="background-color: #4a5568; color: white;">9</th> <th style="background-color: #4a5568; color: white;">10</th> </tr> </thead> <tbody> <tr> <td style="background-color: #4a5568; color: white;">1</td> <td></td><td></td><td></td><td></td><td></td><td style="text-align: center;">✓</td><td></td><td></td><td></td><td></td> </tr> <tr> <td style="background-color: #4a5568; color: white;">2</td> <td></td><td></td><td></td><td></td><td></td><td style="text-align: center;">✓</td><td></td><td></td><td></td><td></td> </tr> <tr> <td style="background-color: #4a5568; color: white;">3</td> <td></td><td></td><td></td><td></td><td></td><td style="text-align: center;">✓</td><td></td><td></td><td></td><td></td> </tr> <tr> <td style="background-color: #4a5568; color: white;">4</td> <td></td><td></td><td></td><td></td><td></td><td style="text-align: center;">✓</td><td></td><td></td><td></td><td></td> </tr> <tr> <td style="background-color: #4a5568; color: white;">5</td> <td></td><td></td><td></td><td></td><td></td><td style="text-align: center;">✓</td><td></td><td></td><td></td><td></td> </tr> </tbody> </table>											SLOs	KLOs										1	2	3	4	5	6	7	8	9	10	1						✓					2						✓					3						✓					4						✓					5						✓				
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General Knowledge Unit (GKU) 1: User Experience Design

Description

This GKU covers user research, user testing, information architecture, interaction design, assistive technologies, and accessibility.

Specific Knowledge Unit (SKU) 1.1: Human-centered design

Description

This SKU is part of the User Experience Design GKU, and is concerned with the process of discovering how your users think, feel, and behave in order to design better products and services that meet their needs and provide a better experience.

Topics

The following topics must be included in this SKU:

1. User research and understanding human interaction.
2. User personas.
3. User interface design techniques.

Specific Learning Outcomes

By completing this SKU, students should be able to:

1. Apply various user research methods to gain insights into user needs and requirements.
2. Describe the key principles of human interaction with technology, including cognitive load, behavior patterns, and mental models.
3. Analyze research data to identify user needs and requirements.
4. Design user interfaces that meet user needs, improve usability, and enhance the user experience.

The table below maps the Specific Learning Outcomes for the Specific Knowledge Unit to the Key Learning Outcomes.

SLOs	KLOs									
	1	2	3	4	5	6	7	8	9	10
1		✓								
2	✓									
3		✓								
4			✓							





Specific Knowledge Unit (SKU) 1.2: Human-centered evaluation

Description	This SKU is part of User Experience Design GKU, and covers the process in which users of a product or service are asked to provide feedback about their experience, focusing on usability, satisfaction, and how well the product meets their needs. This feedback can be used to improve the product or service.																																																															
Topics	<p>The following topics must be included in this SKU:</p> <ol style="list-style-type: none"> 1. Heuristic evaluation of user interfaces. 2. Prototyping for usability testing. 3. Usability testing and metrics. 																																																															
Specific Learning Outcomes	<p>By completing this SKU, students should be able to:</p> <ol style="list-style-type: none"> 1. Evaluate user interface designs through heuristic evaluation, applying principles such as consistency, error prevention, and visibility to identify usability issues and propose improvements. 2. Design prototypes for usability testing, for evaluating user needs, performance, and emotional engagement. 3. Develop a comprehensive usability test plan, incorporating performance metrics (e.g., task completion and effectiveness) and affective metrics (e.g., user satisfaction and emotional reactions) to assess overall user experience. <p>The table below maps the Specific Learning Outcomes for the Specific Knowledge Unit to the Key Learning Outcomes.</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr style="background-color: #4a4a8a; color: white;"> <th rowspan="2">SLOs</th> <th colspan="10">KLOs</th> </tr> <tr style="background-color: #4a4a8a; color: white;"> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> <th>9</th> <th>10</th> </tr> </thead> <tbody> <tr> <td style="background-color: #4a4a8a; color: white;">1</td> <td></td> <td>✓</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="background-color: #4a4a8a; color: white;">2</td> <td></td> <td></td> <td>✓</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="background-color: #4a4a8a; color: white;">3</td> <td></td> <td>✓</td> <td>✓</td> <td></td> <td></td> <td></td> <td>✓</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>										SLOs	KLOs										1	2	3	4	5	6	7	8	9	10	1		✓									2			✓								3		✓	✓				✓			
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General Knowledge Unit (GKU) 2: Global Professional Practice

Description

This GKU covers IT governance and resource management, principles of project management, ethical, legal, and privacy issues, principles of information systems, and intellectual property.

