DEPARTMENT OF COMPUTER & INFORMATION SYSTEMS ENGINEERING
BACHELORS IN COMPUTER SYSTEMS ENGINEERING

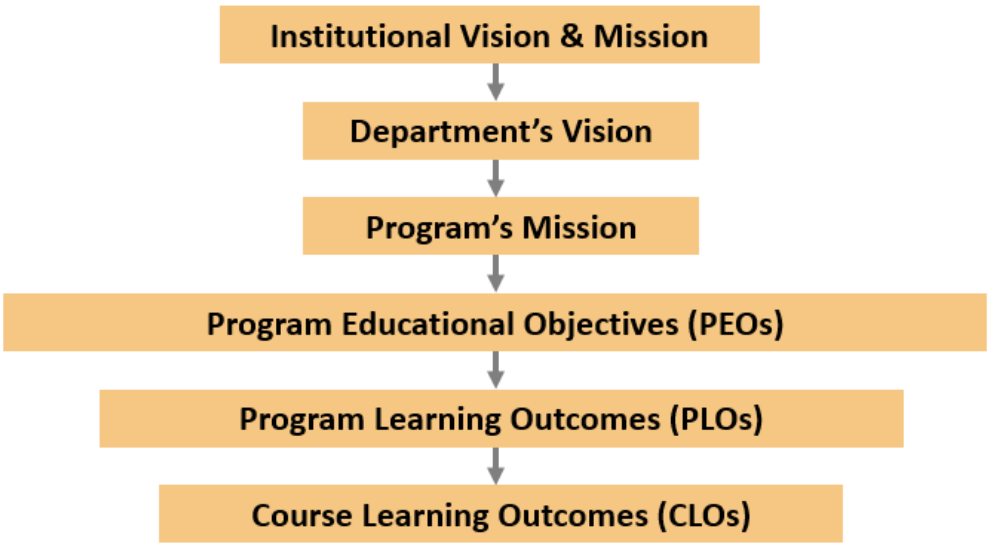
OUTCOME BASED EDUCATION (OBE)

Definition

Outcome based education means starting with a clear picture of what is important for students to be able to do, then organizing the curriculum, instruction, and assessment to make sure that this learning ultimately happens (Spady, 1994)

- Student centric learning
- Defining achievable and assessable learning outcomes
- Expanded opportunities for students
- The system is accountable to the stakeholders: *the learners and their parents*, *the teachers*, *the employers* and *the public*.

The Framework



Vision of NEDUET

Be a leader in enabling Pakistan's social and economic transformation.

Mission of NEDUET

Acquire education and research excellence in engineering and allied disciplines to produce leadership and enabling application of knowledge and skills for the benefit of the society with integrity and wisdom.

CIS Vision

Lead in computing and innovation for a smart, secure and sustainable future

Mission of Computer Systems Engineering Program

The mission of Computer Systems Engineering program is to impart world-class education to computer engineers, enabling them to exhibit outstanding professional skills, practice ethics of highest standards and impact society transformations through technological innovations.

Program Educational Objectives (PEOs)

PEO-1: The graduates will be able to design, implement and maintain cost effective cutting edge technologies using concepts relevant to computer engineering.

PEO-2: The graduates will be able to act as effective team players and eloquent communicators.

PEO-3: The graduates will demonstrate ethical responsibility to societal and environmental obligations.

PEO-4: The graduates will engage in lifelong professional development.

Program Learning Outcomes (PLOs)

PLO-1 Engineering Knowledge: An ability to apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

PLO-2 Problem Analysis: An ability to identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

PLO-3 Design / Development of Solutions: An ability to design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

PLO-4 Investigation: An ability to investigate complex engineering problems in a methodical way including literature survey, design and conduct of experiments, analysis and interpretation of experimental data, and synthesis of information to derive valid conclusions.

PLO-5 Modern Tool Usage: An ability to create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering activities, with an understanding of the limitations.

PLO-6 The Engineer and Society: An ability to apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solution to complex engineering problems.

PLO-7 Environment and Sustainability: An ability to understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.

PLO-8 Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

PLO-9 Individual and Teamwork: An ability to work effectively, as an individual or in a team, on multifaceted and /or multidisciplinary settings.

PLO-10 Communication: An ability to communicate effectively, orally as well as in writing, on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PLO-11 Project Management: An ability to demonstrate management skills and apply engineering principles to one's own work, as a member and/or leader in a team, to manage projects in a multidisciplinary environment.

PLO-12 Lifelong Learning: An ability to recognize importance of, and pursue lifelong learning in the broader context of innovation and technological developments.