Specific Knowledge Unit (SKU) 2.1: Principles of information systems and project management

Description

This SKU is part of the Global Professional Practice GKU and covers the process of planning, executing, and monitoring the progress of a project to ensure its successful completion.

Topics

The following topics must be included in this SKU:

1. Project management tools and techniques.
2. Project management processes.
3. System Development Life Cycle (SDLC): phases, models, and best practices.
4. IT governance principles.
5. IT resource management.

Specific Learning Outcomes

By completing this SKU, students should be able to:

1. Describe the key components of a project plan.
2. Evaluate appropriate project planning and tracking tools to ensure effective project management.
3. Apply the system development life cycle, its phases, and models.
4. Analyze the expanding role of IT governance and its effect on organizations.
5. Compare organizational cultures and their impact on IT governance.
6. Create several appropriate policies and procedures to manage resources in a system.

The table below maps the Specific Learning Outcomes for the Specific Knowledge Unit to the Key Learning Outcomes.





SLOs	KLOs									
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3	✓		✓							
4		✓						✓		
5					✓		✓	✓		
6						✓			✓	





Specific Knowledge Unit (SKU) 2.2: Ethical, legal, and privacy issues

Description	This SKU is part of the Global Professional Practice GKU and is concerned with ethical, legal, and privacy issues in the IT field.																																																																											
Topics	<p>The following topics must be included in this SKU:</p> <ol style="list-style-type: none"> 1. Ethical issues in IT. 2. Legal issues in IT. 3. Privacy issues in IT 4. Intellectual property issues in IT. 																																																																											
Specific Learning Outcomes	<p>By completing this SKU, students should be able to:</p> <ol style="list-style-type: none"> 1. Evaluate the role of legal, ethical, and privacy issues within IT as it relates to organizations. 2. Model a computer use policy that includes privacy, legal, and ethical considerations for all employees. 3. Apply the principles of intellectual property within IT contexts. 4. Describe several transnational issues concerning intellectual property. <p>The table below maps the Specific Learning Outcomes for the Specific Knowledge Unit to the Key Learning Outcomes.</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr style="background-color: #4a4a8a; color: white;"> <th rowspan="2">SLOs</th> <th colspan="10">KLOs</th> </tr> <tr style="background-color: #4a4a8a; color: white;"> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> <th>9</th> <th>10</th> </tr> </thead> <tbody> <tr> <td style="background-color: #4a4a8a; color: white;">1</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>✓</td> <td>✓</td> <td></td> </tr> <tr> <td style="background-color: #4a4a8a; color: white;">2</td> <td></td> <td></td> <td>✓</td> <td></td> <td></td> <td></td> <td></td> <td>✓</td> <td>✓</td> <td></td> </tr> <tr> <td style="background-color: #4a4a8a; color: white;">3</td> <td>✓</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td style="background-color: #4a4a8a; color: white;">4</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>✓</td> <td></td> </tr> </tbody> </table>											SLOs	KLOs										1	2	3	4	5	6	7	8	9	10	1								✓	✓		2			✓					✓	✓		3	✓								✓		4									✓	
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General Knowledge Unit (GKU) 3: Cybersecurity Principles

Description

This GKU covers cyber attacks and their detection, high assurance systems, vulnerabilities, threats, risk, and an overview of cryptography. It also covers security services and their mechanisms and countermeasures, usable security, and mitigation and recovery.

Specific Knowledge Unit (SKU) 3.1: Cyber attacks, vulnerabilities, threats, risk, and detection

Description

This SKU is part of the Cybersecurity Principles GKU. It covers cyber attacks, vulnerabilities, threats, and risk management in cybersecurity. It focuses on detecting and preventing attacks by understanding system weaknesses and applying effective mitigation strategies across various computing environments.

Topics

The following topics must be included in this SKU:

1. Types of cyber attacks and vulnerabilities.
2. Threats and risks in computing environments.
3. Methods and tools for detecting and mitigating attacks.
4. Risk management and prevention approaches across systems, networks, and devices.

Specific Learning Outcomes

By completing this SKU, students should be able to:

1. Explain the common types of cyber attacks, vulnerabilities, and their corresponding detection methods.
2. Compare vulnerabilities, threats, and risk, as well as how they interrelate.
3. Apply risk management frameworks and use appropriate tools to identify vulnerabilities and threats.
4. Analyze data from detection systems and propose mitigation strategies.
5. Recognize specific vulnerabilities, threats, and risks associated with diverse platforms such as networks, cloud computing, desktops, and mobile devices.

The table below maps the Specific Learning Outcomes for the Specific Knowledge Unit to the Key Learning Outcomes.





SLOs	KLOs									
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5	✓									





Specific Knowledge Unit (SKU) 3.2: Cryptography overview

Description	This SKU is part of the Cybersecurity Principles GKU. Cryptography is described as a technique used to protect information or communication from unauthorized access. It uses mathematical algorithms to encode and decode data.																																																																			
Topics	<p>The following topics must be included in this SKU:</p> <ol style="list-style-type: none"> 1. Cryptography algorithms (public-key, symmetric-key, hash functions, and digital signatures). 2. Authentication and data security. 3. Privacy and encryption (block-level, file-level, and application-level). 																																																																			
Specific Learning Outcomes	<p>By completing this SKU, students should be able to:</p> <ol style="list-style-type: none"> 1. Identify various types of cryptography. 2. Compare cryptography algorithms to assess their strengths, weaknesses, and practical applications. 3. Explain block-level encryption, file-level encryption, and application-level encryption for encrypted storage. <p>The table below maps the Specific Learning Outcomes for the Specific Knowledge Unit to the Key Learning Outcomes.</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr style="background-color: #4a4a8a; color: white;"> <th rowspan="2">SLOs</th> <th colspan="10">KLOs</th> </tr> <tr style="background-color: #4a4a8a; color: white;"> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> <th>9</th> <th>10</th> </tr> </thead> <tbody> <tr> <td style="background-color: #4a4a8a; color: white;">1</td> <td>✓</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="background-color: #4a4a8a; color: white;">2</td> <td></td> <td>✓</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="background-color: #4a4a8a; color: white;">3</td> <td>✓</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>											SLOs	KLOs										1	2	3	4	5	6	7	8	9	10	1	✓											2		✓										3	✓										
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General Knowledge Unit (GKU) 4: Networking

Description

This GKU covers the foundations of networking, network management, and application networking services.

Specific Knowledge Unit (SKU) 4.1: Foundations of networking

Description

This SKU is part of the Networking GKU. It covers the basic concepts and technologies that underpin the design and operation of network systems. These include the physical components of networks, the protocols that define how data is transmitted, and the architecture that controls how the network functions.

Topics

The following topics must be included in this SKU:

1. Introduction to networking (including OSI model, protocols, and standards).
2. Network hardware and devices (e.g., routers, switches, hubs, cables, and wireless transmission).
3. Network types and architecture (e.g., LAN, WAN, client-server, peer-to-peer).
4. Network media and troubleshooting (e.g., cables, wireless technologies, and diagnosing connectivity and performance issues).

Specific Learning Outcomes

By completing this SKU, students should be able to:

1. Describe the basic concepts of networking including the OSI model, network types, and network devices.
2. Solve basic network connectivity problems and troubleshoot LANs and connected devices.
3. Distinguish the basic components and media of network systems, LANs and WANs.

The table below maps the Specific Learning Outcomes for the Specific Knowledge Unit to the Key Learning Outcomes.