Mapping of Curriculum to PLOs – Batches: 2018 and Onwards

		Computer Systems Engineering Courses	Program Learning Outcomes (PLOs)											
			PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PLO-6	PLO-7	PLO-8	PLO-9	PLO-10	PLO-11	PLO-12
First Year	Fall	CS-114 Fundamentals of Computer Engineering	X				X							
		CS-115 Computer Programming	X		X		X							
		EE-120 Basic Electrical Engineering												
		MT-114 Calculus	X											
		HS-111 Functional English									X	X		
		HS-106 Pakistan studies / HS-107 Pakistan Studies (for Foreigners)												
	Spring	CS-116 Object Oriented Programming	X		X		X							
		CS-117 Discrete Structures	X	X										
		EL-103 Basic Electronics												
		PH-122 Applied Physics	X											
		HS-205 Islamic Studies / HS-209 Ethical Behaviour (for Non-Muslims)												
Second Year	Fall	CS-218 Data Structures & Algorithms	X	X	X									
		CS-220 Digital Logic Design	X	X	X									
		CS-219 Computer Engineering Workshop					X							
		MT-224 Complex Variable & Fourier Analysis	X											
		EE-217 Circuit Theory	X	X										
		HS-218 Business Communication										X		X
	Spring	CS-221 Computer Organization & Design	X	X			X							
		CS-215 Signals & Systems	X	X			X							
		CS-222 Database Management Systems	X	X			X				X			
		MT-222 Linear Algebra & Ordinary Differential Equations	X											
		HS-219 Professional Ethics						X		X				
Third Year	Fall	CS-323 Artificial Intelligence	X		X		X							
		CS-326 Software Engineering		X			X						X	
		CS-327 Computer Communication Networks	X	X			X							
		CS-328 Computer Architecture		X	X	X								
		MT-335 Probability & Statistics	X											
	Spring	CS-301 Microprocessor Based System Design	X	X	X									
		CS-329 Operating Systems	X	X	X									
		CS-330 Digital Communication Systems*	X			X	X							
		CS-324 Machine Learning*	X			X	X							
		CS-325 Software Development & Testing*	X			X	X							
		MT-442 Numerical Methods	X											
		EF-305 Engineering Economics & Management							X				X	X
Fourth Year	Fall	CS-419 Digital Signal Processing		X	X		X							
		CS-431 Digital System Design		X	X		X							
		CS-425 Entrepreneurship for Computer Engineers						X	X	X				
		CS-433 Internet Computing**		X	X									
		CS-434 Bioinformatics**		X	X									
		CS-435 Software Project Management**		X									X	
	Spring	CS-406 Computer Engineering Project				X		X	X	X	X		X	X
		CS-438 Computer System Modelling	X	X		X								
		CS-432 Distributed Computing		X	X	X								
		CS-426 Computer System Security***		X	X		X							
		CS-436 Computer Vision***		X	X		X							
		CS-437 Parallel Programming***		X	X		X							
		MG-482 Organizational Behaviour						X			X			X

* Elective – 1 ** Elective – 2, *** Elective - 3

Key Performance Indicator for a CLO

Measurement Tools:

Assessment through course learning process
(Quiz / Assignment / Project,
Midterm Exam,
Final Exam,
Affective Rubrics,
Psychomotor Rubrics,
FYP Rubrics)

Passing Criteria:

A student attains a CLO by obtaining at least 50% marks in any of the given attempts.

Bloom's Taxonomy

Domains of Bloom's Taxonomy

1. **Cognitive:** Learner's ability to process information in a meaningful way - *Brain*.
   Categories: knowledge, comprehension, application, analysis, synthesis, evaluation
2. **Psychomotor:** Learner's ability to use motor skills to learn – *Hands*.
   Categories: perception, set, guided response, mechanism, complex overt response, adaptation, origination
3. **Affective:** Learner's attitude and feelings that are result of the learning process – *Heart*.
   Categories: receiving, responding, valuing, organization, internalizing

Cognitive Domain Levels

- **C1 - Knowledge:** Recognizing or remembering without necessarily understanding - *Name three common varieties of apple.*
- **C2 - Comprehension:** Demonstrating understanding of facts and ideas by organizing, comparing - *Compare the identifying characteristics of a Golden Delicious apple with a Granny Smith apple.*
- **C3 - Application:** Solving problems in new situations by applying acquired knowledge - *Would apples prevent scurvy, a disease caused by a deficiency in vitamin C?*
- **C4 - Analysis:** Examining and breaking information into component parts - *List four ways of serving foods made with apples and explain which ones have the highest health benefits. Provide references to support your statements.*
- **C5 - Synthesis:** Building a structure or pattern from diverse elements - *Convert an "unhealthy" recipe for apple pie to a "healthy" recipe by replacing your choice of ingredients. Explain the health benefits of using the ingredients you chose vs. the original ones.*
- **C6 - Evaluation:** Presenting and defending opinions by making judgments about information - *Which kinds of apples are best for baking a pie, and why?*

Example from CS-212: Computer Organization and Design

Topic: Instruction Set Architecture (ISA)

Possible Questions:

Knowledge - C1:	*DEFINE / DESCRIBE the term instruction set architecture.*
Comprehension - C2:	*CLASSIFY instruction set architectures on the basis of hardware complexity.*
Application - C3:	*SHOW how the following C language instruction can be compiled into MIPS code.*
Analysis - C4:	*ANALYZE the pros and cons of adding a new instructions in the instruction set.*
Synthesis - C5:	*DESIGN an instruction set ISA comprising the given instruction.*
Evaluation - C6:	*DETERMINE the possible reasons for performance degradation in the given design after adding an enhanced multiplier unit.*

Important Things to Remember

- Questions that measure a CLO are linked to a taxonomy level.
- At the end of a question that measures a CLO, the CLO# and its taxonomy/cognitive level will be mentioned in brackets.
- The question must be answered according to its taxonomy level.