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Specific Knowledge Unit (SKU) 4.2: Network management

Description	This SKU is part of the Networking GKU. Network management is the process of administering and managing computer networks. This includes the physical components of the network, such as the routers, switches, and other hardware, as well as the software that controls the network.																																																																
Topics	<p>The following topics must be included in this SKU:</p> <ol style="list-style-type: none"> 1. Network management architectures, protocols, and standards. 2. Network management tools and techniques. 3. Common network problems and troubleshooting methods (e.g., connectivity issues, bandwidth bottlenecks, and hardware failures). 																																																																
Specific Learning Outcomes	<p>By completing this SKU, students should be able to:</p> <ol style="list-style-type: none"> 1. Apply principles of network management and related technologies in IT contexts. 2. Manage a network using appropriate tools and techniques. 3. Troubleshoot common network problems. <p>The table below maps the Specific Learning Outcomes for the Specific Knowledge Unit to the Key Learning Outcomes.</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr style="background-color: #4a4a8a; color: white;"> <th rowspan="2">SLOs</th> <th colspan="10">KLOs</th> </tr> <tr style="background-color: #4a4a8a; color: white;"> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> <th>9</th> <th>10</th> </tr> </thead> <tbody> <tr> <td style="background-color: #4a4a8a; color: white;">1</td> <td></td> <td>✓</td> <td>✓</td> <td></td> <td></td> <td></td> <td>✓</td> <td></td> <td></td> <td></td> </tr> <tr> <td style="background-color: #4a4a8a; color: white;">2</td> <td></td> <td></td> <td></td> <td>✓</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="background-color: #4a4a8a; color: white;">3</td> <td></td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>											SLOs	KLOs										1	2	3	4	5	6	7	8	9	10	1		✓	✓				✓				2				✓							3		✓	✓	✓						
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General Knowledge Unit (GKU) 5: Platform Technologies

Description

This GKU covers operating systems, their architecture and organization, and computing infrastructures.

Specific Knowledge Unit (SKU) 5.1: Operating systems

Description

This SKU is part of the Platform Technologies GKU. An operating system is described as a system software that manages computer hardware and software resources and provides common services for computer programs.

Topics

The following topics must be included in this SKU:

1. Fundamentals of Windows and Unix-class systems (e.g., installation, configuration, and usage).
2. Processes, threads, and CPU scheduling.
3. Memory management and virtual memory.
4. File and I/O systems.
5. Operating system troubleshooting.

Specific Learning Outcomes

By completing this SKU, students should be able to:

1. Describe the components and functions of an operating system and their interactions to provide a computing platform.
2. Apply system administration techniques to operate and manage Windows and Unix-class systems, including user management, file system configuration, and process control.
3. Perform the basics of installing, configuring, and troubleshooting an operating system.

The table below maps the Specific Learning Outcomes for the Specific Knowledge Unit to the Key Learning Outcomes.

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General Knowledge Unit (GKU) 6: Information Management

Description

This GKU covers concepts of data information, data organization architecture, data modeling, managing the database environment, special-purpose databases, and database query languages.

Specific Knowledge Unit (SKU) 6.1: Data-information concepts and data modeling

Description

This SKU is part of the Information Management GKU and covers the fundamentals of data and information, including how data is collected, structured and modeled. It also covers the mechanisms for data collection and their implications.

Topics

The following topics must be included in this SKU:

1. Data collection and retention (e.g., storage, backup, and security)
2. Entity Relationship diagrams
3. Relational and non-relational database concepts (e.g., relational operations, object-oriented, XML, NewSQL, and NoSQL)
4. Normalization, indexing, and constraints.

Specific Learning Outcomes

By completing this SKU, students should be able to:

1. Describe the role of data, information, and databases in organizations, including data collection and retention mechanisms and their implications.
2. Design Entity Relationship diagrams based on appropriate organizational rules for a given scenario.
3. Assess data retention issues including the need for retention, physical storage, backup, and security.
4. Apply relational operations, including select, project, union, intersection, set difference, and natural join operations on simple example relations.
5. Contrast relational and non-relational databases, describing key concepts of object-oriented, XML, NewSQL, and NoSQL databases.
6. Design a physical model for the best performance, including the impact of normalization and indexes.

The table below maps the Specific Learning Outcomes for the Specific Knowledge Unit to the Key Learning Outcomes.





SLOs	KLOs									
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Specific Knowledge Unit (SKU) 6.2: Database management and query languages

Description	This SKU is part of the Information Management GKU. Managing the database environment includes tasks such as configuring the database server, setting up user accounts, backing up data, and restoring data. It also covers dealing with database query languages.																																																																										
Topics	<p>The following topics must be included in this SKU:</p> <ol style="list-style-type: none"> 1. Database administration and security. 2. Backup and recovery. 3. Metadata management. 4. Structured Query Language (SQL). 																																																																										
Specific Learning Outcomes	<p>By completing this SKU, students should be able to:</p> <ol style="list-style-type: none"> 1. Describe tasks commonly performed by database administrators. 2. Evaluate the importance of metadata in the database environment. 3. Evaluate database security measures and design effective backup and recovery strategies. 4. Perform filtering and sorting data using various clauses, including <i>where</i>, <i>order by</i>, <i>between</i>, <i>like</i>, <i>group by</i>, and <i>having</i>. <p>The table below maps the Specific Learning Outcomes for the Specific Knowledge Unit to the Key Learning Outcomes.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #4a5568; color: white;"> <th rowspan="2">SLOs</th> <th colspan="10">KLOs</th> </tr> <tr style="background-color: #4a5568; color: white;"> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> <th>9</th> <th>10</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td style="text-align: center;">✓</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">2</td> <td style="text-align: center;">✓</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">3</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td style="text-align: center;">✓</td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">4</td> <td style="text-align: center;">✓</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>										SLOs	KLOs										1	2	3	4	5	6	7	8	9	10	1						✓					2	✓										3								✓			4	✓									
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General Knowledge Unit (GKU) 7: System Paradigms

Description

This GKU covers requirements engineering, testing, and quality assurance.

Specific Knowledge Unit (SKU) 7.1: Requirements engineering

Description

This SKU is part of the System Paradigms GKU. It covers the skills and tools required to gather systems requirements and modeling techniques.

Topics

The following topics must be included in this SKU:

1. Fundamentals of requirements engineering.
2. Modeling techniques.
3. Functional vs. non-functional requirements.
4. Creating and analyzing use cases.

Specific Learning Outcomes

By completing this SKU, students should be able to:

1. Apply the fundamentals of basic requirements engineering, including various modeling techniques.
2. Contrast between functional and non-functional requirements.
3. Design detailed use cases, illustrating their structure, event flows, and how functional requirements relate to use case scenarios.

The table below maps the Specific Learning Outcomes for the Specific Knowledge Unit to the Key Learning Outcomes.

SLOs	KLOs									
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Specific Knowledge Unit (SKU) 7.2: Testing and quality assurance

Description	This SKU is part of the System Paradigms GKU, which covers the essential principles and practices of software testing, focusing on how to apply current testing standards and execute acceptance testing.										
Topics	<p>The following topics must be included in this SKU:</p> <ol style="list-style-type: none"> 1. System testing standards. 2. User acceptance testing. 										
Specific Learning Outcomes	<p>By completing this SKU, students should be able to:</p> <ol style="list-style-type: none"> 1. Describe different ways for current testing standards. 2. Illustrate different ways to execute and evaluate an acceptance test. 										
	<p>The table below maps the Specific Learning Outcomes for the Specific Knowledge Unit to the Key Learning Outcomes.</p>										
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2				✓							





General Knowledge Unit (GKU) 8: Software Fundamentals

Description

This GKU covers software fundamentals such as problem solving, program development, algorithms, and data structures.

Specific Knowledge Unit (SKU) 8.1: Problem solving and program development

Description

This SKU is part of the Software Fundamentals GKU. It covers programming paradigms to solve a variety of programming problems.

Topics

The following topics must be included in this SKU:

1. Problem solving strategies including abstraction, decomposition and modeling.
2. Program development using an iterative process.
3. Program documentation.
4. Programming tools.
5. Version control and project hosting and deployment.

Specific Learning Outcomes

By completing this SKU, students should be able to:

1. Use abstraction and decomposition strategies to design a solution to a complex IT problem.
2. Develop a program using an iterative process to solve specified problems effectively.
3. Create comprehensive program documentation and integrate user feedback to enhance program functionality.
4. Analyze a program's design and implementation by assessing its coding style, correctness, and expected behavior on specific inputs, and provide feedback on how well the program meets its intended functionality.
5. Design a program by using tools relevant to current industry practices: version control, project hosting, and deployment services.

The table below maps the Specific Learning Outcomes for the Specific Knowledge Unit to the Key Learning Outcomes.





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Specific Knowledge Unit (SKU) 8.2: Fundamentals of data structures and algorithms

Description	This SKU is part of the Software Fundamentals GKU and covers fundamental data structures and algorithm development.																																																																											
Topics	<p>The following topics must be included in this SKU:</p> <ol style="list-style-type: none"> 1. Fundamental data structures including built-in, library, and programmer-defined, e.g., strings, lists, and maps. 2. Algorithmic program development. 3. Abstract data types. 4. Recurrence relations. 5. Formal reasoning on the efficiency of an algorithm. 																																																																											
Specific Learning Outcomes	<p>By completing this SKU, students should be able to:</p> <ol style="list-style-type: none"> 1. Decide on appropriate data structures (built-in, library, and programmer-defined, e.g., strings, lists, and maps) for modeling a given problem. 2. Create algorithms to solve a computational problem. 3. Apply mathematical concepts, including expressions and abstract data types, to develop and analyze programming solutions. 4. Utilize recurrence relations and formal reasoning to evaluate and ensure the efficiency and correctness of algorithms. <p>The table below maps the Specific Learning Outcomes for the Specific Knowledge Unit to the Key Learning Outcomes.</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr style="background-color: #4a4a8a; color: white;"> <th rowspan="2">SLOs</th> <th colspan="10">KLOs</th> </tr> <tr style="background-color: #4a4a8a; color: white;"> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> <th>9</th> <th>10</th> </tr> </thead> <tbody> <tr> <td style="background-color: #4a4a8a; color: white;">1</td> <td></td> <td></td> <td>✓</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="background-color: #4a4a8a; color: white;">2</td> <td></td> <td></td> <td>✓</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="background-color: #4a4a8a; color: white;">3</td> <td>✓</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="background-color: #4a4a8a; color: white;">4</td> <td></td> <td>✓</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>											SLOs	KLOs										1	2	3	4	5	6	7	8	9	10	1			✓								2			✓								3	✓										4		✓								
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General Knowledge Unit (GKU) 9: Web and Mobile Systems

Description

This GKU covers concepts and technologies of the Web and mobile systems, their vulnerabilities and development frameworks, and digital media.

Specific Knowledge Unit (SKU) 9.1: Web and mobile systems concepts and technologies

Description

This SKU is part of the Web and Mobile Systems GKU. It covers the major components of a web system and how they function together, including the web server, database, analytics, and front end.

Topics

The following topics must be included in this SKU:

1. Web and mobile application technologies.
2. Data validation.
3. Client vs. server-side development.
4. Cookies.
5. Server-side database connectivity.
6. JavaScript.

Specific Learning Outcomes

By completing this SKU, students should be able to:

1. Develop a web or mobile application that uses industry-standard technologies.
2. Develop a web or mobile application that validates data inputs on the client- and server-side as appropriate, uses cookies, and uses JavaScript.
3. Develop a web or mobile application that reads or modifies data in a server-side database
4. Write, debug, and test a script that includes selection, repetition, and parameter passing.
5. Use scripting languages for web scripting, server-side scripting, and operating system scripting.

The table below maps the Specific Learning Outcomes for the Specific Knowledge Unit to the Key Learning Outcomes.





SLOs	KLOs									
	1	2	3	4	5	6	7	8	9	10
1			✓	✓						
2			✓	✓						
3			✓	✓						
4		✓								
5				✓						





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